

The Challenges of Cochlear Implant Users in Jos, North Central Nigeria

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Abstract

Cochlear implants (CIs) are remarkable solutions for severe to profound sensorineural hearing loss globally. Access to cochlear implants in developing countries is not without challenges. This study examined the challenges of CI users in Jos, Nigeria. The study is a cross-sectional survey that used a convenient sampling technique to sample 41 respondents. CICQ questionnaire was used to elicit data from the respondents. A simple percentage was used to analyze the data. The results revealed that 62.5% of the CI users lived below 100,000 Naira (USD244) as their yearly income. The majority (93.75%) have severe to profound hearing loss bilaterally but used CI unilaterally. Cost and access to CI accessories and management have affected the economic, social and psychological life of the CI users and that of their relations. ENT personnel said that the demand for CI in their facility is very high and managing CI users is very challenging due to inadequate manpower, finance and equipment. Easy access to CIs, their accessories and services at affordable cost, effective training for ENT personnel, and adequately equipped health facilities were recommended.

Keywords

Cochlear Implant, Accessibility, Affordability, Family and Societal Challenges

1. Introduction

It is a global fact that cochlear implants are solutions for severe to profound sensorineural hearing loss [1] in both children and adults and can be implanted bilaterally. It is a surgically implanted device that provides electric stimuli directly to the auditory nerves' fibers in the cochlear [2]. Access to Cochlear implants and their services can be very challenging to patients with severe to profound sensorineural hearing loss in Jos, Nigeria compared to developed coun-

tries [3].

The demand for it is significantly increasing [3] [4] and will continue to increase in the coming decades [5]. Most of the reports on cochlear implantation accessibility are from developed countries [3]. Few such stories are recorded in Nigeria [4] [6].

There are many patients with severe to profound sensorineural hearing loss who are candidates for cochlear implants in Nigeria, but several factors, including access and cost, limit their access to it [6] [7] [8]. The few that have access to cochlear implants are facing serious challenges also. The need for accessible cochlear implants in sub-Saharan Africa, most especially in Nigeria, cannot be over-emphasized. This study examines the challenges faced by patients who are using cochlear implants.

Even though cochlear implants are the better solution for effective communication for patients with severe to profound hearing loss, it is more demanding to access, afford, and manage their services. Accessing cochlear implants in Jos (Nigeria) is a notable problem, and when it is available, only a few patients can access, afford, and manage them. This is to say that the availability or supply of cochlear implants and their services does not in any way meet its demand in Jos, Nigeria.

In 2014, nearly 400,000 people globally had received cochlear implants, including 200,000 pediatric patients and 60,000 bilateral users [1]. However, the number of patients using them pales in comparison to the much larger population of patients who have hearing loss with no access to cochlear implants.

Cost is one of the main factors that limit access to cochlear implants, especially in developing countries. It is a very expensive device; very few individuals can afford it. For the very few that can afford it, access to services that sustain its span also poses a serious challenge. When any part of the device is faulty, resolving it is challenging. It is very difficult to access and afford the costs of repair or replacement of faulty parts. Lack of easy access to services of persons with technical know-how is the main issue. This means that patients using cochlear implants will stay many weeks or months without using the device. This reduces their quality of life.

So, how can cochlear implants and their services be made accessible to the many patients with severe to profound hearing loss in Jos Nigeria? Knowing that it is the best solution can warrant effective communication and facilitate their quality of life. Since the majority of persons with hearing loss who need a cochlear implant cannot afford it, how can affordability be made a reality for this group of people? For the few who can afford to use cochlear implants, how can the management of the device in terms of quick access to accessories, repairs, and replacement be delivered effectively? This is the motivation that makes this study necessary at this time and in this part of the world.

1.1. Research Questions

1) What is the extent of the challenges of cochlear implants for patients with severe to profound sensorineural hearing loss in Jos, Nigeria?

2) How does limited access to cochlear implants affect patients with severe to profound sensorineural hearing loss in Jos, Nigeria?

3) How does access to cochlear implants affect the psychological, social, economic, and family life of patients with sensorineural hearing loss in Jos, Nigeria?

1.2. Aim and Objectives

This study aims to determine the challenges that patients who have cochlear implants are facing in Jos, Nigeria. While the objectives of the study are to:

1) Determine the extent of the challenges of Cochlear implants for patients with severe to profound sensorineural hearing loss in Jos, Nigeria.

2) Describe how limited access to Cochlear implants affects patients with severe to profound sensorineural hearing loss in Jos, Nigeria.

3) Explain how access to Cochlear implants affects the psychological, social, economic, and family life of patients with sensorineural hearing loss in Jos, Nigeria.

2. Methodology

2.1. Design

The research design for this study was a cross-sectional survey research design. This allows the researcher to gather information about the challenges faced by cochlear implant users in Jos that cannot be directly observed at a single or specific point in time. The implant products companies are Med-El and Cochlear.

