PERCEPTION OF HEALTH WORKERS AND ASSESSMENT OF TREE SPP. COMPOSITION IN ADEOYO GENERAL HOSPITAL, IBADAN, OYO STATE

ADENUGA, D. A., AGBO-ADEDIRAN, A. O., OLAJIIRE-AJAYI, B., ODEYALE, O. C., ADEREMI, A. M., OYEDEJI, M. B., ROBERTS, A. E. AND EZE, F. B.

ABSTRACT

Trees as a crucial component of forest play a vital role in providing a wide range of products and services including health benefits. The lack of information on tree species composition and diversity around public health care facilities in Ibadan may hinder comprehensive understanding of the ecological value and potential benefits that trees provide to the surrounding environment and public health care facilities. This study assessed the perceptions of health workers and evaluation of trees within the premises of Adeoyo General Hospital, Ibadan. Forty-nine (49) Structured questionnaire was used to derive the perceptions, while total enumeration of all the trees with diameter at breast height (DBH) greater than or equal to 10 cm were identified and enumerated in the study area. Tables and percentages were used to analyze the perception of the health workers while data collected on dbh (cm) and total height (m) were used to compute basal area (m^2) and volume (m^3). The analysis of socio-demographic data revealed a higher representation of female health workers (61.2%), a concentration of professionals in the 30 to 39 age group (46.9%), and a predominant presence of married individuals with tertiary education. Examining health workers' perceptions, a significant consensus emerges on the positive effects of tree exposure. Workers believed that exposure to trees improve patient clinical outcomes, speeds up recovery, and boosts the immune system (42.9%). There is also recognition of the role of trees in reducing stress levels and enhancing focus for both patients and healthcare workers. The positive correlation between trees around healthcare facilities and increased staff satisfaction is noteworthy. In the study area, *Azadirachta indica* was the dominant tree species constituting 42.2% of the total population. *Terminalia catappa and Gliricidia sepium* are also of great significance. Mean diameter, height, basal area, and volume suggest a diverse forest with a wide range of tree sizes. Meliaceae dominated the families with 42.2% while other families like Fabaceae and Combretaceae also contributed to biodiversity and ecological significance. In DBH, *Delonix regia* had the highest value of 198.3cm while *Newbouldia laevis* had 15.1 cm as the lowest value. *Antiaris africana* and *Azadirachta indica* both had the maximum values of 19.8 m and 51.8 m^3 in height and basal area respectively. Species diversity indices indicated a diverse forest ecosystem with 13 identified taxa and 64 individuals. The diversity index (Shannon-Wienner) of 1.89 - though it is low- is within the general limit for tropical forests. It is therefore recommended that integration and management of green spaces in healthcare facility design, development of employee wellness programs, promoting nature exposure, educational initiatives on the benefits of nature and economic valuation studies should be greatly considered.

KEYWORDS: Species diversity, Assessment, Adeoyo General Hospital, Adeoyo Ibadan, Health workers

INTRODUCTION

Nigeria possesses abundant biodiversity and ranks among the countries in Africa with the most diverse ecosystems.

Biodiversity plays a critical role in human survival, economic well-being, and the overall functioning and stability of ecosystems (Singh, 2002). Biodiversity encompasses the variability present among living organisms in terrestrial and aquatic ecosystems,

Adenuga, D. A. Forestry and Environmental Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Agbo-Adediran, A. O. Forestry and Environmental Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Olajiire-Ajayi, B. Forestry and Environmental Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Odeyale, O. C. Forestry and Environmental Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Aderemi, A. M. Agricultural Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Oyedeji, M. B. Statistics Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Roberts, A. E. Agricultural Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

Eze, F. B. Forestry and Environmental Technology Department, Federal College of Forestry, Ibadan, P.M.B 5087, Jericho, Ibadan

including both intra and inter-species diversity. Habitat destruction, over-exploitation, pollution, and species introduction are identified as major factors leading to biodiversity loss (UNEP, 2001). The disturbances caused by these factors significantly influence forest dynamics and the diversity of tree species within a given area (Hubbel, 2006).

