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Pure tone hearing threshold of patients with cleft palate anomaly in Kaduna, Nigeria

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ABSTRACT

Background: Hearing loss is common in people with isolated cleft palate (ICP) or cleft lip and palate (CLP). There is renewed hope for surgical repair for people with cleft deformity in Nigeria today due to serious commitment in offering them free surgeries by Smile Train and other non-governmental organizations. While effort at corrective surgery is very commendable, the need for proper diagnosis and management of hearing loss among the cleft population cannot be overemphasized. The aim of this study was to assess the pure tone hearing threshold of patients with cleft palate anomaly at Smile Train Centre Kaduna, Nigeria.

Methods: This was a prospective cross-sectional case controlled study to assess the pure tone hearing threshold of consecutive adults and children not less than 5 years of age with repaired or unrepaired cleft lip and cleft palate attending Etomie Smile Train Centre in Kaduna, Nigeria compared with a control group of non-cleft volunteers matched for age and sex. Ethical clearance and informed consent were obtained. History, ear examination and pure tone audiometry were performed. Data collected were analyzed using SPSS version 16. Simple statistical parameters, Chi-square and paired-samples T-test were used as appropriate. The level of statistical significance was set at p<0.05. **Results:** The prevalence of hearing loss was 59.4% in patients with CLP and ICP and 12% among the control group. **Conclusions:** There is high prevalence of conductive hearing loss among patients with cleft palate anomaly at Etomie Smile Train Centre Kaduna.

Keywords: Cleft palate, Pure tone hearing threshold, Smile Train centre

INTRODUCTION

Cleft lip and cleft palate are the most common congenital malformations of the head and neck. 1-4 Patients with these deformities often may have associated problems including otologic diseases, speech and language problems, dental deformities, facial growth deficiencies, and psychosocial issues. 5 Hearing loss is common in people with cleft palate though the incidence of hearing

loss in people with cleft lip alone is thought to be the same as in the general population. $^{6-8}$

Globally, the incidences of hearing loss among cleft population vary greatly ranging from 3% to 90%. A study of 36 cleft subjects in Nigeria showed that while 18 (50%) of the studied subjects had speech defects, 3 (8.3%) had history of ear infections and 4 (11.1%) of the subjects had both ear infections and speech defects.²

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Many studies in Nigeria have also addressed various aspects of the cleft population in different parts of the country. 2,9-14

Great variation in the global incidence of hearing loss in the cleft community makes comparisons among cleft populations difficult. This problem may not be unconnected with lack of age stratification, classifications according to cleft types and difference in criteria for the diagnosis of hearing loss in terms of affected frequencies and thresholds in some previous studies.

There is paucity of knowledge on the magnitude of the problem of hearing loss in the cleft community in Northern Nigeria. This study aimed to assess the pure tone hearing threshold and determine the prevalence of hearing loss among patients with cleft palate anomaly at Etomie Smile Train Centre, Kaduna-Nigeria.

METHODS

The study was a prospective cross-sectional case controlled study which assessed the pure tone hearing threshold of patients 5 years of age and above with repaired or unrepaired cleft palate anomaly at both the Etomie Smile Train Centre, a Specialist Hospital for Smile Train activities and the National Ear Care Centre, a Specialist Hospital for diagnosis, treatment and research in Ear, Nose and Throat (ENT) specialty both in Kaduna Nigeria. A control group of non-cleft volunteers matched for age and sex were recruited from consecutive clients registering at the General outpatient Department office of the National Health Insurance Scheme at the National Ear Care Centre (NECC) Kaduna. The study was conducted between September 2013 and April 2014.

A structured questionnaire was used to generate data from 160 cases (patients) and 160 participants in the control group. The patients with cleft deformity were transported from the Smile Train Centre to the National Ear Care Centre, Kaduna. Each volunteer had complete ENT examination including careful otoscopy of both ears and full head and neck examination. Pure tone audiometry was carried out in a sound proof booth for all participants. Maico MA 42 Made in USA, Serial Number 23383 with head phone TDH 39 B71 pure tone audiometer was used. Frequencies of 125 Hz, 250 Hz, 500 Hz, 750 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz were tested at different decibels (dB). The pure tone average (PTA) for each ear was determined by average of pure tone hearing thresholds for 500, 1000, 2000, and 4000 Hz and reported in dBHL.¹⁵

Data generated include age, sex, type of cleft, otoscopic findings, type and degree of hearing loss. Data collected was analyzed using Statistical Package for Social Sciences (SPSS) version 16. Simple statistical parameters and paired-samples T-test were used as appropriate. The level of statistical significance was set at p<0.05.

