

Assessing Architectural Barriers and Inclusive Design in Secondary Healthcare Facilities in Akure, Ondo State, Nigeria.

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ABSTRACT

Universal Design (UD) refers to the design of the environment, goods and services to be usable, enjoyable and accessible by all people irrespective of age, sex, ability or disability. Nigeria's population has over 25 million people with varying disability types, and the environment of most public health care facilities is not accommodating, a contravention to access right to health, which is a promise upheld by the Discrimination Against Persons with Disabilities (Prohibition) Act 2018, but empirical evaluation of architectural barriers in Nigerian secondary level health care facilities in medium sized city such as Akure, Ondo state, is limited. The study adopted a quantitative methodological approach, using physical observation and a structured observation checklist of 88 items derived from the seven principles of UD, to examine architectural barriers to inclusive health care delivery in three secondary-level health care facilities in Akure. A weighted compliance index (WCI) was developed and implemented by incorporating the state and availability of each component, graded on a scale of 0 (Not Available) to 100 (Good). Overall WCI for the facilities revealed that none of the three facilities complied with any of the four PWD-specific sanitary criteria, which are door width, turning space, grab bars, and accessible approach. A Kruskal-Wallis H-test was conducted; the result revealed no statistically significant difference among the three facilities, while variations existed in fire safety system design, rooms for sensory access, exit-way finding strategy, and assistive equipment across all buildings. These findings indicate that architectural exclusion is systemic and calls for universal design-based retrofitting and periodic accessibility audits in secondary healthcare facilities.

Keywords: Universal Design, architectural barriers, healthcare accessibility, persons with disabilities (PWD), Weighted Compliance Index, Nigeria.

INTRODUCTION

Buildings and spaces in the built environment have varying levels of activity and provisions for people of all abilities, ages, and accessibilities. Sometimes, the provided levels will only benefit one party, leaving the others out. As a result, the World Health Organization provided a standard classification of functioning, disability and health to subsequently measure health and disability at individual and population levels. According to Jelsma (2009) and the Centers for Disease Control and Prevention (2012), the WHO provided categories in 2001 to succinctly group possible disabilities through the International Classification of Functioning, Disability and Health (ICF). These categories group people by disability, ensuring that accessibility provisions are tailored to their specific needs.

The grouping by the World Health Organization led to the development of the International Classification of Functioning, Disability and Health (ICF), which includes the principle of universality. No matter what, ICF is all about how buildings, physical factors, medical factors, etc., should be applicable to all persons, irrespective of their health conditions (WHO, 2002). This is how universal design came into play. Universal design is the design and composition of an environment in order for it to be easily accessed, understood and utilised to the best and most responsive extent possible by everyone, regardless of age, size, ability or disability (Erdtman, Rassmus-Grohn & Hedvall, 2021; Centre for Excellence in Universal Design, 2022).

All spaces in the built environment, whether public or private, especially in the healthcare setting, should be accessible to everyone, regardless of demographics, as healthcare is the one place with diverse user groups. A healthcare system is an organization, people and actions that have the primary aim of promoting, restoring or maintaining health (Kuper et al., 2024). However, healthcare delivery is not as inclusive these days, with poorly designed hospitals; people living with disabilities are usually excluded from the very facilities that should cater for them.

In Nigeria, up until 2020, it was estimated that there were 25 million disabled persons within the country. At the time, there was a population forecast for Nigeria of 208 million persons, and it was estimated that 1 in 8 Nigerians is disabled (Uduu, 2020). It has to be said that estimates for the prevalence of disabilities within Nigeria vary from source to source and depending on the study. The majority of these persons, in Nigeria, according to Ayub and Abubakar (2022), face various challenges on an institutional level with high rates of violence, discrimination, inadequate provision of housing and health facilities and very poor provision of basic amenities within the society.

Inclusive design, like universal design, is a process designed to develop effective solutions for users at risk of seclusion or marginalization (Szewczenko & Pronobis, 2020). With a focus on user diversity and the benefits of design diversity, inclusive design ensures that people who are often excluded are catered to in the design of products, buildings, and other things. It is not created specifically for a group; it addresses people who face exclusion for different reasons (Morena, Trupi & Kluger, 2024).

Universal design ensures that the building or product design is accessible to the greatest possible number of users, regardless of age, ability, gender, etc. (Erdtman et al., 2021). According to Persson, Ahman, Yngling & Gulliksen (2014), inclusive design can be understood as a subset of universal design; however, it caters only to individuals who are usually excluded from the environment or from using that design, focusing on diverse experiences that might make it hard for them to use the product (AEL Data, 2023). Universal design is meant to address this, removing the possibility of segregation and seclusion, serving all parties at large, and it is most important in healthcare settings.

Despite progress in global health systems, over 1.3 billion people worldwide, which is about 16% of the global population, experience significant disabilities and face systemic barriers in accessing healthcare services (World Health Organization, 2022). Inaccessible environments in health facilities often impede full participation and effective care, violating the right to health recognized in international frameworks such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and the WHO's Model Disability-Inclusive Health Services guidelines.

In Nigeria, many public hospitals do not implement Universal Design principles, and as a result, many facilities are inaccessible to individuals with physical, sensory, or cognitive disabilities, as it effectively bars a segment of the population from healthcare facilities that are meant to serve them all (Unuebho & Adeola, 2024). In the local context, the Akure North Local Government Area, with a projected population of over 230,000, lacks a fully inclusive General (secondary-level) hospital. The available facility located in Iju/Itaogbolu does not have features such as ramps, lifts, accessible toilet facilities, or adequate signage, nor does it address any other aspects that facilitate accessibility for people with other forms of disabilities, including but not limited to cognitive or sensory disabilities, and it does not consider the inclusion of people with other disabilities, hence urgent investment in Universal Design-compliant infrastructure. This study seeks to provide a structured approach for applying the principles of universal design to assess the impact of architectural barriers on inclusive healthcare delivery in Akure.