Trees play a critical role for people and the planet. Numerous studies have demonstrated that the presence of trees and urban nature can improve people's mental and physical health, children's attention and test scores, the property values in a neighborhood, and beyond. Trees cool our urban centers and are essential for healthy communities and people. Trees, as a crucial component of forests, trees play a vital role in providing a wide range of tangible products and services. They offer recreational opportunities, game viewing experiences, and tourism prospects. Moreover, they serve as a valuable natural resource that generates income for the government and creates employment opportunities for individuals (Abu and Adebisi, 2002). However, the increasing threats to tropical forests have resulted in a decline in species variety, leading to the loss of biodiversity.

The diversity of tree species holds significant importance for overall forest biodiversity, as they provide resources and habitats for a wide range of other forest species. Biodiversity inventories play a crucial role in natural resources management, helping to identify the nature and distribution of biodiversity within a managed area. This information guides the implementation of appropriate management strategies to enable the resources to fulfill their potential (Bankole, 2002). The presence of vegetation surrounding an urban landscape not only improves the aesthetic appeal of a city but also offers a range of benefits to the inhabitants, such as ecosystem services that can positively impact their quality of life. Urban green spaces offer multiple benefits, such as energy conservation, carbon sequestration, reduction in water run-off, urban heat island effect mitigation, air quality improvement and positive impacts on human health and well-being (Lawrence, 2006; Donovan, 2017; Summers and Vivian 2018;)

Therefore, assessing trees around Adeoyo General Hospital, Adeoyo, (public health care facility) Ibadan Metropolis can lead to numerous benefits, including improved environmental health, enhanced well-being, microclimate regulation, biodiversity conservation, aesthetic improvements, and community engagement

MATERIALS AND METHOD
Study area

Adeoyo Hospital, formerly known as Adeoyo Maternity Hospital (established in 1928) is a large general hospital in the city of Ibadan, Oyo State, Nigeria. The hospital was established in 1928 and was formerly used as a college hospital by the University of Ibadan between 1948 and 1954 after being upgraded with an additional fifty beds, laboratory, X-ray annex, medical lecture rooms, and mortuary. Adeoyo Hospital, Ring road which lies on the geographical coordinates of 7.3512°N, 3.8625°E provides maternal and child healthcare services to people in Ibadan and the surrounding area. It is made up of an antenatal clinic, labour ward etc.
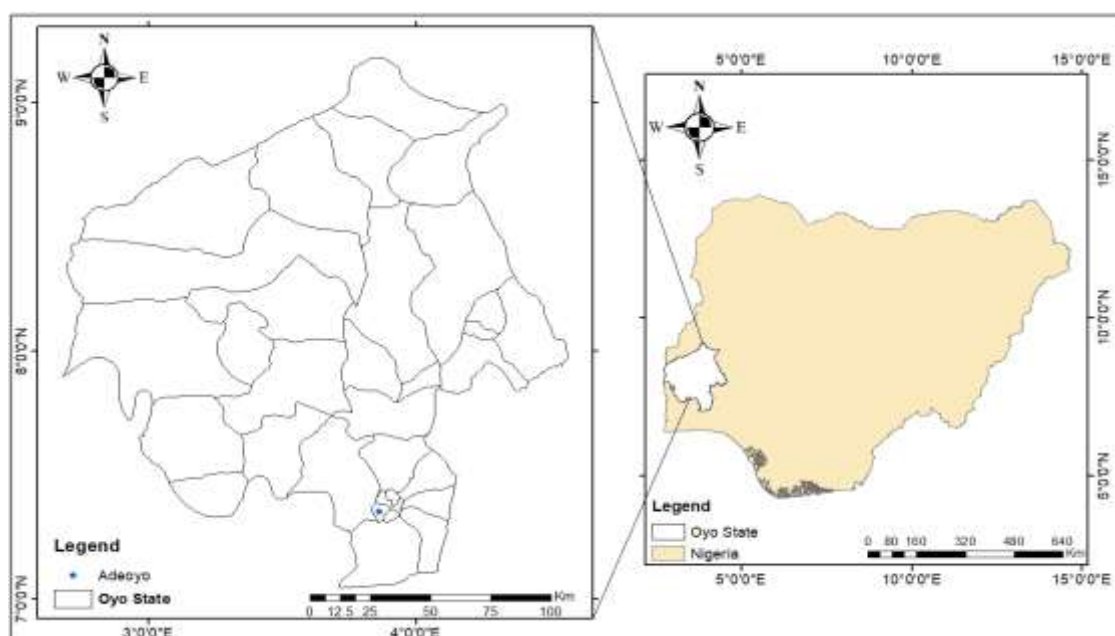
Source: Field survey, 2023
Figure 1: Map of study area

