# CORRELATION BETWEEN SELF-HEARING ASSESSMENT AND STANDARD AUDIOMETRY AMONG ENT PATIENTS AT UNIVERSITY COLLEGE HOSPITAL IBADAN.

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## ABSTRACT

**Background:** *Self- hearing rating is a very subjective tool used in assessing hearing depending on the respondents' perception of their hearing level. This has been employed in screening the hearing of people but hardly considered for grading the severity of hearing loss.*

**Aim**: *To determine the correlation between self-hearing rating and standard audiometry grading of hearing loss among ENT patients at the University College Hospital, Ibadan.*

**Materials and methods:** *This was a hospital-based, cross-sectional study of ENT patients aged 10years and above at the audiology room in ENT clinic. Interviewer-assisted questionnaires were administered on all participants to obtain clinical information concerning demographics, clinical data, and self-hearing rating as "bad, fair, good and very good". The standard audiometer was then used to assess their hearing and their hearing was graded with WHO 2008 grading of hearing loss (normal 0-25dB, mild HL 26-40dB, moderate HL 41-60dB, severe 61-80dB and profound deafness >81dB)*

**Results:** *There were 60 patients (120 ears), age ≥10years, 41 ± 17.6 years (mean ± SD), M: F is 1:1. The respondents' self-hearing rating were 4(6.7%) bad, 20(33.3%) fair, 23(38.3%) good, and 13(21.7%) very good. The pure tone average (Mean ± SD of PTA) of standard audiometry in the right and left ears respectively, for the self-hearing rating were; bad (81.8±12.5 dB, 66.6±38.4 dB), fair (52.6±29.0 dB, 55.4±28.9 dB), good (25.6±13.4 dB, 27.3±13.4 dB) and very good (21.6±7.8dB, 17.3±4.5 dB). There was a strong correlation between self-hearing rating and pure tone average of standard audiometer in both the right (RT) and left (LT) ears f-test for RT and LT (16.765 and 13.318 respectively) p=0.0001*

**Conclusion:** *Self-hearing rating was found to be a reliable data for hearing screening and was also predictive of the severity of hearing loss*

**Key words:** *self-hearing rating, standard audiometry, pure tone average, correlation*

## INTRODUCTION

A person who is not able to hear as well as someone with normal hearing – hearing thresholds of 25 dB or higher in both ears – is said to have hearing loss.[1] The global burden of hearing loss is increasing exponentially and the disability is becoming so rampant in our environment due to some unhealthy practices especially among the youths such as exposure to loud music. More than two-thirds of those with hearing loss, live in low- and middle-income countries with limited access to treatment.[2]

The hearing care services is grossly inadequate and often unavailable in the remote areas and villages where majority of people with hearing disabilities are found. The standard facilities for assessing hearing are not only grossly inadequate but also expensive to access. They are mostly found in cities and tertiary institutions where the expertise can be found. To maintain these scarce facilities, their use should be limited to only when it is necessary.

Hence, various method of screening people who will need them should be devised. These methods of screening should involve extensive clinical history and thorough examination of the ear, self-hearing rating and use of some common devices like mobile phone applications where possible. These will help to reduce the burden on the over stretched and deficient facilities by ensuring adequate screening of people to ascertain those that require it. Self-hearing rating is very subjective and would require some level of acumen before it can be considered. However, the use of self-hearing rating may be the only tool available in some settings to make decision on the need for specialist care by the person. There is therefore need for studies to determine the reliability of self-hearing rating among the populace. This study aims at determining the correlation between the self-hearing rating and standard audiometry test, to know how reliable self-hearing rating.

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## MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted in the audiology room at the Ear Nose and Throat (ENT) clinic of the University College Hospital, Ibadan. Consenting patients (≥

10years) who presented at the audiology room of the clinic were recruited as they were coming for pure tone audiometry test. Their ears were examined and hearing assessment done with a standard audiometer. Excluded from the study were participants with congenital or acquired external auditory canal stenosis, participants otitis externa, participants with actively discharging ears, participants with mental retardation or psychiatric disorders and participants less than 10 years (because their responses may not be reliable). Written informed consents were obtained and interviewer assisted questionnaires were administered on all participants to collect biodata, relevant clinical data, and their self-hearing rating. The self-hearing rating of the participants was graded into "bad, fair, good and very good" and patients were asked to rate their hearing into any of these categories depending on their perception of hearing.[3] Participants were then moved to the audiology room to have their pure tone audiometry done using a standard audiometer (calibrated interacoustic A/S, type 2 audiometer/type B-E speech audiometer).The head phone was in the sound proof booth and connected to the audiometer outside the booth where the researcher sat to conduct the test. The patient sat backing the researcher who was seeing the patient through a transparent glass window. The participant raised the hand on the side where he/she hears any sound until he/she could not hear the sound any longer. The tone was presented to the right ear first at frequency of 1kHz, from an intensity of 40dB and if patient could hear, it was reduced by 5dB until patient could no longer hear. If participant could not hear at 40dB, intensity was gradually increased by 10dB until he/she could hear. The threshold at that frequency was the decibel value at which patient begins to hear while increasing or stopped hearing while decreasing the sound intensity. The tests were then done also at 500Hz, 250Hz, 2kHz, 4kHz and 8kHz respectively and the audiogram was plotted. The same procedure was repeated on the left ear and audiogram was also plotted. The pure tone average was

