

Traumatic Perforation of Tympanic Membrane in A Tertiary Hospital in South-Eastern, Nigeria

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ABSTRACT

Introduction: Traumatic tympanic membrane (TM) perforation is a commonly encountered otological condition with consequent hearing impairment and potentials for more grievous complications. We aim to establish the prevalence, sex distribution, laterality and aetiological factors associated with traumatic TM perforation in our locality

Materials and Method: This is a 10 Year retrospective study involving patients who were managed for traumatic TM perforations at ENT outpatient clinic of Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State.

Results: A total of 186 patients were managed for traumatic TM perforation involving 190 ears. The prevalence was 4.9%; 66.1% were males, 33.9% females giving a male to female ratio of 2:1 while age ranges from 1-68 years (mean± SD was 22.23± 15years. Left ear was involved in 54.3% of the cases, right ear in 43.5% and both ears in 2.2%. The commonest cause of traumatic TM perforation was Assaults (58.1%) of various kinds; domestic violence was the commonest, accounting for 22% of all the assault cases followed by assaults from security men (15.1%), then, slap by school teachers, prefects and senior students (10.2%). Mob actions and attacks by Robbers constituted 10.2%. Fifteen percent (15%) of the cases resulted from ear cleaning with cotton bud (10.2%), broom stick (3.2%) and metallic objects (2.2%). Sports related injuries accounted for 2.7% of the cases. Various forms of accidents (8.1%) such as road traffic accidents (1.1%), accidents from work place (3.2%) and fireworks (1.6%) were recorded.

Conclusion: The predominance of slap as the major cause of TM perforation resulting from assaults shows how this condition is caused by avoidable circumstances. Every opportunity should be explored to educate the populace on the sequelae of such indiscriminate outburst of anger.

Keywords: Assaults, perforation, slap, tympanic membrane.

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I. INTRODUCTION

The tympanic membrane (TM), a thin fibrous membrane which separates the outer and middle ear [1]. It is an important part of the tympano-ossicular sound conduction system, as its vibratory function is required for sound transmission. It also serves to protect the middle ear cleft from infection [1]–[4]. Traumatic perforation of the TM is commonly encountered in otologic practice and has strong legal and social implications [1], [5], [6]. It may result from various causes such as assaults, fights, explosion, attempted foreign body removal by unskilled personnel etc. The injury can also be self-inflicted following ear cleaning. Excessive direct or indirect pressure impact on the TM causes it to rupture [2], [7]–[10]. Same force causing traumatic TM perforation may consequently lead to ossicular chain disruption, skull fracture, brain or orbital injury [11], [12].

Studies suggests that majority of traumatic TM perforations heals spontaneously with very few requiring surgical intervention. Large size of perforation and those located peripherally have been linked to reduced rate of spontaneous healing [2], [3], [13], [14]. It could however constitute a significant cause of morbidity and mortality as it may predispose the patient to recurrent middle ear infection and prospectively facial nerve palsy, cholesteatoma formation, peri-lymphatic fistula and CNS infections [1], [15], [16]. Traumatic TM perforation results in conductive hearing loss due to reduced effective membrane area and recurrent middle ear infections which limits patient's participation in water sports, recruitment in military as well as commercial and personal drivers [17]. Aside the burden of its medical or surgical management, it can thus restrict an individual's productive abilities.

We therefore aim to analyze the spectrum of TM perforation in our environment, Nnewi with respect to prevalence, sex distribution, laterality and its various

aetiological factors with a view to curbing this largely avoidable menace.

II. METHOD

This is a 10-year retrospective study carried out at ENT clinics of Nnamdi Azikiwe university teaching Hospital, Nnewi, Anambra State, Nigeria. Case notes of patients who had tympanic membrane perforation from any kind of trauma to the ear were retrieved and reviewed. Those who had previous history of discharging ear were excluded from the study. Data, including patients age, sex, side of the ear involved, and causes of TM perforations were retrieved from patients' case notes and analyzed using SPSS version 23 software package; Chi-square test was used to test for association between categorical variables and differences were considered to be statistically significant when $p < 0.05$. Results were presented with descriptive statistics.

III. RESULTS

Out of about 3840 patients who had otological complaints, a total of 186 patients with 190 ears (4 were bilateral) of traumatic TM perforation were managed during the period under review, giving a prevalence of 4.9%. Sixty six percent were males, while 33.9% were females; male to female ratio of 2:1. 54.3% of the perforation involved the left ear, 43.5% involved the right ear, and 2.2% involved both ears. The age of participants ranges from 1-68 years mean \pm SD was 22.23 ± 15 years.

Traumatic TM perforation was shown to be commonest amongst patients aged between 0-9 year and within this age group, trauma from ear cleaning with cotton bud (23.1%), attempted foreign body removal by non-specialist doctor (23.1%) and patent medicine dealers (15.4%) were the leading causes. Amongst adolescents and patients in the

second decade of life, the leading causes were slap by school teacher/senior students/prefects (47.2%), whereas in older age groups, domestic violence and assault by security men topped the list as shown in Table II below.

