Assessment of the Challenges of Hearing Aid Maintenance, Repair, and Services in Secondary and Tertiary Government Hospitals within the Metropolitan Areas of Northwest

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ABSTRACT

The study explored the difficulties and present condition of hearing aid aftercare services and repairing in secondary and tertiary level government-owned hospitals in the metropolitan areas in Northwest Nigeria. A total of 62 ENT service-providing institutions were identified 16 of these offered any form of audiology services. Information was collected by a structured questionnaire. The results indicated marked imbalances in service provision, deficiencies in working audiology units, and a dearth of manpower. Despite a strong reliance on external providers, a minority of hospitals had in-house facilities for maintaining hearing aids. Key barriers identified were lack of training, insufficient technical tools and lack of coverage of hearing aid services by insurance. The findings of this study illustrate the critical need for capacity development, infrastructure development, and supportive policy changes to build capacity in audiology services and to establish better hearing health in the region.

Keywords: *Hearing aid, maintenance, audiology services, Nigeria, ENT hospitals.*

INTRODUCTION

The WHO emphasises the necessity of a hearing health approach that is integrated with other relevant health aims, across prevention, early detection and treatment. This is because with this view of the world hearing organization, the measurement and the delivery of hearing aids is only just a small step towards ensuring the whole auditory experience. The WHO acknowledges that hearing aid effectiveness is not a one-time fix, but a dynamic process that involves continuous support and adjustment to the changing needs of the user (WHO, 2019). It emphasises the importance of hearing aid maintenance, repair, and service. Maintenance encompasses daily cleaning and periodic inspections, while repair covers fixing breakdowns and replacing degraded parts. In addition, continued service keeps the hearing aid working properly and fitted and fine-tuned to the individual user's needs, if that means programming changes or troubleshooting (McCormick et al., 2016). Hearing aids cannot be used properly and therefore abandoned without proper maintenance and repair system, leading to wastage of resources and untouched quality of life.

THE NORTHWEST NIGERIA

The Northwest region of Nigeria covers an area of about 307,754 square kilometres. There are approximately 35.8 million people living there (NPC, 2020). Seven states and 196 local government areas make up this region (NBS, 2020). Northwest Nigeria has an agrarian economy bedeviled with several socio-economic problems such as low literacy levels (35.6%) and poor access to health care service (NPHCDA, 2019). In addition, the region is characterised by urbanisation, especially in metropolitan areas, which have multi-demographic groups and challenges in meeting people's demands for health services (Abdullahi et al., 2019).

Comparison of health care facilities in two locations often indicates a wider range of specialisations in metropolitan areas than rural areas for secondary and tertiary hospitals. These hospitals serve not only local residents but also as referral centres for patients from nearby areas. Here they emphasise the important role that NGOs play in providing necessary healthcare services, including ear care for those with hearing loss. Nonetheless, the Northwest has some serious problems that impact on quality patient care delivery. These challenges are intensifying by increasing rates of poverty exacerbated by inadequate schooling and fewer healthcare systems (National Bureau of Statistics, 2020). These challenges result in a range of circumstances that contribute to challenges of ensuring proper utilization of hearing aid and other health management practices through the delivery system of public health.

While there is relatively little research into hearing aid services in the Northwest region specifically, anecdotal evidence suggests that the issues are particularly severe. The existing literature review have shown the healthcare service delivery system in Northern Nigeria to be overstretched due to an inadequate number of healthcare professional, dilapidating infrastructure and resource deprivation (Adamu & Qundina, 2016). Such systemic avoidable barriers will likely hold serious ramifications for the long-term viability and impact of hearing aid programmes within the region. Moreover,

cultural attitudes, including the stigma of hearing loss, may challenge the willingness of people to access hearing aid services (Bello & Adebayo, 2017). In this context, it is critical to evaluate the challenges of secondary and tertiary hospitals in the delivery of hearing aid maintenance, repair, and service. Such an assessment will be key to enhancing the quality of hearing healthcare in Northwest Nigeria.

General Objective

This study aimed to determine the availability and accessibility of hearing aid maintenance and repair services in secondary and tertiary level facilities in Northwest Nigeria. Great insights into what is good and what is bad with the services and what the possible solutions could be.

Specific Objectives

The study had the following objectives:

1. To ascertain the provision of audiological and hearing aid services in secondary and tertiary hospitals in the region.
2. To evaluate the processes and practices involved in hearing aid maintenance and repair services within these institutions
3. To identify the most common hearing aid problems encountered by users in Northwest Nigeria
4. To assess the main barriers preventing the effective repair of hearing aids within these hospitals.
5. To examine the type of hearing aids used, the supply chain for hearing aid parts and accessories, and the level of collaboration with suppliers on repairs and maintenance.

Hypotheses

Alternative Hypothesis:

There is no significant gap in the availability and accessibility of hearing aid maintenance and repair services among secondary and tertiary government hospitals in the Northwest Nigeria.

Null Hypothesis:

There is no significant gap in the availability and accessibility of hearing aid maintenance and repair services among secondary and tertiary government hospitals in Northwest Nigeria.

This research aimed at establishing a comprehensive understanding of the gaps in hearing aid maintenance, repair, and services in the metropolitan area of Northwest Nigeria, by identifying gaps and obstacles that hinder effective service delivery.

Literature Review

Overview of Hearing Aid Maintenance in Nigeria

Standard care for hearing aid maintenance in Nigeria is challenged by environmental-determined, infrastructural related and economic-related factors. Corrosion of microelectronic components in high humidity environments such as coastal and riverine cause over 40% of all component failures, according to regional audits (Bankaitis & Kemp, 2023). Also, unreliable mains electricity prevents users from

regularly re-charging or testing devices, leading people to use disposable batteries, which can leak and destroy battery compartments (Akande et al., 2019). Further still only about 22 per cent of users seek professional services on the average, twice a year primarily because of travel cost to urban centers where audiology are concentrated (Adamu and Qundina, 2016). This compound hardship of environmental stressors and lack of service availability means that small issues wax clogging, damp can quickly escalate to the point of irreparability, reducing device lifespans and preventing ongoing usage.

Impact of Users and Professionals

For one thing hearing aid wearers, like users of other equipment, often throw away their hearing aids without seeing a professional. They usually do this because they fell the device isn't helping, is uncomfortable, or causes problem that seem avoidable. This behavior has many negative effects (Akande et al, 2019). Psychologically it results in decreased selfesteem and reluctance to engage in community and educational activities (Adamu & Qundina, 2016). Practitioners, however, maintain significant arrays of repeat repair requests; the median repair turnaround time is greater than one month, when devices are returned to outside laboratories (Bankaitis & Kemp, 2023). These results in delayed patient treatment further burdening administrative tasks in under-serviced departments, where more than 75 per cent of hospitals outsource repairs as they do not have in-house technicians (Adamu & Qundina, 2016). The net effect is lower clinician morale, higher overhead, and a feedback loop to further erode patient trust.

Routine Maintenance Practice and Limitations

Standard of care guidelines advocate for daily user cleaning (i.e., surface cleaning and wax guard removal) and professional checks every six months, including real-ear measurement and electroacoustic analysis (Akingbehin, 2016). In Nigeria, however, geographic confinement has suppressed uptake: only in urban centres in Kaduna and Kano, and then only by some, is professional maintenance available, while cleaning is conducted by rural users employing inappropriate tools (e.g., cotton buds) with its potential to push wax further into sound bores (Akande et al, 2019). The cost factor is also an important one: standard servicing costs (₦5 000 – ₦15 000) in most states equate to 10–30 per cent of the average household's monthly income (Adamu & Qundina, 2016). Thus, smaller defects may go uncorrected until the device fails entirely and instead of being able to repair a device, a new, very expensive, device must be purchased.

Common Faults in the Nigeria Context

Field experts from seven state identified the main reasons why hearing aids stop working.