Data collection

All the trees with diameter at breast height (DBH) greater than or equal to 10cm (≥ 10 cm) within the health care facility were identified and enumerated with the help of a taxonomist. The tree heights were measured with Haga altimeter while the diameters were measured with girthing tape. Thirty-five (35) percent of one hundred and forty (140) health workers were interviewed using forty-nine (49) structured questionnaires in the study area

Data analysis

Perception was analyzed using description statistics such as frequency table and charts, basal area of the trees was estimated using formula;

$BA = \pi d^2$---(1)

Where BA= Basal Area (m³)   (Harrison *et al.*, 2010)

        D= DBH, π=22/7

Tree volume estimation: The tree volume for each tree within the study area was estimated using Newton equation:

V=B.A x height

Where V = tree volume

        B.A=Basal area

Shannon-wiener diversity index

Species diversity was computed using Shannon wiener diversity index Magurran (2004) and Lu *et al.* (2010);

$$H' = -\sum_{i=1}^{S} pi \ln(pi)$$

H= Species diversity index   S= Total number of species in the study Pi= proportion of S made up of the it species   Ln= Natural logarithm

RESULTS AND DISCUSSION

Table 1 Socio-demographic Characteristics of health workers at Adeoyo General Hospital, Ibadan

Variables	Frequency	Percent
Gender		
Male	19	38.8
Female	30	61.2
Total	**49**	**100**
Age		
20 to 29	14	28.6
30 to 39	23	46.9
40 to 49	11	22.4
50 to 59	1	2
Total	**49**	**100**
Marital Status		
Married	34	69.4
Single	14	28.6
Divorced	0	0
Widowed	1	2
Total	**49**	**100**
Education		
Informal	2	4.1
Primary	3	6.1
Secondary	4	8.2
Tertiary	40	81.6
Total	**49**	**100**
Years of Experience as Health Workers		
0 to 5	14	28.6
6 to 10	22	44.9
11 to 15	10	20.4
16 and above	3	6.1
Total	**49**	**100**

Table 2 Perception of health workers at Adeoyo General Hospital, Ibadan

S/N	Perceptions of Workers in Adeoyo	SD	D	A	SA	Mean	Score	Rank
1	Exposure to Trees Improve Patient's Clinical Outcome	1	1	23	24	3.43	168	1
2	Patient's recovery is faster after they see green view	0	1	25	23	3.45	1128	13
3	Patients suffer less severe pain when exposed to trees	0	2	27	20	3.37	1137	15
4	Patients exposed to trees are less anxious than other control conditions	0	4	20	25	3.43	1048	7
5	Tree Exposure boost immune system	0	3	25	21	3.37	1037	6
6	Healthcare Workers use trees to recuperate from stress	0	5	28	16	3.22	1051	8
7	Trees around healthcare facilities increase staff satisfaction	0	2	27	20	3.37	1086	9
8	Spending time around trees reduces stress and lowers blood pressure	0	2	22	25	3.47	1098	11
9	Green spaces in urban areas are just as important as rural forests	0	1	23	25	3.49	1133	14
10	Green view exposure has positive impact on patient's response with surgical issues	0	3	25	21	3.37	1103	12
11	Spending time around nature (trees) helps you focus	0	3	28	18	3.31	1087	10
12	Trees around the facility improve the aesthetic nature of the facility	2	6	21	20	3.2	966	5
13	Trees serves as means of protecting the healthcare facilities	8	6	18	17	2.9	770	4
14	Trees around the facility can be monetarily quantified	17	9	10	13	2.39	591	2
15	Are you willing to pay for the services trees provides within your facility?	38	8	1	2	1.33	754	3