The objectives of the study include the following; to identify and analyse the level of implementation of universal design principles in secondary care facilities in Akure; to analyse architectural and environmental barriers in accessing healthcare services encountered by persons with disabilities; to measure the inclusiveness level of the selected healthcare facilities based on the dimensions of use, accessibility, mobility and sensory design and navigation, to develop evidence-based architectural and design interventions that can facilitate and promote usability and inclusive healthcare delivery in Akure; and to compare and benchmark the level of

compliance of selected healthcare facilities in Akure against national (NCPD), international (ADA, ISO 21542) and WHO accessibility standard benchmarks as the measured performance standards.

LITERATURE REVIEW

Universal Design and Its Relevance to Healthcare

Universal Design holds profound and measurable relevance for healthcare, directly addressing health equity, functional performance, and user experience in complex institutional environments (Saha, Biswas & Chauhan, 2025). Healthcare facilities are characterised by heterogeneous users: patients, staff, visitors, with varying ages, physical and cognitive abilities, cultural backgrounds and literacy levels, requiring buildings that have designs to cater to all. Universal design in this context means more than ramped access, as it requires careful attention to circulation, zoning, way finding, sensory environment, infection control, and user comfort. Research by Mosca & Capolongo (2023) shows that Universal Design is important in hospitals to address the physical, psychological, and social needs of all users, including patients and staff.

Although universal design has existed for decades and there are standards and principles for designing user-centered spaces, there's no standard way to assess the outcome. Only legal accessibility standards or a single Universal Design principle are considered when evaluating design (Mosca et al., 2022). Researchers like Mosca & Capolongo (2023) have developed frameworks, such as Design for All A.U.D.I.T. (Assessment Usability Design & Inclusion Tool), which assess the Physical, Sensory-Cognitive, and Social qualities of healthcare services.

However, further work is still needed to develop standardized metrics and verification tools.

Architectural Barriers to Accessing Healthcare

People living with disabilities have low rates of social participation, largely due to various barriers, including especially architectural barriers they encounter (Heldak, Stacherzak & Przybyla, 2018). Barriers here don't just refer to what's visible; they encompass failures in sensory perception, cognition, and systemic processes that impact users' safety, ability to function independently, and the quality of care they receive (Mosca & Capolongo, 2023). Research by Burns, Mendonca & Smith (2023) revealed that, despite being in public buildings, 70.64% of people living with disabilities in the USA faced inaccessible buildings due to physical barriers. Similar accessibility issues, ranging from difficult entry to problematic wheelchair transportation, inadequate parking, and unsuitable surroundings, have been noted worldwide, including in America, Europe, Asia, and Africa (Clemente, Silva, Vieira, Bortoli, Toma, Ramos, & Brito, 2022).

Barriers to the physical spaces in healthcare are much more complex than simply physical limitations. They also include how the space feels and challenges related to cognitive processing. It is clear that the sense of a space and its perceived qualities are beginning to heavily impact people's health, focus, and general well-being (Leonards et al. 2024). Sensory qualities significantly contribute to the perception of an architectural space (Chen et al. 2022), whereas visual aspects of a space help to determine where specific groups of potential users will go (Ahmed, Muhammed, Abdulrahman and Adebisi, 2022). A study by Rooke, Rooke, Tzortzopoulos and Koskelaa, (2023) found that many patients found hospital layouts confusing, which caused them distress. These obstacles stem from the complexity of the built environment and from failing to gain bearings, which results in confusion, anxiety, and stress, and subsequently in missing appointments (Ahmed et al. 2022). These combined issues highlight the vital need to include universal design from conception.

Applying Universal Design in Healthcare globally and in Africa

Across the globe, the implementation of universal design in healthcare is driven by performance evaluation and the integration of evidence-based design strategies, often exceeding legal minimums. The demanding nature of hospitals in Europe and the US has resulted in the creation and implementation of tools, such as the Design for All A.U.D.I.T. (DfA A.U.D.I.T.) by Mosca & Capolongo (2023) examines three quality categories, namely Physical quality, Sensory-Cognitive quality and Social quality. Use of universal design elements like automatic doors, handrails that offer good support and the use of contrasting colours that enable the visually

impaired to easily perceive a space defines a benchmark for accessibility that contributes to an equitable outcome of health and showcases the positive role of patient-centred care (Saha et al., 2025).

In contrast, in sub-Saharan Africa, many LMICs and their infrastructure lack the necessary support structures to facilitate universal design efforts, exacerbating inequalities in health service access (Mohapatra, Maiya, Nayak, Benny, Watson, Kinjawadekar & Nandineni, 2024). Despite signing the UNCRPD and enforcing local disability acts, many health facilities in sub-Saharan Africa, ranging from hospitals to PHCs, still lack basic universal design features, such as accessible toilets, ramps, and wheelchair-accessible pathways (Azubuike, Akinreni, Adai, Ogbonna, Abba, Udofia, Odo, Nwadicie, & Imo 2025).