Corrosion and Moisture (42%): this happens when sweat and humid air damage the inside part of the hearing aid. It's often made worse because most users don't use a drying or humidifying tool (Bankaitis & Kemp, 2023). Wax blockage (35%): earwax blocks the device, especially when people don't go for regular ear cleaning. The problem is also worsened by the common habit of using object to cleaning the ear at home (Akande et

al., 2019). Battery compartment breakdowns (18 per cent): associated with poor quality cells use and corrosion from leakage (Akande et al., 2019). Smaller but still substantial issues are transmissions (8%): poor seal out of the earmould causing acoustic leakage, and setting (7%): no software updates (Bankaitis & Kemp, 2023). These shortcomings in turns highlight the importance of targeted, context-specific maintenance approaches.

Strategies for Efficient Audiology Services

In countries like Ghana, hearing aid services have improved by using a system where by big hospitals or audiology centres in the cities train and guide health workers in rural areas (Akingbehin, 2016). In Nigeria, an initial roll out might capitalise on the existing PHC infrastructure: district nurses could be trained to perform simple cleans, wax guard replacement and battery tests, with the specialist consultation undertaking only the more complex tasks, heads of department at state centres telling us if there was service required. Tele-audiology platforms, made possible by the proliferation of mobile networks, can provide tele-remediation and firmware updates (Bankaitis & Kemp, 2023). These strategies, however, are dependent on an early outlay of capital for portable diagnostic kits (e.g., test boxes) but can only be implemented through formal partnering between teaching hospitals and Ministries of Health.

People with the funds to help healthcare will take action together through music and fellowship programs to advance mental and emotional health in limited resources nations such as Nigeria. Such programs can include training of Audiologists and other health workers who have an important role to play in managing the hearing impaired homeless people who may be facing difficulties due to several factors (Dillard, 2019). There is a demand for resource mobilization through increased funding from the government and different community-based initiatives (Akanji, 2016). Infrastructure: it should be more on improving websites, upgrading hardware and improving internet (Olusanya, 2015). The promotion of positive behavior through various community programs and public health campaigns plays a pivotal role in promoting awareness (Al-Rowaily et al., 2019). Says that the physical therapy through telemedicine approaches should be reinforced for rural access to remote specialists (Swanepoel & De Sousa, 2019). In addition to this, the impact of an organization can also be measured by using qualitative, quantitative and mixed data through a well-established monitoring and an evaluation system (Olusanya, 2015).

Troubleshooting and Service Delivery Bottleneck

In nearly all secondary and tertiary hospitals, lack of in-house repair labs obliges 75 per cent of such facilities to send their equipment repairs outside the hospital, causing median delays of 30–45 days (Adamu & Qundina, 2016; Bankaitis & Kemp, 2023). A poor level of manufacturer partnerships (i.e., only 25% of those surveyed have any kind of partnership) as well as the absence of on-site spare-part inventories are also important contributing factors (Akande et al., 2019). Inclusion of elementary hearing-aid repair modules in nursing and technician training courses could help to overcome the problem of

manpower. On the one hand, creating 3 depot repair centres (e.g. in Kaduna, Kano and Sokoto) would cut down on the time of transportation, as well as consolidate technical knowledge provided that they are furnished with required tools (e.g. electroacoustic analyzers, humidity controlled cabinets).

Related Studies

Hearing aid services research identified several major themes related to access, maintenance, and sustainability, especially in resource-constrained contexts. In developed countries, routine maintenance programs funded by insurers ensure devices operate optimally (Sullivan & Brothwell, 2015), and patient education and acceptability of systems to access a support system for repairs is critical (Akingbehin, 2016). The scenario in the context of Sub-Saharan Africa with respect to hearing aid provision and service delivery is however different. In low-income countries, with a few exceptions, they usually face minimal infrastructure in community-based, secondary and tertiary hospitals, and the absence both of adequate installation and trained human resources to maintain and repair hearing aids is frequent (Kochkin et al., 2011). This problem is compounded by accessibility issues: geographic and financial barriers often amplify already limited access to and availability of hearing aid services, especially in rural areas (Leary et al., 2016). Murray et al. (2012) and Lohr et al. (2012) also noted in their review, a shortage of audiologists and technicians meant that repairs and services were not sufficiently provided, and the regular supply of hearing aids and parts at government hospitals was hindered due to inadequate resource allocations.

There are also documented specific challenges in hearing aid service delivery within Nigeria. Studies suggest patients hold low awareness of the significance of consistent hearing aid maintenance (Akande et al., 2019) and excessive wait times for repairs due to insufficient staffing support (Akinpelu et al., 2020). Udom et al. (2020) explains that government efforts to provide accessible hearing aids are always compromised by maintenance negligence and rare provision of resources. Furthermore, urban studies on patients indicate a large load on urban hospitals as they create long queues, thus several service delays (Pattison et al., 2017). Shortage of replacement parts is another challenge faced by many facilities, which is an impediment to successful hearing aid repairs, and negatively affects the performance of the devices (Murray et al., 2019). Fitzgerald et al. (2018) also elaborated on how the lack of longitudinal integration of services in the 'Post- SURG' period can increase sub-optimal device longevity and reduce patient experience.

There are major differences in hearing aid provision and maintenance between rural and urban settings. Akinpelu et al. (2020) and others have come to the conclusion that although audiology services are more accessible in larger metropolitan areas, audiologists within these settings are often overbooked and unable to meet the needs of their patient populations. Patients often make pandemics to central hospitals to fix hearing aids, but great variations in service quality and limited accessibility (resources) due to finances are major obstacles (Lohr et al., 2012). Overall, this suggests that although urban hospitals are more inclined to offer

audiology services, they may not be equipped to deliver full audiologic care (Akinpelu et al., 2020). The lack of competent skilled personnel results in the provision of low maintenance quality services (Akande et al., 2019), and while many governments' institutions subsidise hearing aids, the provision of long-term sustainability and follow up support remains a poorly established practice (Udom et al., 2020). Pattison et al. (2017) argued that even with a high level of initial motivation, greater patient education about regular hearing aid service is needed to maximize device longevity suggesting again that we may benefit from addressing these challenges with a multifaceted approach.

Need of the Study

There is a significant deficiency in hearing aid service provision across secondary and tertiary hospitals in Northwest Nigeria. This gap necessitates research into finding the barriers such as poor training, limited resources, and weak policy support. The study aims to illuminate these challenges and advocate for strategic reforms and investments to ensure sustainable and equitable hearing care.

Aim of the Study

This study aimed to determine the availability and accessibility of hearing aid maintenance and repair services in secondary and tertiary government Health facilities in Northwest Nigeria. It sought to identify existing service gaps, barriers, and potential interventions to improve hearing healthcare delivery.

Inclusion Criteria

Hospitals included in this study were government owned secondary and tertiary hospitals within metropolitan areas of Northwest Nigeria that provided ENT services. The study included all hospitals with or without audiology units to provide a comprehensive overview of the availability and distribution of hearing aid services.

Exclusion Criteria

Hospitals located in rural areas or private healthcare providers were excluded from the study. Additionally, facilities that did not offer any ENT-related services were excluded from the data collection process.

Methodology

Research Design

The design of the study was empirical and quantitative in nature. The main instrument for data collection was a structured questionnaire carried out to determine availability and source, state of maintenance and repair, and services of hearing aids in the secondary and tertiary hospitals that offered ENT services in the northwest zone of Nigeria.

Population and Sample

A multistage sampling method was employed. Formal letters were sent to the states' ministry of health requesting for the overall number of secondary and tertiary hospitals in each of the state in the North-west Nigeria and to seek ethical approval (Stage 1). In the second stage, all second-

level hospitals (state) and third-level hospitals in each state in which ENT services are available or not available were stratified. Finally, all the hospitals with ENT service were selected in Stage 3. These were approached directly, and a structured questionnaire was forwarded to each to be completed by the head of the departments of Audiology, otolaryngology, or the ENT Nurse in Charge.

