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Auditory Brainstem Responses of Schizophrenic Patients in a Nigerian Mental Health Clinic

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Abstract:

Schizophrenia is a mental disorder characterized by incoherent or illogical thoughts, bizarre behavior and speech, delusions or hallucinations such as hearing voices. This study sought to find out if there would be hearing loss among schizophrenic patients with active auditory hallucination and if there is, will it be significant?

This is a descriptive cohort study conducted among 31 actively hallucinating schizophrenic patients who were recruited from Department of Psychiatry, LAUTECH Teaching Hospital, Osogbo and 31 normal adults. Ear examination was for both study and control groups and Maico MB 11 ABR was used to determine the participants' hearing thresholds. Analysis of data was done through standard deviation, percentages, mean, chi-square and t-test.

The minimum age was 20 years, maximum was 58 years, SD = 9.247 with 28 males (45.2%) and 34 females (54.8%). Among the study group 26 (83.9%) had abnormal ABR bilaterally while only (12.9%) were abnormal on the right and 5 (16.1%) on the left in the control group. Also, mild hearing loss was prevalent in both groups bilaterally. There is a significant difference of 14 dB on the right ears and 15 dB on the left ears between the study group and the control group: RE: $t=6.062$, $df=60$, $p=0.000$, LE: $t=6.198$, $df=60$, $p=0.000$.

Schizophrenia is one of the most disturbing mental disorders that require serious attention. The collaboration in the management of schizophrenia among specialists such as Psychiatrists, Ear, Nose and Throat Specialists and Audiologists in the treatment and management of this disorder hold a satisfying prognosis.

Keywords: Auditory brainstem response, hearing loss, mental health, Nigeria, schizophrenia

1. Introduction

Schizophrenia is a serious mental illness which is characterized by abnormal social behavior and failure to understand reality. Common symptoms include false beliefs, unclear or confused thinking, hearing voices that others do not, reduced social engagement and emotional expression, and lack of motivation (WHO, 2015; National Institute of Mental Health, 2016). People with schizophrenia often have additional mental health problems such as anxiety disorders, major depressive illness, or substance use disorders (Buckley, Miller, Lehrer, Castle, 2009). Symptoms typically come on gradually, begin in young adulthood, and last a long time (National Institute of Mental Health, 2016). According to Razali and Abd Wahid (2012), depressive symptoms and high perceived stigma in schizophrenic patients have been associated with their low quality of life and self-esteem respectively. As such, it is one of the most disturbing mental illness conditions that require serious attention.

The prevalence rate of schizophrenia is about 1.1 percent of the population over the age of 18 years old (Danielyan and Nasrallah, 2009) while the average age of onset is 18 and 25 years old in male and female respectively with rare occurrence in population below 10 and over 40 years old (Sham, MacLean and Kendler, 1994). This is considered the most critical age in social and vocational development, schizophrenia has both economic and non-economic impacts on its sufferers, family members and society (Van and Kapur, 2009). Most schizophrenic patients have a low socioeconomic status but this is not because schizophrenia preferentially targets the poor but mainly because it brings about drastic impairment in social and occupational skills.

Some authors concluded that there is no relationship between auditory hallucination and hearing loss while the bulk of literature supports a poorly defined relationship. A study by Lindstrom, Klockhoff, Svedberg and Bergstrom (1987) reported a relationship between auditory brainstem response (ABR) and auditory hallucinations. The result implied that brainstem dysfunction is involved in the psychopathology of schizophrenia and that interference with the auditory pathways in the brainstem may induce auditory hallucinations in schizophrenic patients.

Auditory brainstem response is a diagnostic tool used primarily to diagnose sensorineural hearing loss. It detects evoked potentials, generated by neuronal activity in the auditory pathways in the brainstem within the first 10 milliseconds following acoustic stimulation. The potentials are recorded by surface electrodes placed on the forehead (vertex), temple and on the mastoid processes. The wave pattern recorded consists of seven peaks, which are interpreted with respect to latencies and amplitudes. Waves I, III and V are the most clinically significant, however, wave V is the most important because it provides critical information about the auditory pathways in the brain.