Universal Design in Nigerian Healthcare: Disregard for Compliance and Barriers

Nigeria's gap between aspirational legislation and failed application of universal design principles appears to exist across a variety of building types (Olodeoku, Alokun, Alagbe, Egwabor & Buseri, 2024). In spite of Nigeria's existing Discrimination Against Persons with Disabilities (Prohibition) Act 2018 and more recent Persons with Disabilities (Accessibility) Regulations, 2023, it is evident from a plethora of public buildings that a distinct absence of accessibility is observed even in major cities such as Lagos (Morenikeji et al. 2022).

The problem is made even worse by Nigeria's National Building Code (2006), which has formulated accessibility guidelines that are vague and fail to provide the specific technical requirements needed to promote universal design ideals (Olodeoku et al. 2024).

In Nigerian tertiary healthcare, like the university teaching hospitals in Southwest Nigeria studied by Akinluyi, Ayoola, Morakinyo, & Fadamiro (2020), facilities are often designed and arranged in ways that patients find disorienting and not conducive to effective healthcare. This design likely indicates a lack of evidence-based principles during its conception. Specific problems encountered include the exclusion of individuals with mobility impairments due to the absence of accessible entrances and adequate designated parking, and the general confusion created by an unclear way finding system (Olodeoku et al., 2024). Systemic exclusion is also a result of a lack of trained personnel to assist disabled users and discriminatory attitudes, even though laws protect against such behaviour (Azubuike et al., 2025). Furthermore, insufficient awareness among developers, architects, builders, and policymakers impedes the application of universal design principles (Olodeoku et al., 2024). These interrelated barriers suggest that Nigerian healthcare accessibility issues are not only physical but also institutional and attitudinal.

Research Gap

In conclusion, while universal design has been widely recognized as the key to more accessible, usable, and equitable healthcare facilities, the Nigerian context lacks the standardized evaluation tools, research data, and comprehensive assessment of inclusiveness that go beyond basic accessibility. Likewise, few studies have examined the level of inclusiveness of health facilities in South-western Nigeria and the scope of services provided to meet users' needs. This problem necessitates conducting a systematic study of the level of inclusiveness of health facilities in Akure North, using the universal design concept as a framework to bridge gaps and inform future building design.

RESEARCH METHODOLOGY

Research Design

The research adopted a quantitative approach and employed the observational checklist method. This approach enabled in-depth observation and systematic documentation of facilities in their natural environment, emphasizing their entirety and the application of universal design principles; identification of physical obstacles; and a thorough comparative evaluation of hospitals.

Study Population and Sampling

This research adopted a purposive sampling method, selecting hospitals that best represented the research scope (accessibility, usability, and universal design in health facilities). Three general hospitals, which may

reflect the scope of architectural constraints and opportunities in a mid-sized Nigerian town, were selected in Akure: Tunada Medical Center (TMC), General Hospital Iju/Itaogbolu (GHI), and Tim Unity Hospital (TUH). These three facilities represent the secondary-level public provision in Akure North Local Government Area, Ondo State, and are therefore an appropriate sample for a complete data set.

Data Collection

Observations were made on the sites in a structured manner for entrances, horizontal and vertical circulation spaces, waiting areas, ward rooms, sanitary facilities, way-finding and signage and access to emergency areas. An observational checklist containing 88 generic items following the seven principles of universal design, for comparison and consistency purposes, was used during the observation and recording process. Each item was observed along two features: Availability (Yes/No) and Physical Condition (Bad/Poor/Fair/Good/N/A). All observations and scoring were conducted by a single trained researcher, with each item anchored to the defined availability and condition descriptors, ensuring ratings were applied consistently across the three facilities. Site features that either inhibited or enabled accessibility were photographically recorded to document spatial arrangements and support item scoring; photographs captured architectural and spatial features only and were not used to identify patients.

Scoring Method

A binary Yes/No compliance approach was also deemed insufficient for this study, as it assigns the same value to a feature present but in poor condition as to one present and in good condition, an essential distinction when examining the actual access conditions experienced by disabled people. Thus, a graduated scoring approach was applied, in line with the methodology by Mactaggart, Ssemata, Menya, Ndlovu, Willan, Zulu, Mhlongo, Mabunda, Padayachee, Lloyd, Mthethwa, & Carpenter (2024), where they measured accessibility at primary health facilities in Uganda using an adapted checklist where summary scores were calculated by taking the values of the observed indicators, and summing across the sub-domains and domains to compute facility-level compliance indices. With this approach, we can reflect on the quality of provision rather than merely its existence. Thus, we constructed a Weighted Compliance Index for each item in this study using the gradual scoring method, assigning Not Available=0, Bad=25, Poor=50, Fair=75, and Good=100. The category and the Overall WCI are determined by averaging all items within that category. Formally, each item is assigned a value S_i , which can take one of five values $\{0, 25, 50, 75, \text{ and } 100\}$. The overall value for any given category, or indeed the facility, is the average of its item scores: $WCI = (\sum S_i) / n$, where n is the number of items in that category, or the full list of 88 for the facility. Each item, regardless of how it is worded, is given the same weight as all other items to avoid bias in favour of certain features and to ensure an overall overview of provision across all indicators. That way, features that are present but deteriorated are not classified the same way as features that are present and in good condition, making the score an even more rigorous and transparent measure of accessibility provision. In addition, for comparability with studies using simpler methods, a binary compliance measure is presented alongside the WCI, with features considered compliant if they score 75 or higher (i.e., in Fair or Good condition).

Ethical Considerations

Ethical protocols were respected throughout the study. Permission was sought and obtained from facility management before physical assessment and photographic documentation were carried out. Architectural and spatial features were documented in the photos, and individuals were photographed only with their expressed permission. All secondary data cited were properly attributed and used strictly for academic purposes.

