

## Exploring Biophilic design features for enhancing patients' recovery in paediatric hospitals in Kano

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### Abstract

The contemporary healthcare sector usually focuses on clinical needs despite strong evidence that there are some components that plays a vital role in health outcomes improvement among which is Biophilia. However, the design approach of providing naturalistic spaces that connects patients with natural world was less considered in most of the existing pediatric hospitals in Kano. Therefore, using mixed method this research explored the Biophilic design patterns suitable for pediatric hospitals. In this regard, Biophilic patterns that have direct impact on patient's recovery outcome in some selected hospitals in Kano was discovered, Isiyaka Rabi Pediatric Hospital, Hasiya Bayero Pediatric Hospital and Murtala Muhammad Specialist Hospital. Data was collected through questionnaire (111 respondents) from all the three hospitals and interview. The information obtained was analyzed using Relative Importance Index and Content Analysis respectively. It was found that Natural Ventilation, Natural Lighting, Water Features, Natural Landscape, Attraction and Beauty with RII of 0.97, 0.95, 0.92, 0.91 and 0.91 respectively are the most impactful features in terms of children's healing. However, the study found that biophilic features such as Natural Colors, Landscape Orientation, Images of Nature, Natural Materials, Views and Vistas, Natural Colors with RII of 0.82, 0.77, 0.74, 0.72, 0.71 and 0.67 respectively are less significant in terms of children's healing process. Considering the health benefits of Biophilic design in pediatric hospitals, architects are urged to make conscious decisions in bringing nature into the hospital environment, through integrating natural lighting and ventilation, rich Natural landscape, water features, healing garden and indoor plants.

**Keywords:** Biophilic Design; Nature; Paediatric Hospital; Recovery; Healthcare

### 1. Introduction

The concept of biophilia is fundamentally and instinctively recognized as the healing influence of nature (Kellert, 2015). The exposure to nature results in immeasurable of benefits, particularly with regards to physical health and mental well-being. Scientific findings reveal that connection with nature can lower blood pressure, reduce heart rate variability, and improve parasympathetic nervous system activity. This simultaneous decrease in sympathetic nervous system activity leads to improved cognitive functioning (Söderlund & Newman, 2017).

Previous researches have agreed that biophilia has a positive effect on child development; playing in outdoor natural environment supports emotional, social, and cognitive child development. Older children learn exploration and building from their interaction with nature; this in return helps in adapting to new contexts, problem solving, group decision making, etc. Among younger children, small scale natural environments with props (water, vegetation, lighting etc.) ignite their imaginative play (Heerwagen, 2009). Earlier studies discovered that individuals who live among the magnificence and mysteries of nature never feel lonely or worn-out of life thus, implying that there is something substantially healing in the recurring stimulations of nature (Downton, 2017).

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It is notable, that research fields in environmental sciences such as architecture and urban planning mostly overlook adolescents and children in spite of them being more sensitive to the environments than adults. Designing for children is both tough and critical due to the several considerations that should be well addressed in respect to children's dynamic nature. Many children particularly new patients, perceive healthcare facilities to be quite a frightening place. It is a necessity to design for children's emotional needs (Onosahwo, 2016).

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## 2. Literature Review

**Healing Environment:** Healing is the step-by-step process of recovery, repair, and return to wholeness, healing involves set of efforts for the alleviation of suffering, enhancement of well-being and treatment of chronic illness (Wayne, 2014). Healing is an overall process of recovering mind, body and spirit, resulting in a beneficial change and movement towards self-realization no matter the absence or presence of disease (Dubose, 2016). Healing Environment (HE) have been described to be one in which the social, psychologic, spiritual, physical, and behavioural mechanisms of healthcare are slanted towards support and fostering of healing and the attainment of wholeness (Alkali, 2023). A healing environment should be soothing, promote wellbeing, and provide a sense of calmness for its inhabitants. The suitable architectural layout of a therapeutic setting would indirectly influence the outcomes for the occupants, including shorter hospital stays, happier patients and much more (Huisman, 2012). Khodeir & Gamal (2018) defined healing environment in healthcare facilities as a physical setting which supports patients and their families with the imposed stresses and undesirable psychosocial effects as a result of hospitalization, sickness, medical visits, and even mourning at times. Which in return, fosters residents' recovery, whether occupants of permanent stay (staff and long term admitted patients) or of temporary stay (patients and their families). The philosophy of biophilic design have provided principles that can be adopted to create a healing environment through integration of natural systems and processes.