2.2. Population

The population for this study was cochlear implant users whose surgical operations were conducted by DR. Douglas Green, Dr. Mark Wood and their team (Hearing Help for Africa/Jacksonville Hearing and Balance Institute Florida, USA) and two (2) patients whose cochlear implant surgeries were done in India but are managed by the Audiologist and ENT Doctors in Jos. The implant surgery conducted by this team is out of charity. The cochlear implant users' relations, ENT Doctors, and Nurses that are involved in the management of CI Users are part of the population for this study.

2.3. Sample Size

The study comprises 41 respondents, 16 out of 30 Cochlear Implant users in Jos responded to the questionnaire. Thirteen (13) relatives of the cochlear implant users and twelve (12) ENT personnel doctors and nurses formed the sample size.

2.4. Sampling Technique

A convenience sampling technique was used for the study.

2.5. Instrument

The instrument for data collection was a closed and open-ended questionnaire.

The close-ended section was used to gather the demographic data and information on the hearing loss of the respondents. The open-ended section was used to interview the respondents. This allowed them to express the challenges they were experiencing with the cochlear implants. The design of the questionnaire is in line with the ethical standard as reviewed by the ministry of health and the ethical clearance was obtained at Jos University Teaching Hospital, Jos, Nigeria.

2.6. Description of Instrument

Cochlear implants Challenges Questionnaire (CICQ) is both structured and unstructured and has four sections. Section A contains the demographic data of the respondents. Section B elicits responses from CI users. Section C gathered data from the family members of the CI users while section D gathered data from ENT Doctors and ENT Nurses in Jos, Nigeria. The unstructured part of the instrument allowed the respondents to say their challenges regarding the use of a CI and/or the challenges of living with people using CI.

2.7. Procedure for the Development of Instrument

The researcher develops the instrument based on the extensive review of relevant literature on the problem under investigation, considering the variables that are involved, the independent (IV), and the dependent variables (DV). The items were sorted out based on the research questions, which were subjected to scrutiny or examination by experts in health research, cochlear implants, and the researcher's supervisor.

2.8. Validity and Reliability of the Instrument

Content and face validity was used to examine the validity of the instrument. This determines whether the instrument will measure what the researcher intends to measure. For reliability, the instrument was scrutinized by experts in test and measurement and the researcher's supervisor to validate whether the instrument was consistent in measuring what the researcher claimed it would measure.

2.9. Procedure for Data Collection

Data were collected from the respondents within six weeks to be precise. Some of the respondents were called to come to Jos University Teaching Hospital to be interviewed, while others came to Kazahyet audiology service due to convenience. Others responded via emails and others through phone calls. Respondents' consent was obtained by giving them the consent form to fill, while those who responded via email signed the consent form before responding to the items on the questionnaire. For those who responded through phone calls, the consent form was read to them, and after their approval, the items on the questionnaires were read to them for their responses. Most of the phone calls were recorded for better transcription. Where the participant could not read, the researcher read the questions and allowed them to choose where appropriate and talk about the

challenges they were facing.

2.10. Method of Data Analysis

A simple percentage (%) was used to analyze the quantitative data, while qualitative data were sorted out, interpreted, and presented.

3. Results

The findings of this study are presented in both quantitative and qualitative manner with explanations and tables to describe the nature of the challenges faced by patients, their relatives, and ENT personnel in terms of using and managing CI.

Table 1 represents the biodata of 16 CI users. It indicates that 43.8% (7) are males while 56.2% (9) are females. The females are the majority in this section of the study. Concerning the age range of the patients with Cochlear implants, those with ages between 26 - 45 years are the first in ranking with 37.5% (6), while the second are those who fall under ages 5 - 25 with 31.3% (5) followed by those with ages between 46 - 65 with 18.7% (3) and the fourth in this category are those whose age is between 66 years and above with 12.5% (2). The respondents' level of education comprises those with a tertiary level of education 81.3% (13) and those with a primary level of education 18.7 (3). None of them have

Table 1. Cochlear implant users biodata.

ITEM	RESPONDENT	FREQUENCY	PERCENTAGE (%)
Sex	Male	7	43.8
	Female	9	56.2
Age	5 - 25	5	31.3
	26 - 45	6	37.5
	46 - 65	3	18.7
	66 - above	2	12.5
Educational Level	Tertiary	13	81.3
	Primary	3	18.7
Occupation	Civil Servants	7	43.8
	Business	1	6.2
	Student	4	25
	Others	4	25
Yearly income	100 - 500 th	1	6.25
	500 - 1m	1	6.25
	1m - above	4	25
	Others	10	62.5

Source: Field Data, 2021.

a secondary level of education. The table also shows that 6.25% (1) of the respondents' yearly income is from 100,000 to 500,000. Other 6.25% (1) of the respondents' yearly income is from 500,000 to 1 million Naira only. Only 25% (4) of the CI users earn 1 million Naira and above yearly, but the majority, 62.5% (10) earn below 100,000 yearly. This is the reason why many of them face financial challenges when it comes to maintaining their CIs.