FINDINGS AND DISCUSSION

The findings of the observational assessment of Tunada Medical Center (TMC), General Hospital Iju/Itaogbolu (GHI), and Tim Unity Hospital (TUH) on seven UD categories are presented. The weighted compliance index (WCI), where scores of 0, 25, 50, 75, and 100 represent none, bad condition, poor condition, fair condition, and good condition, respectively, is used for reporting. Table 1 details the category-

level WCI of the three hospitals, and Table 2 presents the overall weighted compliance index and binary compliance for all three facilities.

Overview of Findings

A total of 88 criteria were measured across the seven Universal Design categories, drawing on Evidence-Based Design (EBD) guidelines. Collectively, the WCI were in close proximity for the three institutions; TMC scored highest at 38.4%, followed by GHI at 37.5% and then TUH at 36.1%, indicating significant barriers for persons with disabilities in all 3 facilities; while all the percentages are similar, the category breakdown revealed variations in the type and level of barriers present. These findings generally confirm studies that have identified a lack of UD provisions in public healthcare facilities in Nigeria (Unuebho & Adeola, 2024; Olodeoku et al., 2024).

Descriptive Analysis - Availability and Condition Frequency

Among the three hospitals, 47 (53.4%) of the 88 criteria were present at TMC, 46 (52.3%) at GHI, and 44 (50.0%) at TUH. Among the available criteria at TMC, 33 were in fair condition, 10 in poor condition, 4 in good condition, and none in bad condition. Among the 46 present criteria at GHI, 30 were in fair condition, 11 in poor condition, 5 in good condition and none in bad condition. For TUH, of the 44 present criteria, 16 were in fair condition, 12 in poor condition, 13 in good condition and 3 in bad condition. Throughout the three facilities, the most common provisions present were hygiene provisions (waste bin, sanitary sink, hygiene facilities), basic lighting along corridors, and ramp provision; among missing provisions across all three hospitals were PWD-designated sanitary provisions, emergency lighting and sprinkler system, accessibility devices, tactile guides, pictograms and emergency readiness plans. Among the highest-scoring provisions were waste disposal and maintenance (all three hospitals had them in good condition), sink and tap availability (good condition for both TUH and GHI, and fair condition for TMC), and non-obstructive pathways (all hospitals in good or fair condition). The worst-performing accessible provisions were ramp slope condition at TUH (bad, scoring 25), corridor illumination (all facilities scored 50 or below), and flooring (all facilities scored 50 or below).

The descriptive narrative above is illustrated by Table 3, which presents the frequency of checklist item availability per category for each hospital; Table 4 displays the distribution of physical conditions across available checklist item categories. These two tables provide a high-level (category-level) perspective on the presence and condition of various architectural elements across the three hospitals.

As shown in Table 4, the most common physical condition across all three facilities was 'Fair', accounting for the largest proportion of total available items at TMC (33/47) and GHI (30/46). The proportion of items recorded in 'Good' condition was largest at TUH (13/47), while only at TUH were any items recorded in 'Bad' physical condition across the entire study (3 items across Site Access, Entrance & Circulation, and Interior Spaces). It was at TUH alone that any items were recorded as 'Bad,' indicating the poor physical condition of elements such as the ramp slope and the Entrance and Circulation components. All three facilities failed to record items in 'Bad' condition for the Sanitary, Sensory, Safety, and Inclusiveness conditions; this is because there is no provision for those conditions, rather than excellent physical condition, as the unavailable items in those conditions do not exist to be evaluated.

Test of Significant Difference across Facilities

The three hospitals were tested for significant differences in compliance across facilities using the Kruskal-Wallis H-test on the Weighted Compliance Index scores for each item at each hospital ($n=88$ per facility). The test was used as the data was ordinal (ranging from 0 to 100 in increments of 25). It was also determined that the normality assumption underlying the parametric ANOVA analysis was violated. The test results are displayed in Table 5.

The overall Kruskal-Wallis test returned $H = 0.100$, $p = 0.951$, a p-value far exceeding the 0.05 significance threshold. Each post-hoc pairwise comparison between hospitals using the Mann-Whitney U test showed that

none of the hospitals differed significantly from each other (all $p > 0.7$). The corresponding effect size was negligible (epsilon-squared, $\epsilon^2 \approx 0.000$), confirming that facility identity explains none of the variation in item-level compliance. Therefore, the null hypothesis that all three facilities originate from the same distribution of accessibility provision cannot be rejected. However, this outcome is substantively important. It suggests that the architectural barriers identified in this study are not the consequence of a single poor-performing facility, but an endemic phenomenon pervading all of secondary provision in the region. While the three hospitals have different category-level profiles of good and bad (Table 1), their overall accessibility provision is statistically no different from one another. The case for a whole-facility policy change rather than targeted support for individual hospitals, and for a broader push against the generally non-compliant context for Universal Design in Nigerian public healthcare, is hence strengthened (Olodeoku et al., 2024; Azubuike et al., 2025). It should be noted that, with only three facilities, the test is statistically underpowered; this is a limitation rather than a flaw, and the convergence of the descriptive and inferential results should be read in that light.

Weighted Compliance Index Analysis

The WCI scores for all three hospitals are notably lower than the binary compliance scores. For example, binary compliance of 42.0% at TMC is more favourable than its WCI of 38.4% and similarly true for GHI (39.8% vs. 37.5%) and TUH (33.0% vs. 36.1%). This observation is consistent with the WCI method of accounting for existing facility conditions, as poor conditions yield lower WCI scores that more accurately reflect the poor condition of accessibility provision than a simple presence of a criterion. This shows how simple binary presence/absence evaluation can overestimate the accessibility of a resource by disregarding the quality of the provision. Hence the employment of a graded index rather than a yes/no tick list can be justified.