**Evidence of Biophilia:** The first time the notion of biophilia was introduced was in the late 1900s by Erich Fromm, a German social psychologist. Biophilia is "the innate human inclination to affiliate with nature" (Kellert & Calabrese, 2015). However, the theory of Biophilia was first stated in 1984 by socio-biologist Edward O. Wilson in his book name 'Biophilia' (Kellert, 2012). He further explained that since humans have evolved with nature throughout their years of existence, contact with it remains an indispensable human need. This idea has been translated into a design theory known as biophilic design that is also explored for the purposes of learning how it is applied to the built environment. Some scientists have begun proving to the medical world that designed natural areas in health care facilities are not just aesthetic, but facilitate the healing of patients and restoration of family and staff (Louv, 2008). With this knowledge, hospital administrators and designers are becoming more and more motivated to include healing gardens and therapeutic outdoor areas as a part of the general design of these new facilities.

**Children and Nature:** Kellert's Organic dimension of Biophilia suggest that, one way to promote children's positive attitude towards biodiversity preservation may be contact with nature. Direct contact with wild nature without human intervention, proved to be the most powerful biophilic method to aid best health effects, specifically with daylight. However, in context of paediatric patients in healthcare facilities, not all have the advantage of spending time outdoors; thus, incorporating biophilia within interiors is essential for their wellbeing and health (Hammad & Serageldin, 2017). When a child is admitted to a hospital, they experience a sudden and complete change of environment, which can be horrific, even if their parents are with them. Outdoor landscape in children's facilities is important for balancing nature-deficit disorder, seasonal affect disorder and to encourage and allow for play (Guzzo, 2011). Many scientific studies confirmed the calming effect of nature on children, predominantly on patients in hospitals, which tend to be serious cause of stress (Moore & Marcus, 2008). It has been revealed that through contact with the natural world, stress levels are lowered, children require fewer pain medications, and usually have shorter hospital stays. In one of his landmarks and often cited research, Ulrich found that simply having a view to the outside with natural elements, rather than an adjacent building's wall, had all of the aforesaid results for children recovering from surgery (Kellert, 2015). In one of his research, Ulrich (2008) explained that children experiencing stressful situations, when exposed to natural setting for recovery, their heart rate, blood pressure, muscle tension and skin conduction all decreased more quickly when they were able to spend time with nature as opposed to an artificial environment.

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## 3. Materials and Methods

Mixed method approach was employed in order to ensure authenticity of information in studying the biophilic features that enhance recovery in paediatric patients. Three hospitals were purposefully selected for the study; Isiyaka Rabi Paediatric Hospital, Hasiya Bayero Paediatric Hospital and Murtala Muhammad Specialist Hospital based on their relevance to the study. To begin with, two among which are fully functioning paediatric hospitals while the other one

has a paediatric section as well. Another important consideration for this selection was the presence of biophilic features in all the hospitals, which is the main topic of the research.

Data was obtained through questionnaire in which respondents from three groups of care givers were randomly selected; Doctors, Nurses and patient's parents. A total number of 102 respondents (Table 1.0) were obtained from all the hospitals. The questionnaire was designed based on ranking of the importance of each biophilic feature using 5 points Likert scale interpreted as not important, somewhat important, neutral, important and very important for easy communication.

Guided by the in-depth literature reviewed during the research, the following Biophilic features are considered as variables; Natural Lighting, Natural Ventilation, Vegetation, Water features, Images of Nature, Natural Materials, Natural Colours, Attraction and Beauty, Views and Vistas, and Landscape Orientation.

**Table 1** Number of respondents based on Case studies and categories.

Hospitals	Nurses	Doctors	Patient's Parents	Total
Isiyaka Rabi Paediatric Hospital	11	4	21	36
Hasiya Bayero Paediatric Hospital	9	3	16	28
Murtala Muhammad Specialist Hospital	4	4	30	38
Total	24	11	67	102

In the case of interview, six respondents were interviewed in each of the three hospitals in which 2 doctors, 2 nurses and 2 patients' parents in all the cases. Therefore, there are 18 respondents who participated in the interview.

#### 4. Results and Discussion

Starting with the results obtained through questionnaire, respondents rate Natural Ventilation as the most important biophilic feature for achieving faster recovery in paediatric setting. With RII score of 0.97, Natural ventilation became the most outstanding element in enhancing recovery of hospitalized children in Kano, Nigeria. This is likely due to the fact that clean air is fundamental in achieving wellbeing and good health not only for children but adults as well (Agboola, 2024). The result also resonates with Alkali's study which revealed that most of the caregivers have preference for natural ventilation as they believe that it refreshes the environment and reduce the risk of infection (Alkali, 2023).

**Table 2** Computed Values of Relative Importance Index.

Biophilic features	Total Respondents	Cumulative Score	Relative Importance Index	Ranking
Natural Lighting	102	486	0.95	2
Natural Ventilation	102	497	0.97	1
Natural Landscape	102	463	0.91	4
Water features	102	469	0.92	3
Images of Nature	102	377	0.74	7
Natural Materials	102	368	0.72	8
Attraction and Beauty	102	466	0.91	4
Views and Vistas	102	344	0.67	9
Landscape Orientation	102	395	0.77	6
Natural Colours	102	418	0.82	5

Natural Lighting is in the second place according to the result shown in table 2.0 with slight difference of just 0.02 from Natural Ventilation. Apart from beautiful indoor ambiance provided by sunlight during the daytime, it also gives sense of security and comfort as well as act as vital source of Vitamin D which some patients are in high demand. Respondents' fondness for Natural Lighting can be traced to an unstable power faced in the hospitals which a times left some indoor spaces dull even during the day. Architecturally, both Natural Lighting and Ventilation could be achieved through incorporating large windows, shorter corridors and proper building orientation.