Table 2 indicates that out of the 12 ENT respondents 75% (9) are male while 25% (3) are female. This shows that the majority of the respondents are male. The age range of the respondents is from 25 to 56 years and above, but the majority of the age range of the respondents is between 36 - 45 years with 41.7% (5) and 46 - 55 ears with 41.7% (5) the minority are age 25 - 35 and 56 - above years which have 8.3% (1) and 8.3% (1) respectively. The table also posits that all the respondents fall within the tertiary education level of 100% (12). It is, again, represented in the above table that 75% (9) of the respondents are ENT doctors, and 25% (3) are ENT Nurses. There are no Audiologists and Speech Therapists. The respondents' yearly income is approximately above a million naira since that range carries the majority number which is 83.4% (10).

Table 3 demonstrates patients' hearing loss and Cochlear Implants usage information. It revealed that 93.75% (15) respondents have hearing loss in both ears while only 6.25% (1) have hearing loss in 1 ear. The table also indicates that 68.75% (11) of the respondents have hearing loss between 1 to 10 years while 25% (4) of the respondents experienced hearing between 11 to 20 years and only 6.25% (1) have hearing loss for 21 years. 31.25% (5) of the respondents' hearing

Table 2. ENT personnel biodata.

ITEM	RESPONDENT	FREQUENCY	PERCENTAGE (%)
Sex	Male	9	75
	Female	3	25
Age	25 - 35	1	8.3
	36 - 45	5	41.7
	46 - 55	5	41.7
	56 - above	1	8.3
Educational Level	Tertiary	12	100
Occupation	ENT Doctor	9	75
	NET Nurse	3	25
	Audiologist	-	-
	Speech Therapist	-	-
Yearly income	100 - 500 Th	1	8.3
	500 - 1m	1	8.3
	1m - above	10	83.4

Source: Field Data, 2021.

Table 3. Patients hearing loss and cochlear implant data.

ITEM	RESPONDENT	FREQUENCY	PERCENTAGE (%)
Ear Affected	Right	1	6.25
	Left	-	-
	Both	15	93.75
Duration of HL	1 - 10	11	68.75
	11 - 20	4	25
	21 - above	1	6.25
Cause of HL	Ototoxic Drugs	5	31.25
	Illness	7	43.75
	Unknown	4	25
Onset of HL	Pre-lingual	6	43.8
	Post-lingual	10	6.2
Nature of Occurrence	Sudden	13	81.25
	Gradual	3	18.75
Ear using CI	One Ear	15	93.75
	Both Ears	1	6.25
Duration of CI Used	1 - 5 Years	11	68.75
	6 - 10	4	25
	11 years and above	1	6.25
Brand of CI	Med-El	8	50
	Cochlear	8	50
	Others	-	-
HA Usage	Yes	2	12.5
	No	14	87.5
Effectiveness of CI	Not effective	2	12.5
	Moderately Effective	6	37.5
	Very Effective	8	50

Source: Field Data, 2021.

loss is caused by Ototoxic drugs, 43.75% (7) of the hearing loss is caused by illnesses and 25% (4) of the hearing loss the causes remain unknown. The table also reveals that 37% (6) of the respondents' hearing loss has a pre-lingual onset, which means the hearing loss occurred before language was developed by the respondents while 62.5% (10) of the hearing loss have post-lingual onset, which means the hearing loss occurs after language have already been developed by the respondents. 81.25% (13) of the hearing loss occurred just of a sudden while only 18.75% (3) have a gradual occurrence.

A total of 93.75% (15) of the respondents, who are the majority, are using

Cochlear Implant in one ear while only 6.25% (1) use Cochlear Implant in both ears. The financial implication may be the reason why the majority of the respondents use only one Cochlear Implant. A total of 68.75% of the respondents have used Cochlear Implant between the past 1 year and the past 5 years while 25% (4) of the respondents used Cochlear Implant between the past 6 and 10 years, then only 6.25% (1) of the respondents used Cochlear Implant for the past 11 years or more. A total of 50% (8) of the respondents' brand of Cochlear Implant is Med-El while the other 50% (8) are using cochlear as their brand of Cochlear Implant.

Table 3 also illustrates that 12.5% (2) of the respondents said Yes when they were asked by the researcher if they are using a hearing aid while 87.5% (14) of the respondents. The majority said no because hearing aids do not benefit them. On the matter of the efficiency and/or effectiveness of the Cochlear Implant, 12.5% (2) of the respondents said their Cochlear Implant is not effective while 37.5% (6) said their Cochlear Implant is moderately effective but the majority numbered 50% (8) said their Cochlear Implant is very effective.

3.1. Patients' Qualitative Result

The Challenges of Using Cochlear Implant

The results of the challenges faced by patients who are using CIs are presented based on the common themes that involve the challenges that concern the cochlear implant itself, their communication and relational ability which involves family members—immediate or extended and the society at large.