RESULTS

A total of 320 ears of 160 patients with cleft lip and palate or isolated cleft palate were studied along with the same number of control participants matched for age and sex.

The age ranged between 5-50 years with mean age of 8.62 ± 6.18 years. The age distribution of the participants is as presented in Table 1.

Table 1: Age distribution of the participants.

Age group (years)	Frequency	Percentage (%)
5-8	110	68.8
9-12	24	15.0
13-16	12	7.5
17-20	7	4.4
Above 20	7	4.4
Total	160	100.0

There were 76 (47.5%) males and 84 (52.5%) females with male to female ratio of 1:1.1

Cleft lip and palate accounted for 125(78.1%) and isolated cleft palate 35(21.9%). The male to female ratio among cleft lip and palate is 1:1.2 while that of isolated cleft palate is about 1:1.

Table 2: Distribution of laterality of cleft deformity with respect to Gender.

Sides of cleft	Gender		Total (9/)	
palate	Male	Female	Total (%)	
Unilateral right	14	21	35 (28)	
Unilateral left	25	28	53 (42.4)	
Bilateral	19	18	37 (29.6)	
Total	58	67	125(100)	

An analysis of laterality of cleft among the 125 patients with cleft lip and palate showed that 53 (42.4%) had left sided cleft palate, 35 (28%) had right sided cleft palate while 37 (29.6%) had bilateral cleft. Left sided cleft is numerically higher in both sexes as seen in Table 2.

Pure Tone Audiometry showed 130 (40.6%) ears with normal hearing thresholds (0–25 dB) and 190 (59.4%) ears with various degrees of hearing losses (46.9% mild, 10.6% moderate and 1.9% moderately severe) among patients with CLP and ICP compared to 282 (88%) and 38 (12%) respectively among the control group (Table 3).

Table 4 below shows the mean pure tone average of the participants. While 62 of the patients studied had unrepaired cleft palate, 98 had repaired cleft palate. The repaired group included patients assessed 6–12 months after repair without pre-operative audiological assessment. The pure tone average range for patients with

unrepaired cleft palate irrespective of laterality of the cleft was 15-61 dB in the right ears and 15-60 dB in the

left ears while the range for the repaired group was 15–56 dB for the right ears and 15–55 dB for left ears.

Table 3: Pure tone hearing thresholds of participants.

Samuritan of hooving large	Patients	s (n=320 ear	Control (n=320	
Severity of hearing loss	CLP	ICP	Total (%)	ears) (%)
Normal hearing thresholds (0-25 dB)	94	36	130 (40.6)	282 (88)
Mild hearing loss (26-40 dB)	126	24	150 (46.9)	30 (9.4)
Moderate hearing loss 41-55 dB	26	8	34 (10.6)	5 (1.6)
Moderately severe hearing loss (56-70 dB)	4	2	6 (1.9)	3 (0.9)

p=0.000 using Chi – square.

Table 4: Mean pure tone average of participants.

Side of care of narticinants	Pure tone average					
Side of ears of participants	No of ears	Minimum	Maximum	Mean	Std. deviation	
Right ears of patients without cleft repair	62	15.00	61.00	30.3427	11.79965	
Left ears of patients without cleft repair	62	15.00	60.20	31.9239	13.54037	
Left ears of patients with cleft repair	98	15.00	55.00	27.8847	9.24320	
Right ears of patients with cleft repair	98	15.00	56.00	27.3143	9.70949	
Right ears of control	160	10.00	57.00	18.3375	7.74181	
Left ears of control	160	10.00	58.00	18.4438	7.24916	

p=0.00 using Chi - Square for right ears; p=0.105 using Chi - Square for left ears.

Table 5: Distribution by types of hearing loss.

Type of hearing loss	Number of	Number of ears (n=190 ears)		
	CLP	ICP	Total	
Conductive hearing loss	143	30	173 (91.1)	
Mixed	12	5	17 (8.9)	
Total	155	35	190 (100)	

Table 6a: Hearing thresholds in ears of side with and side without cleft in patients with unilateral cleft lip and palate.