calculated using the average of hearing level in dB at 500Hz,1000Hz, 2000Hz and 4000Hz frequencies.[4] Using the WHO 2008 grading of hearing loss (normal 0-25dB, mild HL 26-40dB, moderate HL 41-60dB, severe 61-80dB and profound deafness >81dB) the hearing level of the participants was determined with pure tone average calculated.

**Statistical Analysis**

Data obtained were entered and analyzed using statistical package (IBM SPSS statistic, version 22). Demographic variables were represented using tables and charts, while summary statistics were done using means and proportions. The self-hearing rating was compared to the pure tone average of standard audiometer using f-test. Association between self-hearing rating and severity of hearing loss with audiometer in both ears were determined using chi-square test. Level of statistical significance was set at p value of <0.05

## RESULTS

The total number of participants recruited for this study were 60 (120 ears). The ages were 10 years and above, the mean ± SD age of participants was 41_+ 17.6 years, median age 40 and modal age 29. There were 30 males and 30 females in this study. The formal educational level of the participants shows that majority of participants had tertiary level of education 41(68.3%), while 16 (26.7%) had secondary level of education and 2(3.3%) had primary and only 1(1.7%) had no form of formal education. Only 15 (25%) of the participants had chronic diseases, 10 of them were hypertensive, 2 sickle cell disease, 2 hepatitis and one diabetes. The participants self-hearing rating distribution as in figure1, shows 4(6.7%) had bad, 20(33.3%) had fair, 23(38.3%) had good, and 13(21.7%) had very good self-hearing rating. The mean pure tone averages using the standard audiometer in both right and left ears respectively, correspond to the self-hearing rating of the participants; bad (81.8±12.5 dB, 66.6±38.4 dB), fair (52.6±29.0 dB, 55.4±28.9 dB), good (25.6±13.4 dB, 27.3±13.4 dB) and very good (21.6±7.8dB, 17.3±4.5 dB). f-test for RT and LT (16.765 and 13.318 respectively) p=0.0001. There was also a significant association between respondent hearing rating and severity of hearing/loss. Most of the respondents could precisely rate their hearing as detected by the standard audiometer in the right ear Table 2 ($\chi^2$=36.101, p=0.001), and left ear Table 3 ($\chi^2$=30.902, p=0.002).

## DISCUSSION

The participants self-rating of their hearing was done and only very few perceived their hearing as being bad, majority of them rated there hearing as good and this was also found to correlate significantly with the standard audiometer result were majority had normal hearing to mild hearing loss but a few severe to profound hearing loss. There were also no discrepancies between the hearing thresholdsas assessed by audiometry in each of the ears and the overall rating by the participants. This self-reported hearing level correlating with standard audiometry is very important in the evaluation of the participants' cognitive function which means they are fully oriented and can accurately express their feelings. Self-hearing rating also points to the accuracy with which individuals could rate there hearing. From the findings in this study, it was observed that individuals could accurately rate their hearing level and this fact cut across all age groups. This contrasts with the study by Corbin et al[5] where only 26% of participants could accurately self-rate their hearing consistent with the audiometric results. However, the participants in the study by Corbin et al were elderly above 60 years, with probably high prevalence of diseases affecting cognitive functions.[5] Kamil et al.[6] in a study of 3557 participants aged 50 years and above, found that subjective and objective hearing differed across gender, age, race/ethnicity, and educational status. They reported over estimation of hearing impairment among young people and underestimation among the elderly population. Even though Kamil et al[6] had a larger number of participants, the participants did not include the young adults and children. Kiely et al.[7] (2015), in a study of 23001 participants in Australia, compared self-reported hearing loss and standard audiometry. It was found that moderate associations exist between self-reported and audiometric hearing loss and the prevalence of hearing loss based on self-report was overestimated for adults aged below 70 years and underestimated for adults aged above 75.Hannula et al.[8] (2011) in a study of 850 subjects aged 54-66 years in Finland, found that participants seem to predict hearing impairment at high frequencies (4–8 kHz) rather than at the frequencies of 0.5–4 kHz, which are commonly used to define the degree of hearing impairment in medical and legal issues.The limitation of this study is that participants were residing in cities and had significant level of formal education. This may not be representative of the population of persons with hearing impairment considering the burden of the disease in rural areas where access to standard audiometer is lacking.

## CONCLUSION

The use of self-hearing rating should be encouraged as a screening tool in remote settlements where standard audiometers cannot be easily accessed, It has been found to be reliable method for hearing screening and was predictive of the severity of hearing loss in this study.