Site and External Access

At the Site and External access level in Table, 6, TUH had the highest WCI of 46.4%, followed closely by TMC at 44.6% and far behind by GHI at 17.9%. Of the 14 elements assessed in this category, the 50% (7/14) of the items were available at TMC; GHI availability was 28.6% (4/14) and 64.3% (9/14) at TUH. In terms of condition, the available TMC items were in the soundest condition (4 good, 3 fair, 0 poor or bad), GHI was in the worst condition with no good items (2 fair, 2 poor) while TUH had the only bad item in this section (3 good, 3 fair, 2 poor, 1 bad). Breakdown frequency counts are;

TUH and TMC perform relatively better due to the availability of external lighting, paved pedestrian pathways, and anti-slip pedestrian pathway surfaces. TUH also provided a defined curb line and ramp (both in bad condition) and signs (also in bad condition). However, none of the facilities provided designated PWD parking, shaded (covered) parking, appropriate drainage and water management features, or measures to reduce glare, which, at some level, forms a primary barrier upon arrival at any of the three facilities for all users and persons with disabilities.

GHI's significantly lower WCI in this category could be traced back to its lack of external lighting, defined pedestrian walkways, and an anti-slip pathway. The pathways at GHI are sandy and can quickly become navigable for wheelchair users and mobility-impaired users with the arrival of wet weather. This is consistent with observations by Moscoso-Porras, Fuhs, & Carbone (2019), which identify the absence of adequate pathways for users with disabilities and an appropriately finished pathway surface as key barriers to accessing healthcare in developing nations. The observations made by site staff at each facility corroborate these findings, where patients struggle with navigation, and the parking lot is highly cluttered, resulting in complications for persons with disabilities.

Building Entrance and Circulation

At the building entrance and circulation, TMC obtains a WCI of 47.5%, followed by GHI at 38.8% and TUH at 28.8%. Of the 20 elements analysed within this section, availability was 70.0% at TMC (14 of 20), 60.0% at GHI (12 of 20) and 45.0% at TUH (9 of 20). Condition-wise, neither TMC nor GHI possessed any items that were in Good condition, with both having a high number of Fair items (10 at TMC and 7 at GHI) and none

Bad; TUH possessed the one Good item and the one Bad item in this category (1 G, 4 F, 3 P, 1 B). Table 7, shows the descriptive frequency data.

Accessible ramps at the main entrances to TMC and GHI are a commendable provision for PWDs. The ramp at TUH, however, was evaluated as being in poor condition (25), with an inappropriate slope, no handrails, insufficient landing space, and no weather proofing; as a result, it is non-functional and inaccessible. The approximate 1200mm width at TMC's main entrance is at the lower end of the clear width recommended for wheelchair access under ISO 21542:2021, and it poses a slip risk when wet due to its tiled surface. The main entrance at TUH was again considered present but in poor condition, with one door always closed and lacking both the slip-resistant qualities of its floor finish and the durability necessary.

All three facilities performed poorly on corridor width, lighting, and ventilation at TMC and GHI, though TUH had acceptable corridor width and lighting. There were no visual contrasting edges or tactile cues on stairs across all three facilities, and the absence of lifts at all three hospitals scored 0 across all parameters. The relevant issue to mention here is that of the two-storey buildings, (which is the case for two out of the three sites) the lack of lifts is truly a limitation on vertical mobility for disabled users, whereas in the single-storey building (which is the case for one site, though spread over different blocks), the consideration is the routes of travel between blocks instead of lifts. This corresponds with the findings of Akinluyi et al. (2020), who reported comparable corridor access problems in Nigerian hospitals. At all three sites visited, it was acknowledged that corridors could become very busy and that the ramp to the TUH was not operational; therefore, the patient with disabilities had to be carried manually.

Interior Spaces

Analysing the interior spaces, GHI received the highest WCI of 50%, followed by TUH at 39.7% and TMC at 30.9%. Of the 17 elements assessed in this category, 47.1% were available at TMC (8 of 17), 64.7% at GHI (11 of 17) and 58.8% at TUH (10 of 17). Of the items that were available on condition, GHI's available items were the "healthiest" (2 Good, 8 Fair, 1 Poor), TUH held the only Bad item of this section (2 Good, 4 Fair, 3 Poor, 1 Bad) and TMC had no Good items within this section (5 Fair, 3 Poor). Table 8, shows the descriptive frequency breakdown:

The better performance at GHI was due to the width and obstruction of its corridors, as well as better seating allocation and arrangement in its waiting area. TUH had a dual performance: good results in signage for legible texts (100) and clear symbols/pictograms (100), but zero on emergency exit provision across all three criteria for PWD: clearly marked, unobstructed, and accessible, indicating a complete lack of an emergency exit strategy. For TMC's interior spaces, corridor width adequacy and lack of obstruction scored zero, though it performed average on all other criteria.

Neither of the facilities, apart from TUH, provided pictograms/symbols on their signs, and while TUH's symbols and pictograms scored 100, they were located in poorly positioned areas in its corridors (in bad condition). Acoustic separation was lacking in all three facilities, and TMC/GHI also lacked visual privacy screens in their waiting areas; though TUH had these features, they were in fair condition. This finding is supported by Tsami & Chrysikou (2024), who report that a lack of internal orientation, signage, and appropriate interior design are barriers to accessing healthcare in current facilities. For all patients and visitors at both TMC and GHI, there was a persistent need to rely on attendants for audible instructions and guidance throughout the consultation rooms and latrines, highlighting poor interior design and inadequate directional signage. This relates to the WHO/ICF mentioned above, as a consequence of environmental factors such as insufficient doorway width and passage congestion, which create barriers that decrease participation and result in exclusion.