C! 1 C . 1. C	Hearing threshold (n=176 ears)						
Sides of cleft palate	Side with cleft		Side without cleft		T-4-1		
parate	Abnormal (>25 dB)	Normal (0-25 dB)	Abnormal (>25 dB)	Normal (0-25 dB)	Total		
Unilateral right	29	6	15	20	70		
Unilateral left	40	13	22	31	106		
Total	69	19	37	51	176		

P=0.000 using Chi – square.

Table 6b: Hearing thresholds in ears of side with and without cleft in patients with unilateral isolated cleft palate.

Sides of cleft palate	Hearing threshold (n=56 ears)						
	Side with Cleft		Side without cleft		Total		
	Abnormal (>25 dB)	Normal (0-25 dB)	Abnormal (>25 dB)	Normal (0-25 dB)	Total		
Unilateral right	10	3	4	9	26		
Unilateral left	13	2	6	9	30		
Total	23	5	10	18	56		

P=0.000 using Chi – square.

The mean pure tone hearing threshold for air conduction (AC) and bone conduction (BC) of ears calculated for the frequencies 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz shows air conduction threshold for the unrepaired group

with a wide air bone gap typical of conductive hearing loss while in those with repaired cleft, it showed improved air conduction threshold with reduced air bone gap compared to the former. The mean pure tone average of patients with unrepaired cleft palate is 30.34 ± 11.80 dBHL compared to 27.31 ± 9.71 dBHL for right ears of patients with repaired cleft palate with p value of 0.00. For the left ears however, the mean pure tone average of patients with unrepaired cleft palate is 31.92 ± 13.54 dBHL compared to 27.88 ± 9.24 dBHL for those with repaired cleft palate with p value of 0.105.

Hearing loss in ears of patients with cleft lip and palate (CLP) and isolated cleft palate (ICP) is conductive and mixed in 173 (91.1%) and 17 (8.9%) respectively.

Hearing thresholds in ears of sides with cleft compared with ears of sides without cleft in the patients with unilateral cleft palate are shown in Tables 6a and 6b below. Hearing loss in ears of side with cleft is significantly higher than side without cleft among the 88 patients with unilateral cleft lip and palate and the 28 patients with unilateral isolated cleft palate (p=0.000).

DISCUSSION

Hearing loss is a very common problem in people with cleft lip and palate or isolated cleft palate. D'Mello et al in a study in India had earlier reported that most patients or parents/care givers were unaware of the hearing problems accompanying the defect.¹⁶

The prevalence of hearing loss in this study was 59.4%. Of this number, 46.9% were mild, 10.6% moderate and 1.9% moderately severe in patients with CLP and ICP. This is significantly higher than the 12% hearing loss found in the control group. The prevalence found in this study is however lower than that of the study in India by Gautam et al where a prevalence of 81.25% conductive hearing loss was reported with 65.6% of them being mild, 21.8% moderate and 12.5% moderately severe. ¹⁷ This study however used pure tone hearing threshold of patients from 5 to 50 years of age compared to the pure tone hearing threshold of children from 5 to 9 years of age used in that study explaining why the figures in this study are lower than theirs since the number of ears with hearing loss in this study is distinctly inversely proportional to age. Moreover, a larger sample size used in this study may be responsible for the difference. The prevalence of hearing loss in ages 5-8 years in this study is 73.6% compared to 28% in patients over 17 years of age. This finding is supported by Handzik-Cuk et al from Croatia who also reported improvement in hearing level with age in patients with cleft palate. 18 Other studies by Broen et al from the United States and Sheahan et al in Australia reported that 50% or more of children with cleft deformity had hearing loss. 19,20

In this study hearing loss in the ears of patients with CLP and ICP is 91.1% conductive and 8.9% mixed. This finding is similar to a study by Gani et al in Liverpool in which 88.9% was conductive and 7.9% mixed hearing loss. ²¹ Gani et al also reported that 3.2% had permanent sensorineural hearing loss. ²¹

In this study there is more left sided cleft than right sided cleft among patients with CLP [53 (42.4%) left sided and 35 (28%) right sided] and ICP [15 (42.9%) left sided and 13 (37.1%) right sided] with unilateral cleft being more common than bilateral cleft. Hearing loss is also commoner in ears of sides with cleft (92 ears) than ears of sides without cleft (47 ears) which is similar to findings by D'Mello et al. ¹⁶

CONCLUSION

The study revealed that 59.4% of patients with cleft lip and palate or isolated cleft palate at Etomie Smile Train Centre, Kaduna had associated hearing loss.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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