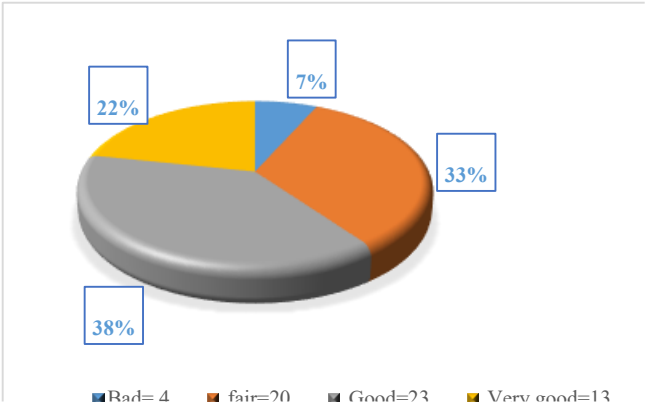


**Figure 1: Distribution of self-hearing rate among respondents**

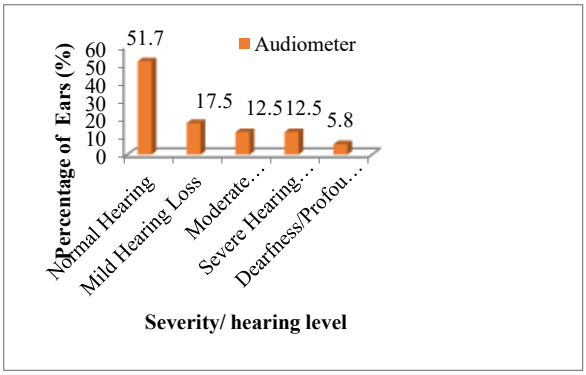


**Figure 1: Distribution of severity of hearing loss in audiometer test**

**Table 1: Comparing pure tone average (PTA) of the respondents to their self-hearing rating**

| PTA measurement | self-hearing rating | Number of respondents | Mean ±SDofPTA | 95% CI for mean | Range | f-test | p-value |
|---|---|---|---|---|---|---|---|
| **Audiometer PTA right** | Bad | 4 | 81.8±12.5 | 62.0-101.7 | 72.5-100.0 | 16.765 | 0.0001 |
| | Fair | 20 | 52.6±29.0 | 39.0-66.2 | 12.5-95.0 | | |
| | Good | 23 | 25.6±13.4 | 19.8-31.4 | 14.0-75.0 | | |
| | very good | 13 | 21.6±7.8 | 16.9-26.3 | 12.5-38.0 | | |
| | Total | 60 | 37.5±26.1 | 30.7-44.2 | 12.5-100.0 | | |
| **Audiometer PTA left** | Bad | 4 | 66.6±38.4 | 5.4-127.7 | 12.5-100.0 | 13.318 | 0.0001 |
| | Fair | 20 | 55.4±28.9 | 41.9-69.0 | 12.5-98.8 | | |
| | Good | 23 | 27.3±13.4 | 21.5-33.1 | 11.0-66.3 | | |
| | very good | 13 | 17.3±4.5 | 14.6-20.0 | 10.0-27.0 | | |
| | Total | 60 | 37.3±26.7 | 30.3-44.0 | 10.0-100.0 | | |

**Table 2: Self-hearing rating and Severity of hearing loss with audiometer in right ear**

| Severity of hearing loss/ Right Audiometer | Respondent hearing rating | | | | Total | χ2 test | p-value |
|---|---|---|---|---|---|---|---|
| | bad(%) | Fair(%) | good(%) | very good(%) | | | |
| normal hearing | 0 | 6(18.8) | 16(50.0) | 10(31.2) | 32 | 36.101 | 0.0001 |
| mild hearing loss | 0 | 2(20.0) | 5(50.0) | 3(30.0) | 10 | | |
| moderate hearing loss | 0 | 5(83.3) | 1(16.7) | 0 | 6 | | |
| severe hearing loss | 3(33.3) | 5(55.6) | 1(11.1) | 0 | 9 | | |
| profound hearing loss | 1(33.3) | 2(66.7) | 0 | 0 | 3 | | |

**Table 3: Self-hearing rating and Severity of hearing loss with audiometer in left ear**

| Severity of hearing loss/ Left Audiometer | Respondent hearing rating | | | | Total | χ2 test | p-value |
|---|---|---|---|---|---|---|---|
| | bad(%) | Fair(%) | good(%) | very good(%) | | | |
| normal hearing | 1(3.3) | 3(10.0) | 14(46.7) | 12(40.0) | 30 | 30.902 | 0.002 |
| mild hearing loss | 0 | 5(45.5) | 5(45.5) | 1 | 11 | | |
| moderate hearing loss | 1(11.1) | 4(44.4) | 4(44.4) | 0 | 9 | | |
| severe hearing loss | 1(16.7) | 5(83.3) | 0 | 0 | 6 | | |
| profound hearing loss | 1(25.0) | 3(75.0) | 0 | 0 | 4 | | |

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