3.2. The Cochlear Implant

3.2.1. Accessories

First of all, all respondents declared that the CI itself is very expensive and the major concern after being implanted is its maintenance, which is very expensive. One of the key issues the respondents have is the fact that CI accessories are very expensive and very difficult to access. Meaning it is not readily available in their locality, their state capital, or the neighboring states. They have to travel far distance or place an order to a far distant state which will take weeks or months before they get it. According to some of the respondents the challenges are:

Cochlear Implant accessories such as batteries, external devices, cords, and services or repairs are very expensive yet they don't last long. We also have to travel a long distance to access cochlear implant mapping which costs us a lot in terms of transport fares.

The battery's life span is very short, and it is difficult to access accessories although they are expensive. It takes a long time to repair or replace any part of the external device when it spoils, which means spending many months without using the device. This is detrimental to all spheres of life for us who are using cochlear implants.

The cable of the external device does not last—highest three months. Batteries do not last long and are very expensive.

The CI external part does spoil often. The cost of maintenance is very high. Accessories are not readily accessible and they are very expensive. Repairs of spoiled parts do take a longer time.

The biggest challenge with my cochlear implant is the availability and cost of repairs. It is hard to get it fixed; I have to send it to USA or India. It takes a very long time and is expensive.

Based on the words of the respondents stated above, availability and cost of accessories and maintenance are the challenges they face in their environment. Another adds that the power supply to charge the batteries is his major challenge.

3.2.2. Communication

Still, with the CIs, some of the respondents said they find it difficult to understand speech and speech therapy is very expensive. They don't even have a speech therapist or an audiologist. It is very difficult to access CI surgeons around them. A parent said, "my child does not develop speech even with the cochlear implant surgery."

Below are some of the stated challenges of the respondents:

I can only listen to one person at a time. I cannot communicate with someone at a distance, I have difficulty identifying the direction of the sound and I have a problem using the device.

I find it very challenging to be in a noisy environment. There is much difficulty in terms of dictating the direction of sound, words, and when my name is called. I always feel pain around the location of the external device and the loudspeakers are irritating.

I cannot detect the direction of the sound; my communication is only effective with lip reading; I receive so many sounds at the same time. I also have challenges with effective communication with the medical doctors during checkups despite having the device.

These are the difficulties most patients who are using Cochlear implants face when it comes to communication.

3.3. Family Challenges

3.3.1. Financial Challenges

One of the major challenges the relatives of CI users have is finance. Some indicated that their families have low incomes. So, affording batteries, repairs and changing some parts of the external device is challenging. Some relatives responded thus:

The family is supportive, though financially challenged due to the high cost of maintaining the device.

Funds that are meant for meeting family needs are diverted for maintaining the implant.

His siblings do play with him, so the device often spoils. As a result, it incurs extra financial expenditures. This sets the family on a disadvantaged financial

pedestal (*says a parent*).

The family is challenged financially because the cost of obtaining the implant, cost of repairs, buying batteries, cord or wires, etc., has affected the family finance negatively.

These are the expressions of patients who are using Cochlear implants. Others said the cost associated with running and maintaining the device had put the family below financially. The expenses of repair and maintenance are quite expensive and the family cannot continuously meet up.

3.3.2. Communication

The respondents said communication with their family members is one of their major challenges. They can only communicate with one person at a time. They cannot listen nor respond effectively when family members sit and converse together. A respondent said:

I communicate easily with my parents using sign language, but I cannot communicate with my extended family members, especially my grandparents, when the device malfunctions because they cannot sign.

I can communicate with my family members when the device is functioning. It is really hard to communicate with them when the implant is faulty.

My experience is difficulty in communication, poor relationship, avoidance, loss of confidence, and stigmatization in the family.

Family members do not understand my needs. It is difficult to understand what they are saying. We experience poor communication and it is difficult to socialize.

Apart from the communication gap, others said:

When the family environment is noisy and sometimes the television set is loud, when I complain, they don't seem to understand my problem.

My family members are having challenges in terms of coping with me; they do not seem to understand me. Their inability to understand and meet my needs gets them frustrated. Sometimes, I experience the same.

Only one of the respondents said they do not have family challenges at all.

3.4. Societal Challenges

The respondents identified communication barriers, stigmatization, loss of confidence, and loss of opportunities as the challenges they are facing because of hearing loss. The primary school children among the respondents said they have relational problems since they cannot communicate well with other pupils in their class. Most times they have to do their schoolwork alone. They sometimes miss instructions given by the teacher which always affects their learning. Some of them said:

I have to explain that my implant is just a simple hearing device and not just a fancy tech gadget like Bluetooth.

I cannot relate well to society. Even in church, I face discrimination. Some people will say, "Why bring him to church since he cannot hear."

I can only hear a sound. I cannot make meaningful conversations with other people in society. I do face discrimination among my peers.