Table 3 Growth characteristics of trees in Adeoyo General Hospital

SPECIES	Freq.	Rel Freq	av dbh (cm)	av. Ht (m)	B.A (cm^2)	Vol (cm^3)
Albizia zygia	2	3.1	45.1	7.8	0.3	2.5
Antiaris Africana	2	3.1	44.6	19.8	0.3	6.6
Azadirachta indica	27	42.2	151.4	12.0	51.8	644.6
Bridellia ferrugenea	1	1.6	30.1	10.2	0.1	0.7
Delonix regia	4	6.3	198.3	15.3	13.8	240.3
Ficus capensis	1	1.6	24.3	4.2	0.0	0.2
Ficus exasperate	2	3.1	42.1	10.4	0.3	2.9
Gliricidia sepium	7	10.9	125.4	9.4	10.5	109.4
Holarrhena floribunda	1	1.6	128.7	10.9	1.3	14.2
Leucena leucocephala	3	4.7	60.9	8.4	1.0	8.6
Newbouldia laevis	1	1.6	15.0	7.2	0.0	0.1
Terminalia catappa	12	18.8	128.8	10.1	17.5	198.1
Terminalia randii	1	1.6	73.6	4.8	0.4	2.0
Total	64	100				

Table 4 Family composition of Adeoyo General Hospital, Ibadan

Family	Freq.	Rel. Freq (%)
Apocynaceae	1	1.6
Bignoniaceae	1	1.6
Combretaceae	13	20.3
Euphorbiaceae	1	1.6
Fabaceae	16	25.0
Meliaceae	27	42.2
Moraceae	5	7.8
Total	64	100

Table 5 Species Diversity of Adeoyo General Hospital, Ibadan

Indices	Adeoyo
Taxa_S	13
Individuals	64
Dominance_D	0.2354
Simpson_1-D	0.7646
Shannon_H	1.887
Evenness_e^H/S	0.5074
Margalef	2.885
Equitability_J	0.7355

Trees around public health care facilities can provide valuable insights into the environmental health benefits they provide, which can positively impact the well-being and recovery of patients, staff, and visitors (Kweon *et al.*, 2017). Assessing the trees around health care facilities can help identify the presence of green spaces and their potential therapeutic benefits, creating healing environments that support patients' psychological and physiological well-being (Dadvand *et al.*, 2014).

Table 1 showed the socio-demographic characteristics of the respondents, where the respondents are more of female than male. In the study area, 38.8% of health workers are male, while 61.2% are female. This aligns with Acker, (1990) who highlighted the feminization of the healthcare workforce globally. Studies have suggested that women tend to dominate in nursing and allied health professions, contributing to the gender composition of the healthcare workforce.

The age distribution indicates a concentration of health workers in the 30 to 39 age group, which is consistent with findings in healthcare literature. The age distribution provides insights into the composition of the health workforce. The highest percentage of health workers falls within the 30 to 39 age group in the study area (46.9%). This indicates a relatively young workforce. This was in line with Dieleman *et al.,* (2008) that this age group often represents individuals in the mid-career stage, where

professionals have gained some experience but are still actively contributing to the workforce.

The result further revealed that the higher percentage of married health workers (69.4%) is in line with broader societal trends. Research suggests that marriage and family status can influence career choices and work patterns, especially for women in healthcare. This supported the findings of Fottler *et al.* (2006) that provides insights into the evolving role of women in the healthcare workforce. The dominance of health workers with tertiary education (81.6%) reflects the educational requirements for entry into the healthcare sector. This emphasizes the importance of higher academic qualifications in the healthcare sector. This aligns with the findings of Marilou *et al.* (2023) who reported that the graduates of Bachelor of Science in Medical Technology/Medical Laboratory Science (BSMT/BSMLS) and Bachelor of Science in Physical Therapy (BSPT) are mostly given employment opportunities both locally and internationally, employed within 6 months after graduation and with work aligned to the program increasing complexity of health care roles and the need for specialized knowledge and skills. In other words, Higher Education Institutions (HEIs) should be talent engines that foster innovation and competence development (Abelha *et al.,* 2020) resulting to highly qualiied graduates who can eventually compete in a local and global arena (Cuadra *et al.*, 2019).

Pacheco *et al.* (2013) present in their study that about 80.8% of graduates are currently employed and 76.8% are actually practicing physical therapy.

The distribution of years of experience reveals a balanced mix of health workers across different experience levels. The distribution of years of experience reveals that a considerable proportion (44.9%) of health workers has 6 to 10 years of experience in the study area.   This balanced distribution suggests a mix of both experienced and relatively newer health workers in the workforce. DiCenso *et al.,* (2013) noted that this is consistent with the diverse career trajectories within the healthcare sector, where professionals may choose to specialize or take on leadership roles at different points in their careers.