Sanitary Facilities

The area with the worst and most uniform result among the three facilities was the sanitary facilities at TMC, GHI, and TUH, where there was a complete absence of accessible toilet facilities for persons with disabilities. Of the 12 elements assessed in this category, availability was consistent between the 3 facilities at 66.7% (8 of

12 each). On condition TUH had the best of sound (4 G, 1 F, 3 P), GHI had 2 G (3 F, 3 P) while TMC had no G (5 F, 3 P); all 3 facilities showed no B. The frequency distribution as shown in Table 9.

All four criteria specific to disabled-access toilet-wheelchair turning radius, adequate door width, grab bars, and adequate accessible path scored 0 across all three facilities, suggesting a complete disregard for the sanitary necessities of persons with disabilities at any of the sites. This constitutes both a violation of human rights and a Public Health risk. In particular, a 0% compliance with all 4 PWD-specific sanitary standards constitutes a violation of the

Discrimination against Persons with Disabilities (Prohibition) Act 2018 and the Persons with Disabilities (Accessibility) Regulations 2023. The identical lack of this feature across all 3 sites indicates that it is due to exclusion at the design stage, not to constraints in site layout or expenditure. Retrofitting a single PWD-accessible toilet facility is a manageable project, and estimates range from 300,000 to 1,200,000 Naira, depending on the project specification. This is a relatively inexpensive project.

Barring the disability-specific toilet criterion, TUH had the best WCI at 52.1%, followed by GHI at 47.9% and TMC at 43.8% in this category. The parameters for tap and sink provision, waste disposal and hygiene received good marks at TUH, and it was the only facility to obtain a good score in waste bin availability and overall cleanliness. Lighting and floor finishes throughout all three facilities, however, received a poor score (50), indicating a need to remodel these areas at all sites. The general disregard for persons with disabilities' sanitary necessities in all three facilities is consistent with findings by Ayub & Rasaki (2021), who establish that disability related amenities are largely absent in public hospitals in Nigeria. Staff at each site affirmed during the visit that dedicated disability toilets was not available, and mobility-impaired patients often had to seek assistance from caregivers and staff for such fundamental aspects of human function, which they reported to be a common challenge on a daily basis.

Sensory Accessibility

WCI scores of 36.1% at TUH, 33.3% at TMC and 25.0% at GHI for Sensory Accessibility in Table, 10 shows that all three institutions have failed most of the points evaluated in this criterion. Out of the 9 items assessed in this category, the availability at TMC was 44.4% (4 out of 9), at GHI 33.3% (3 out of 9) and at TUH 44.4% (4 out of 9). On condition, all items in this category were almost fair, except in TUH where one Good item was available (1 Good, 3 Fair); TMC obtained 4 Fair items and GHI had 3 Fair items. Neither one facility had Bad nor Poor item in this category.

There were no assistive devices for speech, vision, or hearing-impaired individuals at any of the 3 facilities, nor were there any pictograms or color-coding to enhance communication. Glare mitigation and the use of non-echoing surface treatments were absent from the design of all 3 facilities; all 6 listed points had a value of 0 in each.

TUH is rated highest in these criteria as they have uniform interior lighting throughout the building, scoring good (100), which makes them the only high-scoring hospital for these criteria. Interior lighting at TMC was rated good (75) and zero at GHI. Spatial separation to limit noise and provide speech-friendly areas scored fair at all 3 facilities. The results at all three sites mirror what was observed by Ahmed et al. (2022): Consistent poor prioritization of sensory and cognitive accessibility features and that people with visual, hearing, and cognitive impairments were the most negatively impacted. Observations from all staff across all three facilities indicated a lack of awareness of available assistive devices and sensory accessibility features, suggesting the problem is not the availability of these provisions, but rather a lack of planning for them.

Safety and Emergency Design

The facilities scored poorly for Safety and Emergency design provisions. The two facilities, TMC and GHI, scored an equal WCI of 22.5%, and TUH, with an even lower score of 17.5%, scored the lowest in the entire assessment category. Out of the 10 items surveyed in these criteria, availability was 30.0% at TMC (3/10), 30.0% at GHI (3/10), and 20.0% at TUH (2/10). On condition, the available few items at TMC and GHI are

all Fair (3 each); TUH's two available items are divided into 1 Good and 1 Fair. None of three facilities received any item categorized as Bad or Poor in this area. The frequency description is shown table 11.

8 out of 10 surveyed criteria received a score of 0 at TUH, including access to emergency routes for PWD. Access to emergency routes scored fair (75) at both TMC and GHI. 7 out of 10 criteria scored zero for TMC and GHI: clear and unobstructed pathways and emergency routes; fire alarms; sprinklers and suppression systems; emergency staff readiness; disaster preparedness plans; marked emergency zones; and visual/auditory guidance systems.

The lack of fire alarm and suppression systems in an operational health care facility poses a significant and imminent danger, especially for individuals with mobility limitations who may be unable to self-evacuate the building. TUH received a good (100) score for fire extinguishers at the facility, which was the only point it earned in this category, earning a passing grade. The presence of fire extinguishers without alarm or suppression systems does not provide an adequate emergency response plan at any of the facilities surveyed. These facilities must seek urgent help from their administrators and the state government for this critical situation. The data reflect the general trend across public health facilities in Nigeria, as noted by Azubuike et al. (2025). All staff members surveyed confirmed that there are no formal emergency evacuation procedures and that any drills held were purely informal and undocumented, which aligns with the zero scores for staff emergency readiness across all 3 facilities.