Data Collection Instrument

A structured questionnaire was developed according to the literature reviews and expert advice. The survey was split into:

- Professional Demographic Section
- Hospital Demographic Section
- Hearing Aid Maintenance and Repair Section
- Service Quality and Outcomes Section
- Challenges and Solutions Section

Missing values and outliers were adequately handled to prevent lack of completeness, precision, and consistency.

Data Analysis

The data were examined for completeness, consistency, and accuracy. Appropriate treatment of missing values and outliers was performed. Descriptive statistics (frequencies, percentage, bar charts, and pie charts) were employed to summarise the data with the aid of statistical software (SPSS).

Reporting

Results: The results in terms of findings were reported in tables, charts and graphs for easy understanding. Comments on the findings, implications of practice and suggestions for improving quality and standards of hearing aid care, maintenance, repair and services are given in the report.

Promotion: The final report was presented to the School of Advanced Education, Research and Accreditation, Castellón, Spain. Moreover, the results were disseminated in academic journals and possibly other conferences to the wider audience.

Limitation

Response Bias: Some self-report potentially was response-biased.

Sample Representation: The sample may not have been a good reflection of the entire population of ear/hearing care professionals in Northwest Nigeria.

RESULTS

Hospital Demographic Section

A total of 28 tertiary and 185 secondary hospitals were identified in the seven states. There are 69 ENT facilities in total. Yet, only 16 have audiology services, indicating a great service deficit. Kaduna has the highest number (4) of audiology services, then closely followed by Kano and Jigawa with 3 each. Kebbi and Sokoto were identified with 2 facilities having audiology services and Zamfara with none.

In terms of collecting data, a total of 69 questionnaires were handed out to hospital providing ENT service and 62 were collected back, giving a total response rate of 89.9%. The highest number of responses which were successfully completed was from Katsina (16), Jigawa (14) and Kano (13) other states

such as Kaduna, Kebbi, Sokoto and Zamfara also made a good level of response and therefore famously co-operated well with the data collection team. In addition, 74.2% of centers did not have an audiology facility, presenting significant infrastructure lack. Although 50% of facilities had existed for more than 10 years providing ear and hearing services, lack of quality audiological services in secondary and tertiary hospitals in most countries raise questions on the magnitude and quality of the services provided. The findings highlight the critical need for policy and infrastructure investment to increase access to audiological services.

Figure 1 shows there is a large discrepancy in the number of the hospitals, those providing ENT and those having audiology services in northwest Nigeria (See Figure 1.). The largest number of hospitals are located in Kano and Kaduna; however, the services for audiology are limited. There is good coverage of ENT at Katsina but not good interlinking with audiology. Zamfara does not have a single audiology service with its 24 hospitals. Jigawa, Sokoto, and Kebbi also have low audiology cover, indicating a regional deficit in accessibility of services for hearing aid.

Professional Demographic Section

The workforce characteristic data presented vividly show that there is a serious shortage of human resources for ear and hearing health care provision in Northwest Nigeria. Among the respondents, most were ENT nurses (75.8%), while there is a critical deficiency of trained audiologists (3.2%) and audiology technicians (11.3%). This implies that a lot of care is provided by non-audiology specialised professionals, which may have implications for the quality and consistency of services. Although a large portion of participants have worked for more than 10 years (35.5%), the number of staff specifically assigned to hearing services is low in most institutions, as 38.7% have only 1-2 members of staff. These results point to a basic imbalance in the workforce, and the necessity of recruiting and training for specialized skills in the provision of services.

Table 1 shows that the percentages of Audiologists (3.2%) and Audiology Technicians (11.3%) are much lower than those of other specialists such as ENT Nurses (75.8%) (See Table 1.). This discrepancy highlights an urgent necessity to increase specialist audiologist availability. This imbalance needs to be rectified in order to provide full Hearing Aid services.

Hearing Aid Maintenance and Repair Section

The findings discover significant deficiencies in technical infrastructure and the ability of the workforce to maintain and repair hearing aids. The majority of centers (81.3%) with audiology departments in our study fit hearing aids, only a minority have a small repair laboratory (18.8%), and very few have an audiology technician to repair hearing aids (12.5%). As repairs are predominately outsourced (75%), and turnaround times (oftentimes above one month) indicate a systemic inefficiency as well as low in-house capability. Pre fitting and post-fitting electroacoustic verification, an important quality check, performed by 31.2% of those surveyed. Additionally, there are few options for emergency repairs and loaner devices while equipment is being serviced, which may impact patient satisfaction and continue care. Patients pay out of pocket for most of the services, so it's

not covered by insurance. These results underscore the need for better technical training, resource provision, and coordinated delivery models to provide timely and effective hearing aid support.

Figure 2 highlights that only 12.5% of the facilities in the study area have trained technicians for hearing aid repair whilst in 87.5% of the cases they don't (See Figure 2.). This is a manifestation of a serious lack of years of experienced human resource.

Service Quality and Outcomes Section

Systematic deficiencies in technical and human resources and infrastructure have undermining effects on the quality of services and end user results. The most common obstacles are shortage of trained staff (28.3%) lack of proper tools (26.1%) and limited access to spare parts (21.7%). There are inherent weaknesses to these approaches that impede service quality. Respondents were roughly divided on being happy or unhappy with training and resources available experienced in their site (indicating variability between centres). There was a strong preference in favour of practical training and specialist repair workshops with 43.7% indicating a preference for specifics related to hearing aid maintenance The most common staff training practice was informal (34.6%), and formal in audiology was less common (19.2%). Collectively, the findings draw attention to the fact that although there are attempts to put services in place, service quality for hearing aid users is inconsistent and largely depends on resources and human resource capabilities.

Table 2 shows that problems that are met in providing hearing aid repair services consist of unemployment of skilled personnel (28.3%) (See Table 2.). Lack of those proper tools and equipment (26.1%) and lack of availability of spare parts (21.7%). Service delivery is also impacted by high service cost (13%) and elongated service turnaround time (6.5%).

Challenges and Solutions Section

The participants suggested thought intriguing ideas such as the need for overcoming existing barrier. The most common proposed solution was structured training and capacity strengthening (50.1 %), indicating the massive shortage of trained staff. Further, 68.8% of the respondents deemed the requirements of sophisticated diagnostic and repair equipment such as hearing aid analysers and electroacoustic testers to be very important. Other suggested interventions were working with manufacturers on training, standardization of service, expanding telehealth, and obtaining better government support. Specialized repair centres and improved end user information on maintenance were equally appreciated. These suggestions constitute a comprehensive understanding that it will not suffice to support workforce capacity; improved technical infrastructure is also necessary to support sustainable, high-quality maintenance and repair of hearing aids.

Table 3 indicates that 50.1% of the interviewed respondents indicated they require structured training and capacity building (See Table 3.). Another 12.5% recommend manufacturer-based training and services led by experts, and 6.3% focus on workshops, technology innovation and telehealth. The results indicate training staff better is the most important factor in

improving the hearing aid maintenance and repair service.

Discussion, Recommendations and Conclusion

Discussion

This study evaluated hearing aid maintenance, repair, and services challenges in government secondary and tertiary hospitals in metropolitan areas of the Northwest Nigeria. The conversation is organised around the five study-specific objectives.

Results showed a dramatic unmet need for hearing aid services in the area. Only 18.8% of hospitals offered some hearing aid maintenance and repair one-quarter of study population stated to have working audiology units. This is consistent with previous findings by Olusanya et al. (2021) and WHO (2018) drew attention to the yawning ghastly deficits in hearing health facilities within sub-Saharan Africa. The restricted service provision is perhaps due to poor government investment in audiology and low knowledge pertaining to hearing rehabilitation among health bureaucrats.

There were several impediments to accessibility. Many hospitals had reported lengthy waiting lists and irregular service, and even no aftercare. Despite 75% of clinics providing post-fitting service(s), the free-text responses suggested that patients were unable to access centres due to distance, financial constraints, and poor understanding. These findings are consistent with those of Goulios and Patuzzi (2008), which report that economic and geographical barriers frequently prevent access to hearing care in LMICs. In addition, the lack of insurance coverage of hearing aid service (reported by 87.5% of all the hospitals) compounds the issue for low-income patients.