Table 2 shows the perceptions of the health workers on the impact of trees in both study area. A significant percentage of respondents agree that exposure to trees improves patient outcomes. A majority of workers in the study area agree that exposure to trees improves patient clinical outcomes. This aligns with existing literature indicating the positive effects of nature exposure on patient well-being, known as "healing environments" in healthcare design (Ulrich, 1984).

The majority of respondents agree that patients recover faster after exposure to green views. Workers generally believe that tree exposure boosts the immune system, and healthcare workers use trees to recuperate from stress. The consensus is that spending time around trees reduces stress, lowers blood pressure, and helps in focusing. This is consistent with Ulrich *et al.,* (1991) studies highlighting the role of nature in promoting healing and reducing recovery time.

The perception that patients suffer less severe pain when exposed to trees corresponds with research of Hartig *et al.,* (2003) linking nature exposure to pain reduction and improved pain tolerance. There is a positive perception that trees around healthcare facilities increase staff satisfaction and improve the aesthetic nature of the facility. Some workers believe that trees serve as a means of protecting healthcare facilities.

Respondents believe that patients exposed to trees are less anxious, supporting the idea of nature's calming effects on mental well-being. The perception that tree exposure boosts the immune system is in line with the concept of nature's role in enhancing overall health and well-being. The acknowledgment that healthcare workers use trees to recuperate from stress aligns with Van den Berg *et al.,* (2003) literature on the positive impact of nature on stress reduction and mental health. The positive correlation between trees around healthcare facilities and increased staff satisfaction is consistent with Nieuwenhuis *et al.,* (2014) studies emphasizing the importance of a pleasant and natural environment in workplace satisfaction. 34.7% of respondents believe

that the benefits of trees around healthcare facilities can be quantified monetarily. This is an emerging concept of Costanza *et al.,* (1997) in environmental economics, emphasizing the economic value of ecosystem services. The majority of respondents express willingness to pay for tree services within healthcare facilities. This aligns with Bratman *et al.,* (2012) the growing recognition of the economic and health benefits associated with green spaces and nature exposure.

The table 3 enumerates various tree species found in Adeoyo General Hospital, with *Azadirachta indica* (Neem) being the most dominant, constituting 42.2% of the total tree population. Other significant species include *Terminalia catappa* (18.8%) and *Gliricidia sepium* (10.9%). *Azadirachta indica* (Neem) trees exhibits substantial average diameter (151.4 cm), height (12.0 m), basal area ($51.8m^2$) and volume ($644.6m^3$), indicate their mature and robust growth. *Delonix regia* (Flamboyant) trees have a lower frequency; they show impressive growth characteristics with a high average height (15.3 cm) and substantial basal area and volume. *Terminalia catappa* species demonstrates significant size, with an average diameter of 128.8 cm and a considerable basal area ($17.5m^2$) and volume ($198.1m^3$). Gregoire and Valentine (2008), emphasizes the importance of accurate measurements for assessing forest resources and planning sustainable management practices.

 The presence of various tree species contributes to the overall biodiversity of the hospital environment. This diversity is crucial for ecosystem health and resilience, as highlighted in studies such as those by Chazdon *et al.,* (2016) and Poorter *et al.,* (2016) as well as the wellbeing of the staff and patients alike.

Table 4 shows the family Meliaceae has the highest relative frequency, indicating a dominant presence in the study area. This family includes economically valuable timber species, and its prevalence may have implications for the forest's commercial and ecological importance. Fabaceae has the second-highest relative frequency, indicating a significant presence in the study area. Combretaceae includes various tree species, and their abundance may contribute to the overall biodiversity and ecological significance of the forest. The Fabaceae family is notable for its high relative frequency, suggesting a substantial representation in the forest. Fabaceae is a diverse family that includes many economically and ecologically important species, such as nitrogen-fixing plants. This finding corroborates the findings of Dar and Singh (2019) who explicity stated the relevance of the Meliaceae family that many species of this family have been used in the treatment of various diseases as claimed by many workers in ethnobotanical and clinical trials. Apocynaceae, Bignoniaceae and Euphorbiaceae families have lower relative frequencies, suggesting less dominant in the study area.

The diversity of families adds to the overall richness and complexity of the study area (Whitmore, 1998).