Inclusiveness and Universal Design

Overall, for the inclusiveness and Universal Design criteria, Table 12, GHI performed best, scoring a WCI of 66.7% compared to TMC at 37.5% and TUH at 25.0%, resulting in the largest score disparity among the three hospitals. Out of the 6 criteria surveyed at all three hospitals, availability was 50.0% in TMC (3 out of 6), 83.3% in GHI (5 out of 6) and 33.3% in TUH (2 out of 6). For the conditional items, mostly Fair and 1 Good in GHI (1 Good, 4 Fair), the 3 items available in TMC were Fair and divided into 1 Good and 1 Poor in TUH, there were no Poor items in the condition part:

TMC and TUH both scored zero for corridor width adequacy for PWD, and for the elderly/caregivers, TMC scored well on ramps and was the only hospital to score in this criterion, besides GHI. TUH's ramp was non-functional and received a 0 in ramp access and usability; they also scored zero for accessible PWD space and elderly/caregivers. GHI performed significantly better in this criterion, scoring good (100) for provision for the elderly/caregivers.

No specific provisions were made for neurodiverse users at any of the three hospitals, with all facilities scoring 0 on availability of calm spaces, neurodiverse safe rooms, or quiet rooms; a topic that has gained much importance over the years for inclusive healthcare design, and which mirrors findings from Nigeria that other disabilities aside physical disability are not well catered for at these facilities (Azubuike et al., 2025; Olodeoku et al., 2024). Each facility and its staff showed no awareness of the need to make any provision of specific assistance for a neurodiverse patient, but no greater awareness in respect of the provision of any assistance for a cognitively and developmentally disabled person than that shown in the neurodiverse population.

Comparative Summary and Implications

Overall, it is clear that all three institutions, Tunada Medical Center, General Hospital Iju/Itaogbolu and Tim Unity Hospital, failed to adequately meet the criteria for a safe, all-inclusive disability-friendly facility, and each received a combined WCI of 38.4%, 37.5% and 36.1%, respectively. The total WCI of all three facilities is remarkably similar and narrow; category differences reveal a pattern across the three hospitals. TMC performed significantly better at entrances and circulation as well as lighting for sensory access, GHI performed exceptionally well in interior spaces as well as inclusiveness at the facilities, and TUH had the relatively high scores in site access, sanitary facilities and lighting for sensory access but low scores in entrance and circulation, Safety & Emergency Design, and inclusiveness.

There are critical common failures in the 88 items surveyed regarding PWD sanitary facilities (all three sites scored 0), assistive devices, fire alarm and suppression systems, disaster preparedness plans, and accessible way finding and signs (all facilities scored 0). These are critical life-safety and rights failures that put the most vulnerable people at the highest risk. A binary compliance score of 42.0% for TMC, 39.8% for GHI and 33.0% for TUH further illustrates how easily compliance can be overstated without the weighted assessment of quality. These findings must inform the strategies of facility managers, architects, and policymakers throughout the state and guide interventions in all three facilities.

Set against other Nigerian studies, this pattern of near-uniform non-compliance is consistent with, rather than an outlier within, the wider literature. Akinluyi et al. (2020) similarly found that university teaching hospitals in Southwest Nigeria were designed and arranged in ways that disorient patients and hinder effective care, while Ahmed et al. (2022) documented poor visual accessibility and way finding provision in Nigerian hospital environments, consistent with the way finding and signage failures recorded across all three facilities in this study (Section 4.3). At a national level, Azubuike et al. (2025) attribute this persistence to systemic and institutional exclusion rather than isolated facility-level failure, a conclusion this study's near-identical WCI scores across three independently managed facilities under different ownership (TMC private, GHI public, TUH mission) directly support. A comparable hospital-specific assessment, Unuebho and Adeola's (2024) evaluation of Irrua Specialist Teaching Hospital in Edo State, likewise reports substantial gaps in universal design provision at a Nigerian tertiary facility, though it applies a different assessment framework that does not permit a direct WCI-to-WCI comparison with the present study. This absence of a shared, standardized quantitative metric across Nigerian hospital accessibility studies is itself consistent with the research gap identified in Section 2.5, and underscores the present study's WCI-based approach as a step toward more comparable, replicable measurement. Internationally, the near-40% WCI ceiling recorded across all three facilities also falls well short of compliance levels reported in higher-resource settings: Burns, Mendonca and Smith (2023) found that even in the United States, with comparatively mature accessibility legislation, 70.64% of people with disabilities still encountered inaccessible public buildings, indicating that architectural exclusion in healthcare settings is not unique to low-resource contexts, even as the scale of the gap identified in Akure North is markedly more severe.

LIMITATIONS OF THE STUDY

This study is positioned as an exploratory case study of accessibility provision in secondary-level healthcare facilities in Akure North Local Government Area, rather than as a generalizable regional survey. The three facilities, Tunada Medical Center, General Hospital Iju/Itaogbolu, and Tim Unity Hospital, were purposively selected because they represent the full population of secondary-level public and mission healthcare provision within the Local Government Area, and the depth of the 88-item structured observation was prioritized over breadth of coverage. Within this scope, the findings offer an in-depth, methodologically rigorous account of the state of Universal Design compliance in this specific setting.