I don't like going to a meeting and some social gatherings because of the noise. Most times, people feel I am ignoring them. Sometimes people do laugh at me.

The respondents also feel that society is neglecting them and there is no specialized personnel who are supposed to be attending to their communication development. It is difficult for them to associate with others in different works of life. They feel it is a challenge since they cannot effectively interact with others within society.

3.5. Patients Relations' Qualitative Result

3.5.1. Challenges Faced by Relations of CI Users

The respondents reported that they are facing financial hardship because their relations use CIs. They said that it requires time, effort, patients, and serious sacrifices to relate with them. They said they are living with serious anxiety about the eventual spoiling of the external part. Communication at night is very difficult because they don't sleep with it. Cochlear has helped in communication, but it is frustrating when their relations who are using the device are not wearing it. One of the respondents said, "other children think he is pretending not to hear them."

3.5.2. Challenges with Cochlear Implant

The respondents have these to say: the cost of the implant is very high. The devices do develop sudden problems and it is heartbreaking. The accessories are not easily accessible when the ones they have spoiled. It takes time to access repairs or replacement of faulty parts. This means a lack of meaningful interaction with their relations who use CIs. Technical experts are not accessible to fix the implants when they malfunction. Maintenance is very expensive, therefore, financially draining. The implants are not beneficial in a noisy environment because they have to shout for their relations to hear them. The batteries are not durable. The cords are fragile and can easily spoil and are very expensive. Cochlear implant maintenance is not accessible in Jos. They have to send to Lagos, which is very far. Sometimes the services cannot be rendered in Lagos. Lagos has to send to the implant company abroad. Therefore, takes a long time for issues to be resolved. The Cochlear Implant does not exceed three (3) months without developing issues. A respondent said:

"I don't have any real challenge, rather my CI has made communication with my husband easier." Contrasting, another said, "I have to shout for him to hear, especially in a noisy environment, which is psychologically and socially challenging."

3.5.3. Societal Challenges Face by Relations

A relation reports that society thinks they are wasting resources by embracing someone's experiment which has the tendency to destroy the child's future. That

they should forget about the CIs and send the child to a Special School where the child can learn and use sign language exclusively. Another posit is that they find it difficult to go out with relations who use CI because they cannot relate with their peers. Schools that can help with speech development are difficult to access. Similarly, other relations state that the CI user can only communicate with one person at a time and finds it difficult to detect the direction of the sound; therefore, socialization is very difficult for them.

Other respondents avowed that most times they experience rejection. Others feel it is stressful to communicate with CI Users because they must keep repeating statements to be heard. For example, a respondent reports that a relation said:

“One has to repeat himself before they hear. Society is very ignorant of our situation. They are not sympathetic to those using CI.” While another respondent says, “We are not facing any real family challenge; my husband does his work well and interacts well with people in the community.”

Some of the respondents said that community life is so challenging because of some level of stigmatization and discrimination at work and in school. They also mention that CI is not insured and there is no assistance from society. And most people stay away from those using CI because they feel it is stressful communicating with them.

Table 4 shows that the most important challenge of CIs in Jos, Nigeria is unavailability or inaccessibility. This is represented by the (100%) unanimous consensus of the ENT personnel that CIs are not readily accessible. The second most important challenge is the high demand for CI. This is seen in **Table 4**, with the indication that 58.3% of the ENT personnel asserted that there is a very high need for CIs in Jos, Nigeria. Other respondents, 41.7%, said that CIs are in

Table 4. Ent personnel responses.

ITEM	RESPONSE	FREQUENCIES	PERCENTAGE (%)	RANKING
Accessibility of Cochlear Implant	Readily Accessible	0	-	
	Not readily accessible	12	100	1
What is the Extent of Cochlear Implant Need	Very high	7	58.3	2 nd
	High	5	41.7	
	Low	0		
	Very low	0		
Is Your Facility Equipped for Cochlear Implant	Yes	6	50	3 rd
	No	4	33.3	
	Partially equipped	2	16.7	
Challenges of Cochlear Implant and Management of Patients	Inadequate manpower	7	58.3	2 nd
	Finance	3	25	4 th
	Lack of equipment	2	16.7	

Source: Field Data, 2021.

high demand in Jos, Nigeria. Another challenge of CIs in Nigeria that falls on the second rating, which has 58.3% vote is inadequate manpower. The above table also indicates that the health facility in Jos, where the study is carried out is 50% equipped for CI surgeries. This shows that there is still a need for improvement in the facility for effective CI surgery to be carried out. It is the third challenge faced in Jos, although 33.3% percent of the respondents said it is not equipped for CI surgeries. The facility is partially equipped, according to 16.7% of the respondents. In the ranking, lack of finance is said to be the 4th challenge of CI. This is supported by 25% of the respondents, who think lack of finance is one of the key issues. A total of 16.7% point out that lack of CI equipment is also a challenge in Jos, Nigeria.