The collaboration in the management of schizophrenia among specialists such as Psychiatrists, Otorhinolaryngologists and Audiologists in the treatment and management of this disorder through pharmacological and psychoacoustics, neuroaudiological and electro-physiologic assessments will improve management outcome. This study therefore aims at finding the presence of auditory deprivation among patients suffering from Schizophrenia.

2. Materials and Methods

2.1. Research Design

This study was a descriptive survey design. Since the variables of interest have occurred, i.e. schizophrenia and hearing loss, they will be studied *expost-facto*. Thus, the variables will not be manipulated in the research.

2.2. Population

The target population for this study were all the patients with schizophrenia within the scope of study.

2.3. Sample

The sample for the study group were 31 consecutive patients with schizophrenia (considering inclusion and exclusion criteria) while the control group were also 31 otologically health members of staff of LAUTECH Teaching Hospital who were not suffering from schizophrenia.

2.4. Sampling Procedure

Purposive sampling technique was used to select the patients for the study because of the nature of the study from the psychiatric department (s) and healthy control participants of matching gender and were recruited from the members of staff.

2.5. Inclusion Criteria

- Patients aged 18 – 64 years (65 years and above may be having presbycusis)
- Patients with schizophrenia that are first time hospitalized (to rule out drug interaction)

2.6. Procedure for Data Collection

The 31 consecutive participants (study group) who met with the inclusion criteria were recruited into the Department of Ear, Nose and Throat, LAUTECH Teaching Hospital, Osogbo from the Department of Psychiatry. Otoscopy and hearing assessment were done for all the participants and data were retrieved from their case files. The same procedures were done for the control group. MAICO MB 11 ABR was used to determine the participants' hearing thresholds.

2.7. Exclusion Criteria

- Patients who refused consent
- Patients who were already suffering from hearing loss before having schizophrenia
- Patients with history of brain injury following cranial trauma
- Patients who were diagnosed with psychiatric co morbidity

2.8. Instrumentation

- Auditory Brainstem Response Machine (The procedure is non-invasive)
- Case files

2.9. Analysis of Data

Analysis of data was done through standard deviation, percentages, mean, chi-square and t-test via SPSS 16.

3. Results

3.1. Demographics

Minimum	Maximum	Mean	Standard Deviation
20	58	36.91	9.25

Table 1: Age Distribution (in years)

	Frequency	Percent
Male	28	45.2
Female	34	58.8
Total	100	100.0

Table 2: Gender of the Studied Patients

Degree of HL	Case	Control	Total
Normal Hearing	5 (16.1%)	27 (87.1%)	32 (51.6%)
Mild HL	18 (58.1%)	3 (9.7%)	21 (33.9%)
Moderate HL	8 (25.5%)	1 (3.2%)	9 (14.5%)
Total	31 (100%)	31 (100%)	62 (100%)

Table 3: Degree of Hearing Loss (Right Ears)

Degree of HL	Case	Control	Total
Normal Hearing	5 (16.1%)	26 (83.9%)	32 (50.0%)
Mild HL	19 (61.3%)	5 (16.1%)	24 (38.7%)
Moderate HL	5 (16.5%)	0 (0%)	5 (8.1%)
Mod.severe HL	2 (6.5%)	0 (0%)	2 (3.2%)
Total	31 (100%)	31 (100%)	62 (100%)

Table 4: Degree of Hearing Loss (Left Ears)

Variables	N	Mean±SD	Mean Diff	t value	df	p value
Case	31	35.97±10.44	14.19	6.06	60	0.000*
Control	31	21.77±7.80				

Table 5: ABR Showing Significant Difference In the Right Ears Hearing Thresholds

*Significant At P<0.05

Variables	N	Mean±SD	Mean Diff	t value	df	p value
Case	31	36.29±10.80	15.00	6.20	60	0.000*
Control	31	21.29±8.06				

Table 6: ABR Showing Significant Difference in Left Ears Hearing Thresholds

*Significant At P<0.05

4. Discussion

Table1 shows that the minimum age of the participants was 20 years and maximum was 58 years. It was revealed in table 2 also that 28 males (45.2%) and 34 females (54.8%) participated in the study.