Three limitations follow directly from this scope and should guide how the results are read. First, a sample of three facilities is not sufficient to support statistical generalization to secondary healthcare facilities across Ondo State or Nigeria more broadly; as already noted in section 4.1, the Kruskal-Wallis comparison across facilities is statistically underpowered at this sample size, and the convergence of the descriptive and inferential findings should be read as internal consistency within the case study rather than as population-level evidence. Second, all observations and condition ratings were conducted by a single trained researcher; while each item was anchored to defined availability and condition descriptors to promote consistent application, no second-observer inter-rater reliability check was performed, and this remains an unaddressed source of potential rating bias. Third, all 88 items were equally weighted in computing the WCI, which assumes that PWD-specific and life-safety items matter as much to the overall score as lower-stakes amenity items. This assumption was tested with a sensitivity analysis, recomputing the WCI while weighting the 14 items covering PWD-specific sanitary provision (Section D: Toilets, items 52–55) and life-safety and emergency systems (Section F: Emergency Routes, Fire Safety, Evacuation, Structural/Natural, and Emergency Signage, items 73–82) at two and three times the weight of the remaining items. The relative ranking of the three facilities (TMC > GHI > TUH) held under every scheme tested. However, the absolute scores fell for all three facilities as the priority items were weighted more heavily, from 38.4%, 37.5%, and 36.1% at equal weighting

to 35.3%, 34.6%, and 32.8% at double weighting, and to 33.0%, 32.3%, and 30.4% at triple weighting. Considered on their own, the 14 PWD-specific and life-safety items scored just 16.1% at TMC, 16.1% at GHI, and 12.5% at TUH, well below each facility's overall WCI. This indicates that equal weighting, if anything, understates rather than overstates the severity of the gaps in the most rights-critical categories, and the equal-weighting choice made in the main analysis can be considered a conservative one.

Future research should extend this exploratory case study into a larger, randomly or stratified-sampled set of facilities spanning multiple Local Government Areas and, ideally, other Nigerian states, to test whether the systemic pattern of non-compliance identified here holds at a population level. A second independent observer scoring a subset of items would allow inter-rater reliability to be quantified and reported alongside future WCI results.

CONCLUSIONS AND RECOMMENDATIONS

Using a Weighted Compliance Index derived from the Universal Design principles, this study examined architectural barriers to disability inclusive healthcare delivery in three secondary facilities in Akure, Ondo State. Results indicated that TMC, GHI, and TUH are far from meeting the criteria for disability-inclusive and accessible healthcare environments, with overall WCIs of 38.4%, 37.5%, and 36.1%, respectively. There was no significant difference among the three facilities in the individual item-level compliance scores ($H = 0.100$, $p = 0.951$; Kruskal-Wallis test), indicating that the reported architectural barriers may be endemic to the secondary level of healthcare provision in Akure.

Several immediate observations should be addressed: The three buildings offer no toilets for PWD; this is a fundamental lapse in even basic sanitation requirements for mobile and non-mobile patients alike, and results in the three facilities violating the 2018 Disability Act and 2023 Accessibility Regulations. The three buildings lack fire alarms, sprinklers, emergency zone signs, and a disaster management plan. These are essential for the safety of any building, especially for PWD, whose capacity to self-evacuate could be compromised. No assistive equipment, tactile way-finding signs, or neurodivergent-friendly spaces have been incorporated into the design for any of the three facilities.

An analysis of the relative strengths and weaknesses shows that whereas TMC demonstrated an adequate to good performance in entrance and circulation and external lighting facilities, but a weak performance in interior space and corridor width, GHI performed better in interior spaces, waiting room facilities, and inclusiveness as represented in three categories having a good performance, and was considerably weak in external infrastructure and pathway surfacing. TUH recorded the highest scores in site accessibility, toilet facilities, and sensory lighting distribution, and the lowest in entrances and circulation, safety/emergency, and inclusiveness in all categories, and has several items in a state described as 'bad physical condition'. All three facilities have profiles that require prioritizing remediation.

This study has also contributed to architectural assessment in Nigeria by using weighted compliance within a multi-criteria framework. By weighing features based on their physical condition rather than merely checking their existence, the Weighted Compliance Index provided a more accurate reflection of accessibility quality and, as it turns out, better reflects the experience of PWD navigating such environments. Comparing binary compliance figures of 42.0% (TMC), 39.8% (GHI), and 33.0% (TUH), which were higher than the WCIs in the three facilities, it is evident that prevalence only assessment does over-state actual quality of access and this should be integrated in future accessibility audits of Nigerian public buildings, and specifically in healthcare facilities regulated by the 2018 Disability Act and 2023 Accessibility Regulations.

The interventions recommended for all three facilities can be tiered by cost and impact. As immediate, low-cost, and high-impact measures, facility managers and Hospital Management Boards should install grab bars and accessible signage, add tactile way-finding cues, and provide comprehensive staff training on emergency preparedness and inclusive service delivery for persons with disabilities. As higher-cost capital measures requiring the involvement of the Ondo State Ministry of Health, the facilities should provide accessible toilets for PWD; install fire alarms, sprinkler systems, signs for emergency zones and general disaster preparedness measures; rehabilitate the ramp infrastructure at TUH (as this was reported as in 'bad physical condition') and

add ramp handrails and weather cover at GHI; and improve GHI's exterior lighting and pathway surfacing. Finally, to make accessibility monitoring routine and replicable, a biennial accessibility audit using the same 88-item checklist is recommended across secondary facilities in the state. Together, these interventions vary in cost but meet the minimum requirements of national law and international standards.

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