4. Discussion

The qualitative and quantitative appraisal have acknowledged the unity and consistency of responses between CI users and their relations to the family and social challenges of Cochlear Implant in Jos, Nigeria. The ENT personnel also identify the challenges they are battling in terms of managing CI patients. The findings revealed that the challenges CI users and their relations are facing include accessibility, affordability or cost of CI and its accessories, services, communication, socialization and psychological issues. ENT Personnel's challenges are unequipped CI facilities and insufficient staffing such as CI surgeons, speech therapists and audiologists. The discussion will center around the observed challenges.

4.1. Availability/Accessibility

The subjects in this study said that CIs are not easy to get. They are very difficult to access in Jos, Nigeria. CI surgery has not been readily available in developing countries [6] and Nigeria is one of them. The reason for the unavailability of CI is because of certain factors such as lack of professional personnel, inadequate training, and inability to purchase the implant due to poverty, inadequate home and school environment that will facilitate effective follow-up [6]. Cochlear Implants are primarily available and accessible in developed countries due to the nature of the intervention and maintenance cost [3].

Apart from the inaccessibility of the CI and the surgery, this study discovered that the accessories that keep it functional for optimal performance are difficult to access. CI accessories such as batteries, the external processor, cords, chargers for rechargeable batteries, battery compartments, etc., are inaccessible. Repairs of spoiled parts are difficult to access within the country. Most times, CI users or their relations have to place orders outside the Country. For example, a respondent who used cochlear implants in both ears said he normally sent spoiled parts or placed orders for accessories in USA or India which takes a longer time to arrive leaving him with a communication challenge. Routine CI mapping is also difficult to access. This is due to difficulty in scheduling it. Time and distance

between those providing the service are one of the major issues. In fact, in the study area mapping has to be scheduled from Jacksonville, Florida, sometimes network challenges do obstruct the flow of its effectiveness. The ENT personnel said that the need for CIs in their health facility is very high, which means there are a lot of CI candidates but its availability is the major challenge.

4.2. Affordability

A CI is very expensive to obtain and maintain. It requires a very good economic prowess or financial capability to afford it but almost all the respondents are financially challenged. The biodata of the CI users shows that the majority of them live below 100 thousand to 500 thousand Naira (244 to 1250 US dollars). Very few earn from 100 thousand to 1 million (\$2439.02) and some significant others who are mostly relations of the CI users live above 1 million Naira, yearly. Some of the CI users indicated that they have no earnings at all and most of them are dependents - children of primary school age, housewives who depend on their husbands and retirees whose yearly income is less than 100 to 500 thousand Naira. This reveals that financial challenge or economic powerlessness is one of the significant reasons why the affordability of CI is a major setback in the study area. Almost all the respondents said that CI and its accompanying responsibilities and services are very expensive. The recipients are seriously battling with it. Cochlear implants are currently too expensive and virtually unavailable in developing countries [9].

Cochlear Implant accessories such as batteries, external devices, cords, and services or repairs are very expensive. This is unanimously agreed by all the respondents because CI services are not localized where the users can access them easily. The cost of accessories and the cost of transportation are some of the challenges the subjects of this study are also battling with. A respondent said they have to also travel a long distance to access Cochlear Implant mapping and other services which cost them a lot in terms of transportation. Aside availability and affordability of the CI, its services and maintenance are on the high side.

4.3. Communication

The respondents, except for one, indicated that they have hearing loss in both ears but are unilaterally implanted. Bilateral implantation is a strong predictor of better auditory and speech production for effective communication [10]. This (unilateral implantation) is due to the financial challenge that made CI affordability very difficult in Jos, Nigeria. CI is very necessary for the Patients because all of them said they don't benefit from hearing aids.

Some of the respondents said they find it difficult to understand speech with the CI. This is a challenge to effective communication. The study reveals that CI users in Jos, Nigeria can only communicate with one person at a close range per time. Probably, this is enhanced with the aid of lip reading. Communication with someone at a distance is challenging. Identification of the direction of

sound and words, despite the localization of the same, is still a challenge that affects effective communication for CI users. “Restoring binaural hearing with two CIs could lead to significant improvements such as speech perception in noise, sound source localization, and attention/inhibition of reverberation in the environment” [11]. CI users cannot communicate effectively in a noisy environment compared to persons with the normal hearing because many sounds are perceived at the same time. All patients with CI experience a great deal of difficulty understanding speech in background noise or under high cognitive loads [11]. Although there is social improvement among children with CI, it is observed that there are disadvantageous situations that concern the difficulty in hearing and speech reading which impedes social interaction [12]. Communication for CI users among a group of people in noisy environments is very challenging. This is contrary to one-on-one interactions [12]. These communication challenges are experienced at the home, playground, school, and in society at large.