Qualified hearing aid technicians were working in 12.5% of the hospitals, and a dedicated maintenance laboratory was available in 18.8% of the hospitals. This shortage speaks to coping with system underdevelopment and is consistent with those of WHO (2021) about shortages of audiology staff. There were few technicians with the appropriate modern equipment such as electroacoustic analysers and real-ear measurement, required for good service. Respondents also stressed that learners must undergo practical lessons and that workshops should be held regularly, if possible in conjunction with in-service training provided by manufacturers—as per Swanepoel and Hall's (2010) plea for skills transfer in resource-frustrated environments.

Battery issues, water damage, and physical trauma were the most commonly reported reasons for equipment failure, which was in line with findings in the literature (Kumar et al., 2016). However, there were few hospitals with the right tools or parts to deal effectively with these problems. For the most part, they turned to outside suppliers, which delayed repairs and saddled patients with the inconvenience of being fitted anew. Three-quarters of the facilities reported reliance on outside vendors for spare parts, confirming Bright et al. (2019) who also claimed the unsustainable services due to dependency on the external sources provided in LMICs.

Discussions with professionals expressed lack of adequate funding, lack of professional development and lack of standardised maintenance procedures.

Responders shows the need for more technicians to be trained, policy reform and public awareness campaigns. Their proposals tie in with the priorities outlined in the World Report on Hearing (WHO, 2021), which is in favour of a place for hearing care within universal health coverage. They also noted that there should be regionally based monitoring to monitor service delivery and pick up on facilities that need support.

Generally, the results of this study endorse the pressing nature of a need for reforms in hearing aid service delivery in the Northwest Nigeria. Although occasional isolated initiatives do exist, structural shortfalls in infrastructure, human resources, support, and policy interfere with the realization of equitable hearing care.

Limitations of this study was that it did not includes rural hospitals, private providers, NGO and the findings and service models may differ.

Cross-sectional Design: the cross-sectional nature of the study presents an analysis at a specific point in time, potential changes and improvements in services over time are not addressed.

Self-report Bias: there may be response bias involved in the use of self and interview questionnaires, which is particularly relevant to service availability or quality.

Notwithstanding these limitations, the study has presented a rigorous account of hearing aid service provision in the government health sector in Northwest Nigeria, and has illustrated systemic deficiencies that demand immediate attention.

Issues Faces in the Course of the Study

Identifier Applicability to other settings this research carried numerous operational and logistical challenges:

- Poor Record keeping: many state ministries of Health did not maintain readily accessible record of hospitals offering ENT services within their respective states instead, such information had to be obtained manually, rather than being readily available through an established database.
- Security: Travel through certain states of the Northwest Nigeria was hampered by security; sometimes questionnaires had to be send

These obstacles, though formidable, were resolved through tenacious tracing procedures, partnerships with local personnel, and multiple approaches to information collection to enhance the validity and comprehensiveness of our data collection.

Recommendations

The following are the recommendations made based from the main findings and conclusions made as results of the study for each of the research objective areas:

Enhance the accessibility of hearing aid services:

The relevant regulatory authority: the Ministry of Health should work with federal Ministry of health to ensure that functional audiology units are establish at all secondary and tertiary government facilities.

Investment in infrastructure for hearing care, including sound proofing booths, and

testing equipment, is required to increase the availability of services. Improved Access.

Trained Providers and Equipment:

- ✓ For audiologists, hearing aid technicians and Hearing Instrument Specialists (HIS), training programs and ongoing education should continue.
- ✓ Hospitals need to have up-to date diagnostic and repair equipment such as electroacoustic analyser, real-ear measurement equipment, and a basic tool kit to offer service on site.
- ✓ Dealing with Hearing Aid Repair and Maintenance Needs Quickly:
- ✓ Develop a regular maintenance program and patient recall system to deal with common problems like battery failure, physical damage and moisture intrusion.
- ✓ Create and distribute hearing aid friendly guidelines on use and care including in local languages so that patients can maintain their own hearing aid and provide them preventive care.
- ✓ Systemic issues and barriers that need to be overcomes:
- ✓ Support changes in policy that make hearing aids and related services eligible for insurance coverage and therefore diminish the financial stress upon the patient.
- ✓ Promote the local production or authorised local sale of hearing aid parts to reduce reliance on such international suppliers and the time lag that inelastic goods result in taking to repair. System sustainability and enhanced service coordination
- ✓ Develop public information programs to make people aware of hearing loss, the available services, and the advantages of early intervention.
- ✓ Develop a local hearing care database to track service provision, to flag underperforming services, and to facilitate targeted intervention.
- ✓ Promote public-private partnerships with non-Governmental Organisations (NGOs) for the provision of hearing health in underserved areas.
- ✓ Further research to identify other area that this study did not captured.

Conclusion

This study has demonstrated significant limitations on accessibility and the quality of hearing aid services in government hospitals in Northwest Nigeria. Active audiology service existed in only 25.8% of hospitals that have ENT service and those able to provide hearing aid services were much lower (18.8%) reflecting the poor access to and provision (Olusanya et al., 2021; WHO, 2018).

Regarding infrastructure and human resources, results indicate that only 12.5% had the support of qualified technicians, and 18.8% of hospitals had maintenance laboratories, clearly suggesting a skill and equipment network gap (Bright et al., 2019).

Frequent maintenance problems (including battery failure, physical and water damage) were common but minimal verification mechanisms and after-hours service existed, pointing to poor quality and ad hoc maintenance procedures (Kumar et al., 2016; Swanepoel and Hall, 2010).

At the systemic level, lack of training (52.5%), lack of equipment (37.5%), poor access to spare parts (50%) and no coverage for hearing aids with insurance (87.5%) were noted. It is also a strain on long-term service sustainability (Bright et al., 2019; Goulios & Patuzzi, 2008) in some cases, as people with lifelong hearing loss may become dependent on external suppliers (75%).

To rise to these challenges, the present study suggests training the technicians, the upgrading of infrastructure, increasing insurance coverage, as well as public awareness. These are critical first steps in addressing the delivery of hearing care in the region (WHO, 2021).

Overall, post-fitting care is more widespread (75%), but the audiological provision of hearing aid care with aftercare is still precarious. Policy, training and infrastructure investment is urgently needed to achieve this and provide equitable access to hearing health in low resourced settings.

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APPENDIX

Ethical Approvals obtained from ministries of health, List of Facilities across state, consent form and Questionnaire used in the data collection process is included here. It permits the study in the area and outlines the purpose of the study, voluntary participation, and confidentiality agreements made with participants.

APPENDIX A - CONSENT FORM AND QUESTIONNAIRE USED

School of Advanced Education,
Research and Accreditation, S.L.,
Castellón, Spain.

Dear Sir/Ma,

I am a student from the above-named institution, conducting a research study on **"Assessment of the Challenges of Hearing Aid Maintenance, Repair, and Services among Secondary and Tertiary Government Hospitals within the Metropolitan Areas in Northwest Nigeria."** You have been purposively selected as a participant for this study, which is part of the requirements for the award of a Master in Clinical Audiology and Hearing Therapy.

Your participation is entirely voluntary, and you are under no obligation to disclose your identity. All information provided will be treated with the utmost confidentiality and used solely for academic purposes. The success of this research greatly depends on your honest and objective responses.

Thank you for your time and cooperation.