Tables 3 and 4 revealed that twenty-six out of thirty-one (83.9%) had abnormal ABR bilaterally among the study group while just four (12.9%) were abnormal on the right and five (16.1%) on the left in the control group with a prevalence of mild hearing loss in both groups bilaterally. Also, we discovered mild (58.1%) and moderate (25.5%) hearing loss in the right ears among the study group, in the control group, 9.7% were mild hearing loss and 3.2 %

moderate hearing loss was discovered. On the left ears, we discovered mild (61.3%), moderate (16.5%) and moderately-severe (6.5%) hearing loss but on the right ears, there was no patient with moderate or moderately severe hearing loss. Tables 5 and 6 revealed that there was a significant difference bilaterally in the hearing thresholds between the study group and the control group. It was reported on the right ears a significant difference of 14.19 dB and on the left ears of 15 dB whereas in tables 3 and 4, it was revealed that 83.9% had abnormal ABR bilaterally in the case group, whereas just 12.9% (right ears) and 16.1% had abnormal ABR in the control group. We can therefore postulate that auditory deprivation is associated with schizophrenia.

A number of studies have associated auditory deprivations and auditory hallucination (van der, van, Verhey, Jolles, Thewissen, and Os, 2007; Stefanis, Thewissen, Bakoula, Os and Germeys, 2006; Mason, Rimmer, Richman, Garg, Johnson and Mottram, 2008). Stefanis et al. (2006) postulated that hearing impairment is a potential risk factor for the development of schizophrenia.

Our study corroborated with the study by Lindstorm, Klockhoff, Svedberg and Berstrom, (1987) that discovered abnormal ABR in 50% of the schizophrenic patients. Lindstorm et al. discovered that 82% of the subjects who reported experiencing auditory hallucination showed abnormal ABR. However, only 11% of schizophrenic patients without auditory hallucination showed abnormal ABR. More importantly, they found a significant relationship between abnormal auditory brainstem response and auditory hallucination. Hence, they conclude that abnormality at brainstem level as a cause factor that triggers auditory hallucination in schizophrenic patients.

Also, our study agreed with the study of Mason and Brady (2004) who reported that perceptual disturbances such as hallucinations are often experienced by people with sensory deprivation. The conclusion was based on their observation on hallucination and non- hallucination prone groups who were completely isolated for a brief period from sound and visual stimuli. Perceptual disturbances were found to be greater on the hallucination group, which strongly suggest the association between sensory deprivation and psychotic-like experience such as hallucinations.

In another study by McKay, Headlam and Copolov (2000) they reported that right hemisphere or inter-hemispheric pathway dysfunction is a possible cause for auditory hallucination. However, they concluded that reports on left hemisphere dysfunction have also been associated with auditory hallucination (Hugdahl, Loberg, Jorgensen, Lundervold, Lund, Green, et al 2008). Also, our study is in line with Igata, Ohta, Hayashida and Kazuhiko (1994) who share the same idea as they believe schizophrenic patients may have auditory processing disorders at the level of lower brainstem.

6. Conclusion

Schizophrenia is one of the most disturbing mental disorders that require serious attention. In this present study, schizophrenics have been found to suffer mild hearing loss, the effect of this on quality of life is suggested for further studies.

7. Recommendations

- Patient with Schizophrenia should undergo periodic hearing assessment in other to diagnose and treat comorbid hearing impairment and improve the prognosis.
- Tips for sound otologic health should be taught in the mental health clinic to increase awareness and prevent other risk factors of hearing impairment.
- Mental State Examination is recommended for patients with hearing impairment.
- Collaborative management of schizophrenic patients by Psychiatrists, Otorhinolaryngologists, Audiologists and other specialists involved.
- Multidisciplinary approach should be employed in the management of schizophrenia because sensory impairment may be a risk factor.

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