On the matter of effectiveness and efficiency of the CI, 50% of the respondents said their device is very effective and 38% of them said it is moderately effective. Only 12% said it is not effective. This proves that a CI is very helpful except for the community discussion or meetings. Those with severe to profound sensorineural pre-lingual hearing loss can significantly benefit from habitation and rehabilitation for those severe to profound sensorineural post-lingual hearing loss.

4.4. Societal Challenges

CI users and their family members have put forward that people in society are unfavorably relating to them because of the severity of the hearing loss, which is still extended to them even after the implantation. This is mostly because society is not aware of what a CI is. Those who claim to know about it think it is someone’s experiment that will put the life and future of the users in jeopardy, especially children. This is typical within a school environment; they feel isolated because most of their class assignments are carried out in isolation. Exclusion from socialization reduces the quality of life and can cause loneliness and isolation [13].

On the issue of isolation, some of the respondents do have a feeling that they do not need to attend any social gatherings or community meetings because “the feeling of not understanding and not being understood is frustrating” [13] for CI users. The ignorance of society about CIs in the study area makes CI users have to keep explaining that the implant is a device that assists in hearing.

Some of the respondents have indicated that they have already lost confidence in themselves and other people in society. CI users also feel neglected by society such that even the government does not care to make specialized contributions that will help improve their quality of life for effective realization, actualization, and fulfillment of potential.

4.5. Psychological Issues

CI users do face discrimination, stigmatization, and denial of opportunities. This

has a way of affecting them psychologically. Their family members have declared that the time, effort, and sacrifices that are involved in communicating or relating and meeting the needs of their relations (CI user) are emotionally and mentally draining. Some of the relations feel frustrated when patients are not using the device because of malfunction or lack of accessories.

Most of the psychological challenges of CI users are due to the inability to hear in a noisy environment when they cannot follow a group discussion or community meeting. The uncontrolled noise, loss of occupational and/or educational opportunities, difficulty in social adjustment, and the terror of isolation have serious psychological impacts on CI users. Amelioration of this condition is possible through bilateral implantation to improve sound localization, speech understanding in quiet environments as well as with background noise [9].

Other respondents stated that they do not have any psychological or emotional challenges. Rather, the CIs have taken away the psychological challenges they were experiencing because of the severe to profound sensorineural hearing loss that affects their relations. For them, effective communication has become a reality on account of the CI.

4.6. ENT Personnel's Responses

The ENT personnel are medical Doctors (Otorhinolaryngologists) and 75% (9) were male while 25% (2) are Nurses. They agreed 100% that CI is not available in their facility but demands are very high. Although their facility is partially or inadequately equipped, they state that inadequate manpower is their major challenge in CI surgery and users' management. Speech therapists and audiologists are the core issues.

The need for training ENT Doctors in ear surgery and CI management in Jos, Nigeria and other developing countries cannot be overemphasized. Here, the CI candidates do wait for a surgeon (Dr Green, D. and Dr Wood, M.) and their team (Hearing Help for Africa) from Jacksonville, Florida and Oklahoma, USA, for the Cochlear implantation surgery and only a few do have access to the CI surgeries. There is only one audiologist and no Speech Pathologists in Jos, Nigeria. This informed some of the great challenges patients faced in Jos, Nigeria and other parts of the country.

4.7. Recommendations

To achieve success and reduce the challenges CI users are facing, there is a high need for training and retraining of personnel in otology, audiology, and speech pathology in Jos parts of the country. The government needs to open academic institutions that will train ENT personnel and grand opportunities for sponsoring the existing medical personnel in and outside the country, considering the lack of manpower and the need for CIs. Universities in Nigeria should offer courses that will train individuals in speech pathology and audiology at undergraduate, graduate and post-graduate levels. Nigeria and West African Colleges

of surgeons need to include otology in their post-graduate studies curriculum to deliberately have trained Doctors in neurotology.

The government and good-spirited individuals should see to it that persons with CI and those that need CI are supported, knowing that hearing is not a luxury; it is a necessity for the citizens.

Considering the financial implications of acquiring and maintaining a CI, the government must be deliberate in terms of adding CI surgeries and the accessories in the Health Insurance coverage to help cushion the cost for the needy citizen. Also, Non-Governmental Organizations can play a great role in assisting the less privileged in our society with grants that can provide funds to support and alleviate the huge challenges faced by CI users in our country.

Cochlear Implant companies need to reconsider developing countries in terms of affordability. CIs should be made cost-effective for candidates in developing countries to afford. Also, the African weather tends to affect the durability of the cords, batteries and battery packs, etc. Manufacturers need to look into this in terms of making more durable accessories that can withstand the African hot weather and the cost of replacing the broken parts. Developing countries seriously need more representatives and technicians who will be readily available for easier and quick services as soon as possible.

The government has a great responsibility to subsidize the cost of importation and clearance of this equipment into the country. This also will reduce the cost of the CI and related equipment for the citizen.