Furthermore, Water Features, Attraction and Beauty and Natural Landscape are the next most outstanding Biophilic features that foster healing in paediatric hospitals according to the research. Due to the fact that Kano is in the tropical region, experiencing a hot semi-arid climate, usually during the hot months, sick children need to be cooled down using wet towel as a result of high body temperature. Water features and natural vegetation helps greatly in cooling down overall temperature of the hospital environment, such that patients prefer staying outside under tree shades than indoors. The respondents' inclinations towards soothing natural elements, aligns with the principles of health-focused design, which prioritize holistic sensory balance and the creation of wellness-oriented spaces (Lubna, 2021) These features can be integrated in paediatric hospitals by providing gardens in form of beautifully planned healing gardens. A healing garden is a restorative place for mind and spirit. It gives the user a place of relief and silence, to engage with a world outside of the traumas that they may be experiencing. Research has shown that gardens provide sense of positive distraction to the patients, carrying away their minds from situation they find themselves, which in turn result in decreased stress, blood pressure and boost their hope. The result aligned with Gaffen study which revealed that positive distraction is an essential tool in achieving optimum healing as it directly targets their psychology positively, which in return fosters their healing and health greatly (Gaffen, 2004). There are over 100 documented studies that show stress reduction is one of the key perceived benefits of spending time in wilderness, particularly those resembling savanna (Louv, 2008).

Respondents interest in Natural Colours is also encouraging. Natural Colours were found to have lots of benefits to human health and wellbeing. Colours such as green and blue are considered to be the most impactful in terms of fostering recovery in healthcare settings. Kaplan (1995) suggest that exposure to natural colours particularly blues and greens drops patients heart rate, blood pressure while fostering relaxation and reduced anxiety. The result also corroborates with another study which says patients contact with natural colours helps regulate their circadian rhythms which is fundamental in overall recovery and wellbeing (Rea, 2011).

The next most important biophilic element in terms of healing in paediatric healthcare setting according to the research is landscape orientation. Having an RII score of 0.77 has surpassed the Point of Consensus of Agreement for this study which is 0.75 equivalent to 75%. It affirms the previous findings which reveals Childrens' unique health care needs, which require unique design solutions. Architects need to pay Special attention to the child scale, their eye-level when they walk, run, climb and crawl provides a much dissimilar view of the world than what adults are used to and for a successful children's space, this must be resolved (Stoecklin & White, 2008).

Images of Nature, Natural Materials, Views and Vistas has the least relevance to patients' restoration based on the findings. These elements receive lowest rating from the respondents, indicating their limited impact on fostering healing in healthcare setting. Interestingly, the result aligns with Alkali's research which found Natural Materials as the least Biophilic element in relation to patients' recovery. The low performance of Natural Materials in the studies of biophilia in Nigeria's healthcare facilities not shocking as barely you see use of natural materials, forms or shapes in institutional buildings such as hospitals in Nigeria (Alkali, 2023).

The findings from the qualitative approach are relatively similar to that of quantitative. Result obtained after thematic analysis of the interview depict that respondents are much aware of the health benefits of biophilia. Going into more details, care givers are more lenient to Natural lighting, Ventilation, Water Features and Landscape which resonates with result from questionnaire. Quoting a most popular statement from the respondents "*Natural Lighting, Ventilation and rich landscape brings comfort, and reduces stress among patients and care givers, thereby improving the healing process of the patients*". This has proved the innate affiliation of humans to nature. The finding also coincides with Schwab & Katharine's research which conclude the therapeutic benefit of contact with natural elements for children especially under the age of 10. Further explained that nature has therapeutic benefits on children as it helps enhance their emotional well-being, reduces stress and responds well to treatment (Schwab & Katharine, 2019).

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## 5. Conclusion

Paediatric hospitals are the central place for sick children to get treatment. This category of healthcare facility needs a healing environment which would aid in promoting health and well-being. One initiative to achieve a therapeutic environment is through integrating biophilic design as suggested by numerous literatures in the research. While biophilic design has many elements that foster human-nature relationship, results obtained from this study has revealed the most relevant biophilic features that directly enhance healing of paediatric patients. Therefore, architects and designers should give special emphasis on integrating Natural Lighting, Natural Ventilation, Water features, Natural Landscape, Attraction & Beauty, Natural Colours and Landscape Orientation in order to achieve maximum healing benefits of biophilia.

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