Saadu Adamu
Phone: +234 802 8536 352
Email: saadukauru@gmail.com

A. PROFESSIONAL BACKGROUND SECTION

1. What is your primary role?
   [ ] Audiologist
   [ ] Audiology Technician
   [ ] Hearing Instrument Specialist
   [ ] ENT Nurse
   [ ] ENT Surgeon
   [ ] Other (Please specify) _____

2. How many years of experience do you have in ear and hearing services?
   [ ] Less than 1 year
   [ ] 1-5 years
   [ ] 5-10 years
   [ ] More than 10 years

3. How many staff members in your hospital are dedicated to Ear and Hearing care services?
   [ ] 1-2
   [ ] 3-5
   [ ] 6-10
   [ ] More than 10

B. HOSPITAL INFORMATION SECTION

4. What is the name of your hospital? (Optional)
   _____

5. Which type of facility do you primarily work?
   [ ] Tertiary Hospital
   [ ] Secondary Hospital

6. Your hospital is located in which state?
   [ ] Jigawa
   [ ] Kaduna
   [ ] Kano
   [ ] Katsina
   [ ] Kebbi
   [ ] Sokoto
   [ ] Zamfara

7. How many years has your hospital been providing Ear and Hearing Services?
   [ ] Less than 1 year
   [ ] 1-5 years

[ ] 6-10 years
[ ] More than 10 years

8. Do you have a functional audiology unit?
[ ] Yes
[ ] No
If your answer is 'yes' to the above question, proceed to the next questions.

C. HEARING AID MAINTENANCE AND REPAIR SECTION

9. Do you dispense hearing aids?
[ ] Yes [ ] No

10. How do you source for hearing aids?
[ ] Dedicated distributor
[ ] Purchasing in large quantities
[ ] Donation
[ ] Other (please specify)

11. Do you have a hearing aid maintenance laboratory?
[ ] Yes [ ] No

12. Is the laboratory adequately equipped to carry out repairs?
[ ] Yes [ ] No

13. Do you have a trained technician who can repair hearing aids?
[ ] Yes [ ] No

14. Do you have a collaboration with manufacturers?
[ ] Yes [ ] No

15. Do you have after-fitting follow-up clinics?
[ ] Yes [ ] No

16. Are your hearing aid maintenance, repair, and services readily available?
a) On-site (within the hospital)
b) Partnered with an external provider
c) Other (please specify)

17. Do you offer emergency repairs?
[ ] Yes [ ] No

18. Do you offer loaner hearing aids while repairs are being conducted?
[ ] Yes [ ] No

19. How long does a repair typically take?
[ ] Within 24 hours
[ ] A week
[ ] A month
[ ] More than one month

20. Are these services covered by insurance?
[ ] Yes [ ] No

21. Do you verify all your hearing aids electroacoustically before hearing aid fitting and after any repair?
[ ] Yes [ ] No

22. Do you also recommend a humidifier to hearing aid users?
[ ] Yes [ ] No

23. What type of hearing aids are most commonly serviced in your hospital? (Select all that apply)
[ ] Behind-the-ear (BTE)
[ ] In-the-ear (ITE)
[ ] Receiver-in-canal (RIC)
[ ] Completely-in-canal (CIC)
[ ] Bone-anchored hearing aids (BAHA)
[ ] Cochlear implants
[ ] Other (please specify)

24. What are the commonest maintenance services provided? (Select all that apply)
[ ] Cleaning and earwax removal
[ ] Battery replacement
[ ] Tubing replacement
[ ] Reprogramming and adjustments
[ ] Feedback reduction
[ ] Moisture damage repair
[ ] Other (please specify)

25. What are the most common repair issues encountered? (Select all that apply)
[ ] Physical damage (e.g., casing cracks)
[ ] Microphone or speaker issues

[ ] Battery compartment problems
[ ] Software or programming errors
[ ] Moisture or corrosion damage
[ ] Connectivity problems (Bluetooth, wireless)
[ ] Other (please specify)

D. QUALITY SERVICES AND PATIENTS OUTCOMES

26. What are the main challenges your hospital faces in providing hearing aid maintenance and repair services? (Select all that apply)
[ ] Lack of trained personnel
[ ] Inadequate equipment or tools
[ ] Limited access to spare parts
[ ] High cost of services
[ ] Patient non-compliance with maintenance schedules
[ ] Long repair turnaround time
[ ] Other (Please specify)
_____

27. How satisfied are you with the training and resources available for hearing aid maintenance and repair?
[ ] Very satisfied
[ ] Satisfied
[ ] Neutral
[ ] Dissatisfied
[ ] Very dissatisfied

28. What additional training or resources would be beneficial to improve your maintenance and repair services?
_____

29. What is the level of training provided to staff engaged in hearing aid maintenance and repair? (Select all that apply)
[ ] On-the-job training
[ ] Formal certification in audiology or hearing aid technology
[ ] Manufacturer-specific training
[ ] Continuing education courses
[ ] No formal training

E. CHALLENGES AND SOLUTIONS SECTION

30. In your opinion, what innovations in hearing aid technology or service delivery could improve maintenance and repair processes?
_____

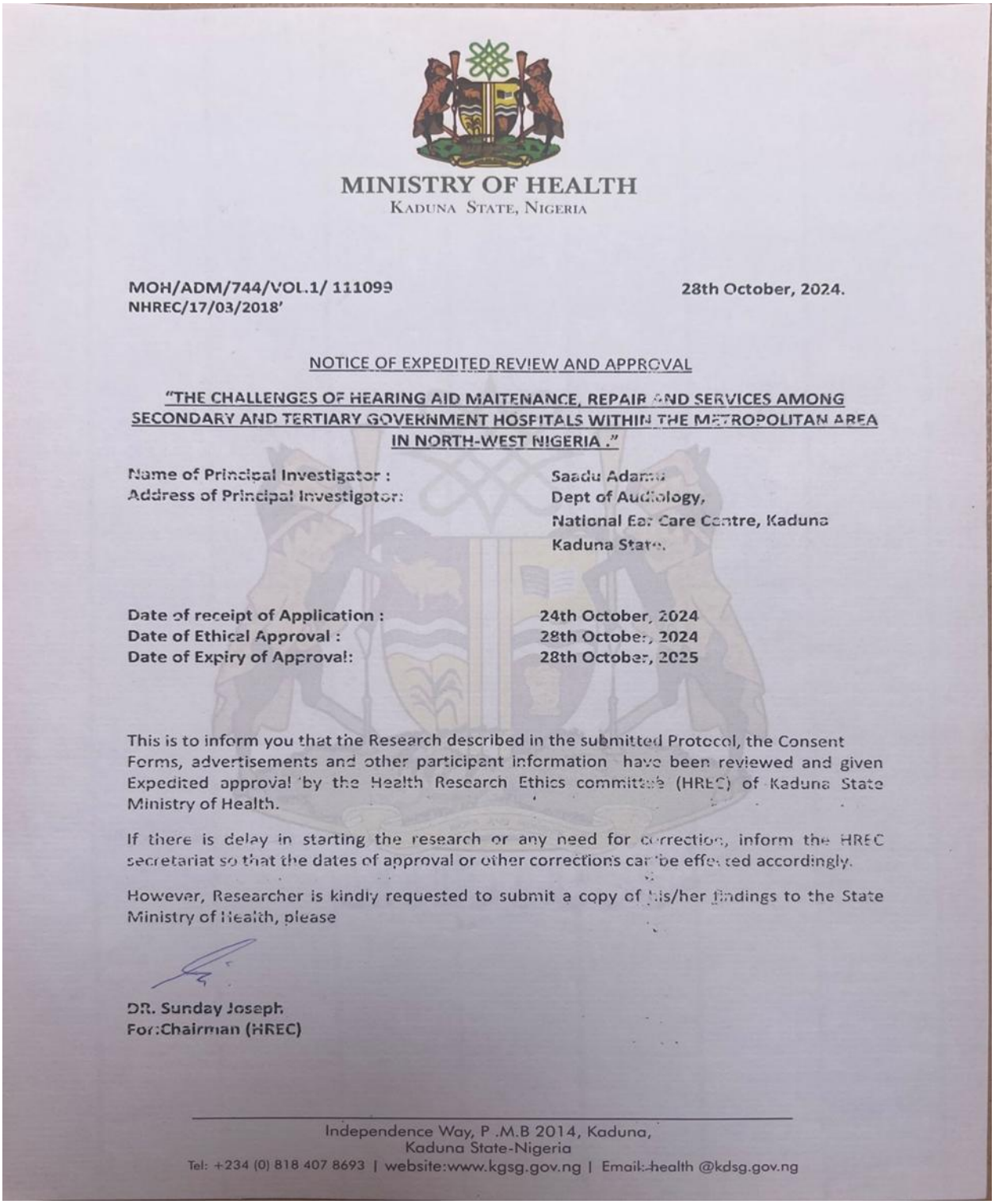
31. Are there any specific tools, equipment, or software that you believe would enhance the effectiveness of hearing aid repairs?