Health awareness is a necessary tool to educate society about preventing hearing loss at all levels than trying to cure it. Prevention is always cheaper than cure. Eradicating and reducing the challenges faced by the persons that use CIs in Jos, Nigeria is everyone's responsibility, not just family members and the government but all of us.

5. Conclusion

CI users have family and social challenges due to limited access and the inability to afford CI accessories and services. They are grappling with economic challenges due to the cost of the implants which affects communication. They are challenged psychologically due to barriers in communication and societal attitudes such as neglect, stigmatization, discrimination, and loss of opportunities. Those that are responsible for managing the CI user (Otorrhinolaryngologists, and ENT Nurses) pointed out that there is high demand for CIs in their facilities and CIs are not readily available. The need for speech therapists, audiologists, specialized equipment, specialized training and expanded partnerships with specialists in developed countries cannot be overemphasized.

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Conflicts of Interest

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References

- [1] Zeng, F.G., Rebscher, S.J., Fu, Q., Chen, H., Sun, X., Yin, L., Ping, L., Feng, H., Yang, S., Gong, S., Yang, B., Kan, H., Gao, N. and Chi, F. (2015) Development and Evaluation of the Neutron 26-Electrode Cochlear Implant System. *Hearing Research*, **322**, 188-199. <https://doi.org/10.1016/j.heares.2014.09.013>
- [2] American Speech-Language-Hearing Association (2022) Cochlear Implant: ASHA Resource on Interprofessional Education/Interprofessional Practice.
- [3] Raine, C., Atkinson, H., Strachan, D.R. and Martin, J.M. (2016) Access to Cochlear Implants: Time to Reflect, *Cochlear Implants International*, **17**, 42-46. <https://doi.org/10.1080/14670100.2016.1155808>
- [4] Adoga, A.S., Nwaorgu, O.G.B., Anthis, J. and Green, J.A. (2014) Our Experience with Cochlear Implant Surgery on Nigerians. *Indian Journal of Otolaryngology*, **20**, 134-139. <https://doi.org/10.4103/0971-7749.136871>
- [5] Zeng, F.G. (2017) Challenges in improving Cochlear Implant Performance and Accessibility. *IEEE Transactions on Biomedical Engineering*, **64**, 1662-1664. <https://doi.org/10.1109/TBME.2017.2718939>
- [6] Suleiman, A.O. Suleiman, B.M., Abdulmajid, R.M., Mustapha, A.Y., Afolabi, O.A. Leko, H., Nathal, C., Mohammed, G.M. and Lasisi, A.O. (2014) Pediatric Cochlear Implantation in North-Western Nigeria Case Report and Review of Challenges. *International Journal of Pediatric Otorhinolaryngology*, **78**, 363-365. <https://doi.org/10.1016/j.ijporl.2013.10.061>
- [7] Li, N.J. Chen, S., Zhai, L. Han, D.Y. Eshraghi, A.A., Feng, Y., Yang, S.M. and Liu, X.Z. (2017) The Advances in Hearing Rehabilitation and Cochlear Implant in China. *Ear and Hearing*, **38**, 647-652. <https://doi.org/10.1097/AUD.0000000000000441>
- [8] Bierbaum, M., McMahan, C.M., Hughes, S., Boisvert, I., Lau, A.Y.S., Braithwaite, J. and Rapport, F. (2019) Barriers and Facilitators to Cochlear Implant Uptake in Australia and the United Kingdom. *Ear and Hearing*, **41**, 374-385. <https://doi.org/10.1097/AUD.0000000000000762>
- [9] Le Roux, T. and Laurent, C. (2021) Open Access Guide to Audiology and Hearing Aids for Otolaryngologists: Cochlear Implant In Developing Countries. <http://www.open.umich.edu/sites/default/downloads/audiologyforinfants.pdf>
- [10] Le Roux, T., Vinck, B., Butler, I., Cass, N., Nauta, L., Louw, L., Schlesinger, D., Soer, M., Tshifularo, M. and Swanepoel, D. (2016) Predictors of Pediatric Cochlear Implantation Outcome in South Africa. *International journal of pediatric otorhinolaryngology*, **84**, 61-70. <https://doi.org/10.1016/j.ijporl.2016.02.025>
- [11] Faulkner, K.F. and Pisoni, D.B. (2013) Some Observation About Cochlear Implant: Challenges and Future Directions. *Neuroscience Discovery Herbert Open Access Journals*, **1**, 1-10. <https://doi.org/10.7243/2052-6946-1-9>
- [12] Michael, R., Attias, J. and Raveh, E. (2019) Cochlear Implant and Social-Emotional Functioning of Children with Hearing Loss. *Journal of Deaf Studies and Deaf Education*, **24**, 25-31. <https://doi.org/10.1093/deafed/eny034>
- [13] Johansson, B. and Olsson, L. (2022) Open Access Guide to Audiology and Hearing Aids for Otolaryngologists: Audiology for Special Populations: Infants <http://www.open.umich.edu/site/default/download/audiologyforinfants.pdf>