The diversity of plant families in the forest is crucial for maintaining overall biodiversity. Each family contributes to the ecological balance and resilience of the ecosystem. The dominance of Meliaceae and Fabaceae may have ecological implications, considering their roles in nutrient cycling, nitrogen fixation, and potential interactions with other species. The presence of Combretaceae and Meliaceae, known for valuable timber species, suggests potential commercial significance. Sustainable forest management practices should be considered to balance ecological and economic interests. Recognizing the distribution of different plant families is essential for conservation efforts. It helps identify areas with unique or threatened species, aiding in targeted conservation strategies (Slik, 2009).

Table 5 shows Species Diversity of the Adeoyo General Hospital. Species richness is a fundamental aspect of biodiversity. High species richness indicates a more diverse and ecologically complex forest while reverse is the case. This reflects the abundance or population density of the forest. High individual counts suggest a dense or well-stocked forest. The dominance index measures the relative abundance of different species. A dominance index helps identify which species are most prevalent in the forest. A low value indicates a more even distribution of species. These indices align with widely used metrics in forest ecology and biodiversity studies (Magurran, 2004; Colwell, 2013). The Simpson diversity index assesses both species richness and evenness. A high Simpson index suggests lower diversity, whereas a low value indicates higher diversity. It considers both the number of species and their relative abundances. The species diversity indices obtained revealed that the diversity of the study site is very low with Shannon-Weinner diversity and Simpson (1-D) diversity indices of 1.89 and 0.77 respectively. This indices can be categorized as 'low' when compared with the general limit of 1.5-3.5 for natural forests (Kent and Coker, 1992), Baliton *et al.* (2020)*,* Maisyaroh (2021). The values are also low when compared to the findings of Agbelade *et al* (2016) who reported 3.35 and 2.48 for urban and per-urban parts of Ibadan respectively.

Table 6 shows the mean DBH of 125.3 cm indicates the average diameter of trees in the forest at breast height. This is a crucial metric often used in forest inventory to assess the size and age of trees. A higher mean DBH suggests a forest with relatively mature trees. The wide range from 15 cm to 286.2 cm (Min to Max) suggests a diverse stand with both young and mature trees.

The standard error of 7.6 indicates the variability of individual tree DBH around the mean. The mean height of 11.1 meters provides information about the vertical structure of the forest. It indicates the average height of trees in the stand. The range from 4.2 m to 19.8 m (Min to Max) suggests variability in tree heights. The standard error of 0.4 m represents the dispersion of individual tree heights around the mean. The mean basal area of 1.5 cm² per tree is a measure of the cross-sectional area of trees at breast height. It is an important parameter for assessing the density and stocking of a forest. The range from 0.02 cm² to 6.4 cm² (Min to Max) indicates variability in basal area, highlighting differences in tree density and spacing. The standard error of 0.2 cm² represents the dispersion of individual tree basal areas around the mean, the result finding aligns with Bertram *et al.,* (2003).

The mean volume of 19.2 cm³ per tree provides an estimate of the total wood volume of individual trees. This is crucial for assessing the timber yield and biomass of the forest. The range from 0.13 cm³ to 127.4 cm³ (Min to Max) suggests variability in tree volumes, indicating differences in wood mass. The standard error of 2.6 cm³ represents the dispersion of individual tree volumes around the mean. The high mean DBH and volume suggest a forest with mature trees. The wide range in all parameters indicates a diverse forest stand with varying tree sizes. Standard errors provide insights into the precision of the mean estimates, indicating the reliability of the calculated averages. It corroborates with Kimmins, (2005).

CONCLUSION

The socio-demographic characteristics of health workers in Adeoyo General Hospital indicate a higher representation of female workers with a concentration of health workers in the 30 to 39 age group. The majority of health workers are married, have tertiary education, and possess a balanced mix of experience levels. In terms of perceptions, health workers in the study area generally agree on the positive impact of trees on patient outcomes. The consensus includes beliefs that exposure to trees improves patient clinical outcomes, speeds up recovery, boosts the immune system, and helps healthcare workers cope with stress. *Azadirachta indica* and *Terminalia catappa* dominated the tree species in the study area. The forest exhibits a low diversity range of species compostion with varying growth characteristics. Family composition analysis reveals the dominance of Fabaceae and Meliaceae.

It is recommended that integration and management of green spaces in healthcare facility design, development of employee wellness programs, promoting nature exposure, educational initiatives on the benefits of nature and economic valuation studies should be greatly considered.

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