_____

32. Do you have any additional comments or suggestions regarding hearing aid maintenance, repair, or services?

_____

APPENDIX B –AMONG THE ETHICAL APPROVALS:



MINISTRY OF HEALTH
KADUNA STATE, NIGERIA

MOH/ADM/744/VOL.1/ 111099
NHREC/17/03/2018'

28th October, 2024.

NOTICE OF EXPEDITED REVIEW AND APPROVAL

"THE CHALLENGES OF HEARING AID MAITENANCE, REPAIR AND SERVICES AMONG SECONDARY AND TERTIARY GOVERNMENT HOSPITALS WITHIN THE METROPOLITAN AREA IN NORTH-WEST NIGERIA ."

Name of Principal Investigator : Saadu Adamu
Address of Principal Investigator: Dept of Audiology,
National Ear Care Centre, Kaduna
Kaduna State.

Date of receipt of Application : 24th October, 2024
Date of Ethical Approval : 28th October, 2024
Date of Expiry of Approval: 28th October, 2025

This is to inform you that the Research described in the submitted Protocol, the Consent Forms, advertisements and other participant information have been reviewed and given Expedited approval by the Health Research Ethics committee (HREC) of Kaduna State Ministry of Health.

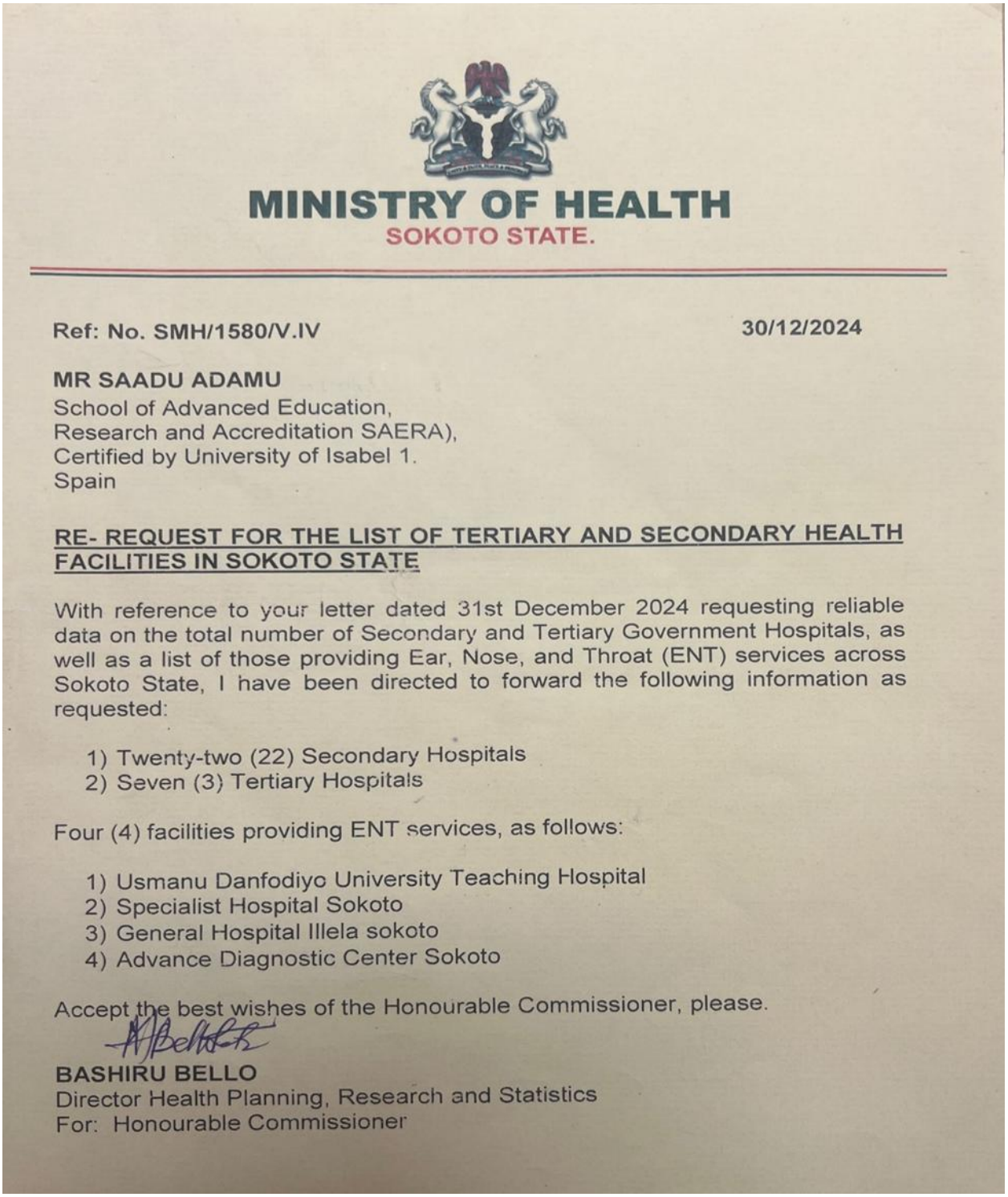
If there is delay in starting the research or any need for correction, inform the HREC secretariat so that the dates of approval or other corrections can be effected accordingly.

However, Researcher is kindly requested to submit a copy of his/her findings to the State Ministry of Health, please

DR. Sunday Joseph
For:Chairman (HREC)

Independence Way, P .M.B 2014, Kaduna,
Kaduna State-Nigeria
Tel: +234 (0) 818 407 8693 | website:www.kgsg.gov.ng | Email:-health @kdsg.gov.ng

APPENDIX C – AMONG THE LIST OF FACILITIES FROM MINISTRY



MINISTRY OF HEALTH
SOKOTO STATE.

Ref: No. SMH/1580/V.IV 30/12/2024

MR SAADU ADAMU
School of Advanced Education,
Research and Accreditation SAERA),
Certified by University of Isabel 1.
Spain

RE- REQUEST FOR THE LIST OF TERTIARY AND SECONDARY HEALTH FACILITIES IN SOKOTO STATE

With reference to your letter dated 31st December 2024 requesting reliable data on the total number of Secondary and Tertiary Government Hospitals, as well as a list of those providing Ear, Nose, and Throat (ENT) services across Sokoto State, I have been directed to forward the following information as requested:

1) Twenty-two (22) Secondary Hospitals
2) Seven (3) Tertiary Hospitals

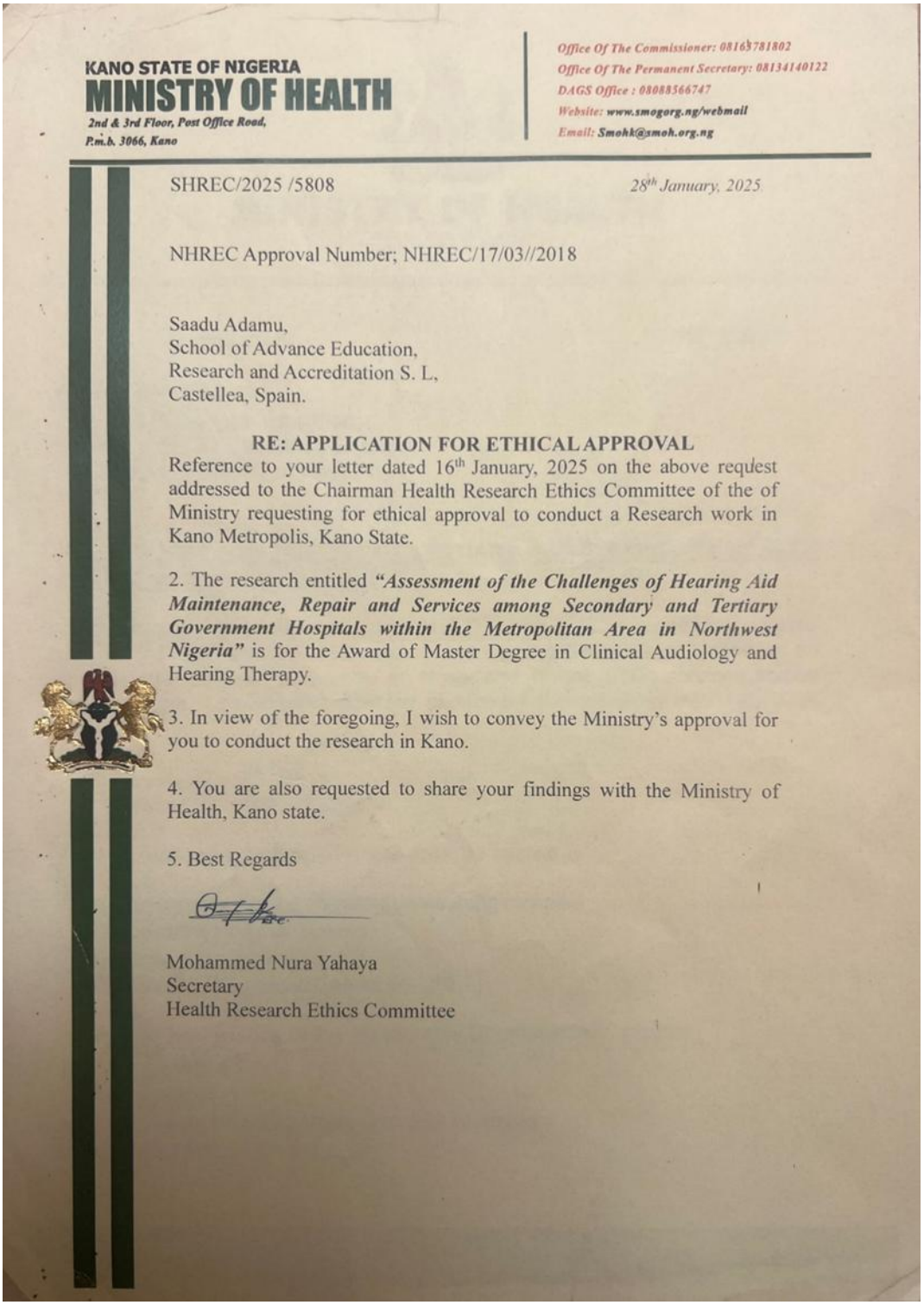
Four (4) facilities providing ENT services, as follows:

1) Usmanu Danfodiyo University Teaching Hospital
2) Specialist Hospital Sokoto
3) General Hospital Illela sokoto
4) Advance Diagnostic Center Sokoto

Accept the best wishes of the Honourable Commissioner, please.

BASHIRU BELLO
Director Health Planning, Research and Statistics
For: Honourable Commissioner

APPENDIX D – AMONG THE ETHICAL APPROVAL FROM MINISTRY



KANO STATE OF NIGERIA
MINISTRY OF HEALTH
2nd & 3rd Floor, Post Office Road,
P.m.b. 3066, Kano

Office Of The Commissioner: 08163781802
Office Of The Permanent Secretary: 08134140122
DAGS Office : 08088566747
Website: www.smogorg.ng/webmail
Email: Smohk@smoh.org.ng

SHREC/2025 /5808 28th January, 2025

NHREC Approval Number; NHREC/17/03//2018

Saadu Adamu,
School of Advance Education,
Research and Accreditation S. L,
Castellea, Spain.

RE: APPLICATION FOR ETHICAL APPROVAL

Reference to your letter dated 16th January, 2025 on the above request addressed to the Chairman Health Research Ethics Committee of the of Ministry requesting for ethical approval to conduct a Research work in Kano Metropolis, Kano State.

2. The research entitled ***"Assessment of the Challenges of Hearing Aid Maintenance, Repair and Services among Secondary and Tertiary Government Hospitals within the Metropolitan Area in Northwest Nigeria"*** is for the Award of Master Degree in Clinical Audiology and Hearing Therapy.

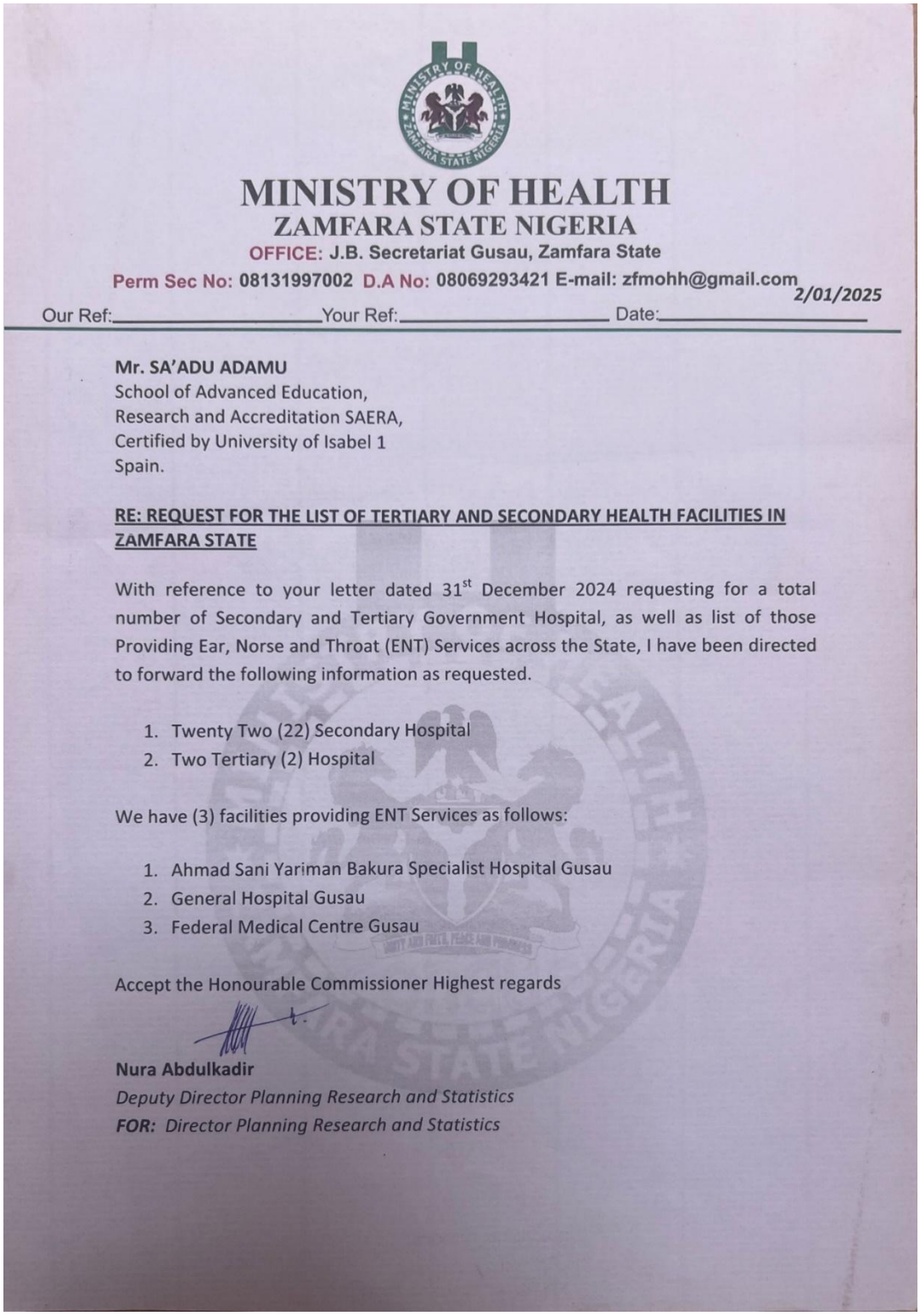
3. In view of the foregoing, I wish to convey the Ministry's approval for you to conduct the research in Kano.

4. You are also requested to share your findings with the Ministry of Health, Kano state.

5. Best Regards

Mohammed Nura Yahaya
Secretary
Health Research Ethics Committee

APPENDIX E – AMONG THE LIST OF FACILITIES FROM MINISTRY



MINISTRY OF HEALTH
ZAMFARA STATE NIGERIA
OFFICE: J.B. Secretariat Gusau, Zamfara State
Perm Sec No: 08131997002 D.A No: 08069293421 E-mail: zfmohh@gmail.com

Our Ref:_____ Your Ref:_____ Date: 2/01/2025

Mr. SA'ADU ADAMU
School of Advanced Education,
Research and Accreditation SAERA,
Certified by University of Isabel 1
Spain.

RE: REQUEST FOR THE LIST OF TERTIARY AND SECONDARY HEALTH FACILITIES IN ZAMFARA STATE

With reference to your letter dated 31st December 2024 requesting for a total number of Secondary and Tertiary Government Hospital, as well as list of those Providing Ear, Norse and Throat (ENT) Services across the State, I have been directed to forward the following information as requested.

1. Twenty Two (22) Secondary Hospital
2. Two Tertiary (2) Hospital

We have (3) facilities providing ENT Services as follows:

1. Ahmad Sani Yariman Bakura Specialist Hospital Gusau
2. General Hospital Gusau
3. Federal Medical Centre Gusau

Accept the Honourable Commissioner Highest regards

Nura Abdulkadir
Deputy Director Planning Research and Statistics
FOR: *Director Planning Research and Statistics*

Figure 1.

Distributions of Facilities with and without ENT as well as audiology to each state

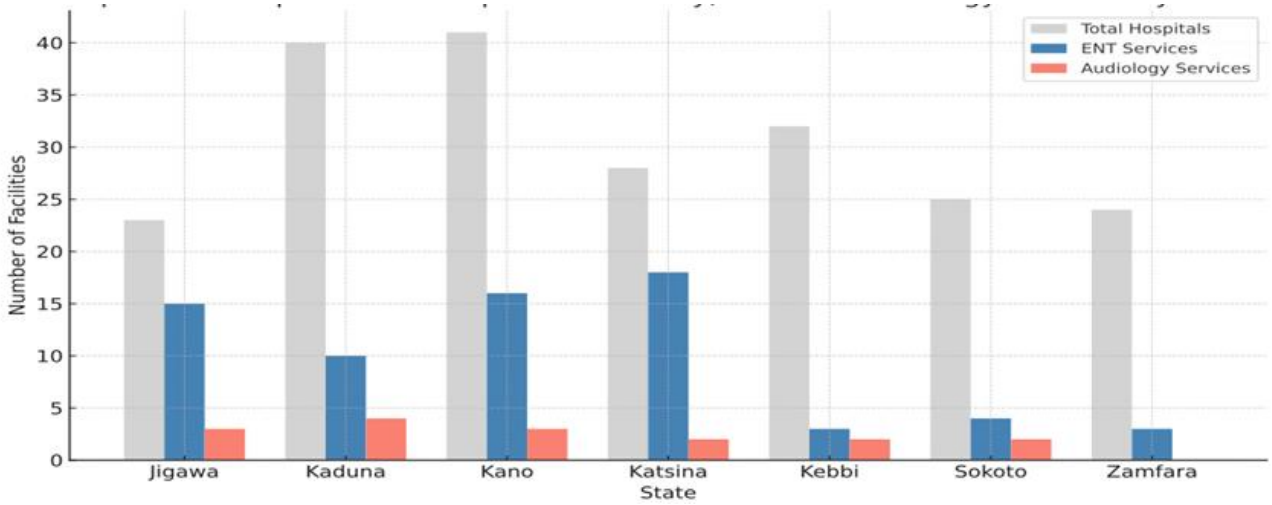


Table 1.

Distributions of Respondents by primary professional role in Ear and Hearing care

		Frequency	Percent
Audiologist		2	3.2
Audiology Technician		7	11.3
Hearing Instrument Specialist		2	3.2
ENT Nurse		47	75.8
ENT Surgeon		3	4.8
Other		1	1.6
Total		62	100.0

Figure 2.

Distribution of trained technician who can repair hearing aids by respondents

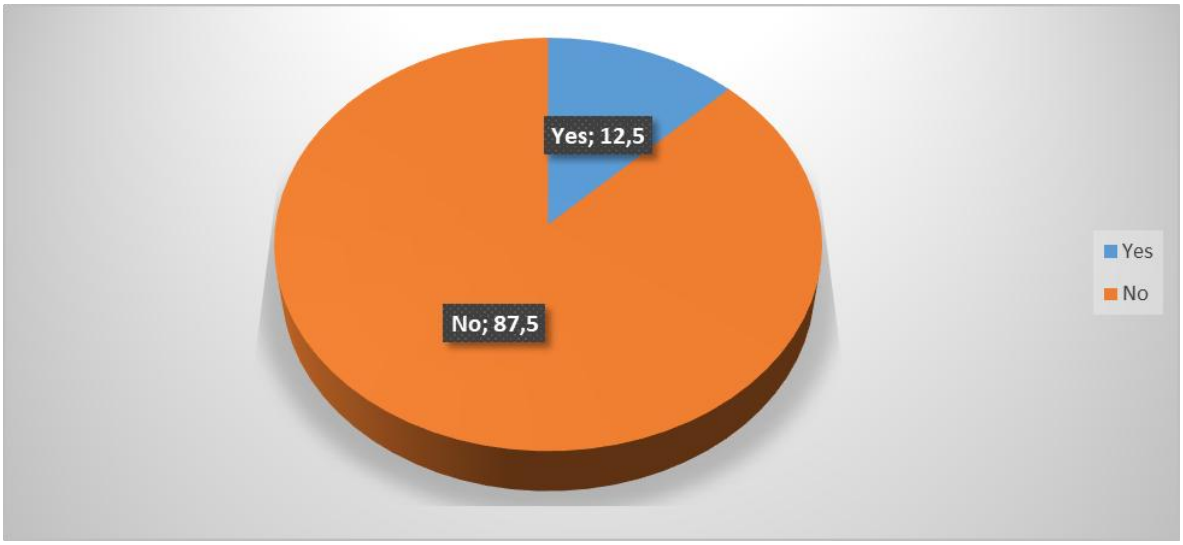


Table 2.

Reported challenges in delivering Hearing Aid maintenance and Repair Services in Respondents' facilities

	Frequency	Percent
Lack of trained personnel	13	28.3
Inadequate equipment or Tools	12	26.1
Limited access to spare parts	10	21.7
High Cost of services	6	13.0
Patient non-compliance with maintenance schedules	2	4.3
Long repair turnaround time	3	6.5
Total	46	100

Table 3.

Suggested Innovation to Improve Hearing Aid Maintenance and Repair Services according to Respondents

	Frequency	Percent
Training and Capacity Building	8	50.1
Workshops and Seminars	1	6.3
Manufacturer/Company-Based Training and Support	2	12.5
Standardization and Expert-led Services	2	12.5
Technological Innovation and User-Centered Design	1	6.3
Affordable Access to Devices	1	6.3
Telehealth Services	1	6.3
Total	16	100