The commonest cause of traumatic TM perforation was Assaults (58.1%) of various kinds; domestic violence was the commonest, accounting for 22% of all the assault cases followed by assaults from security men (15.1%), then unfortunately, slap by school teachers, prefects and senior students (10.2%). Mob actions and attacks by Robbers constituted 10.2%. Fifteen percent (15%) of the cases resulted from ear cleaning with cotton bud (10.2%), broom stick (3.2%) and metallic objects (2.2%). Sports related injuries accounted for 2.7% of the cases. Various forms of accidents (8.1%) such as road traffic accidents (1.1%), accidents from work place (3.2%) and fireworks (1.6%), were also noted from our study as shown in Table II and Fig. 1 below.

The box plot (Fig. 2) shows that the majority of patients who had traumatic TM perforation were young people. Quackery (failed attempts at foreign body removal from the ear) as a cause of TM perforation was commoner among children, whereas inadvertent injury from ear cleaning was commoner among Children and adolescents. Sports, assaults and accidents were common aetiologic factors in young adults.

TABLE I: DISTRIBUTION OF PATIENTS BY SEX AND AGE

Sex	Frequency		Percent
	Female	Male	
	63	123	33.9
			66.1
Age (Years)	0-9	52	27.9
	10-19	36	19.4
	20-29	31	16.7
	30-39	43	23.1
	≥ 40	24	12.2
Total	186	100	

TABLE II: DISTRIBUTION OF THE TRAUMATIZED EARS BY THE AGE GROUPS AND AETIOLOGY

	Age category (Years)					TOTAL
	0-9	10-19	20-29	30-39	≥ 40	
ASSAULT						108 (58.1%)
1A: Domestic	3	8	12	13	5	41 (22.0%)
1B: Attacks/ Robbers	0	0	4	7	4	15 (8.1%)
1C: Security/Vigilante	1	4	5	12	6	28 (15.1%)
1D: Teacher/prefect/Senior student	1	17	0	1	0	19 (10.2%)
1E: Others	1	0	2	1	1	5 (2.7%)
Ear Cleaning						29 (15.6%)
2A: Cotton bud	12	2	0	3	2	19 (10.2%)
2B: Broom stick	6	0	0	0	0	6 (3.2%)
2C: Metal	2	2	0	0	0	4 (2.2%)
Foreign body removal						29 (15.5%)
3A: non-specialist doctor	12	0	1	0	1	14 (7.5%)
3B: Nurse	1	0	0	0	0	1 (0.5%)
3C: PMD/ Chemist	8	0	1	1	1	11 (5.9%)
3D: Others	3	0	0	0	0	3 (1.6%)
Sports Related Injury	0	2	2	1	0	5 (2.7%)
Accidents						15 (8.1%)
5A: RTA	0	0	1	1	0	2 (1.1%)
5B: Work place	0	0	2	1	3	6 (3.2%)
5C: Fire works	0	0	1	1	1	3 (1.6%)
5D: Others	2	1	0	1	0	4 (2.2%)
TOTAL	52	36	31	43	24	186 (100%)

TABLE III: ASSOCIATION BETWEEN THE CAUSES OF TM PERFORATION WITH LATERALITY AND GENDER OF THE PATIENTS

Causes	Side			P-value	Sex		Total	p-value
	Both	Left	Right		F	M		
Accident	0	13	8	0.038*	5	16	21	0.228
Assault	3	63	36		31	71	102	
Ear cleaning	1	11	17		11	18	29	
Quackery	0	12	17		16	13	29	
Sports	0	2	3		0	5	5	
Total	4	101	81		63	123	186	

*Significant P-value

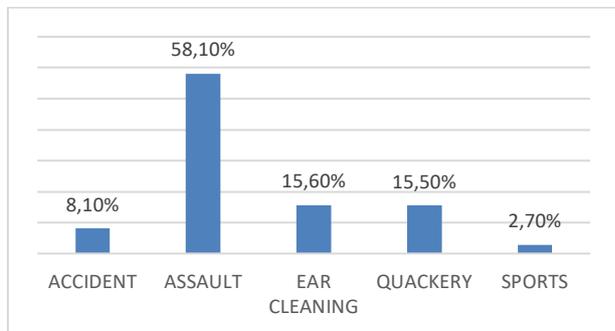


Fig 1: Causes of traumatic TM perforation.

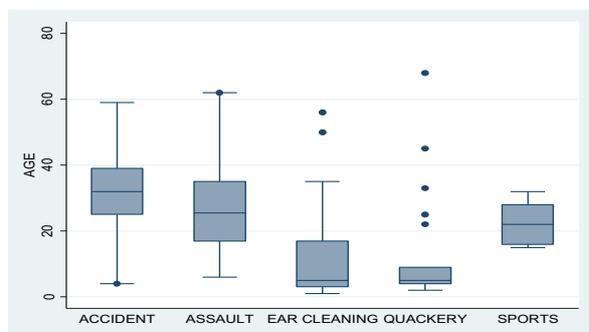


Fig 2: Box plot showing the distribution of the causative mechanisms of TM perforation among various ages.

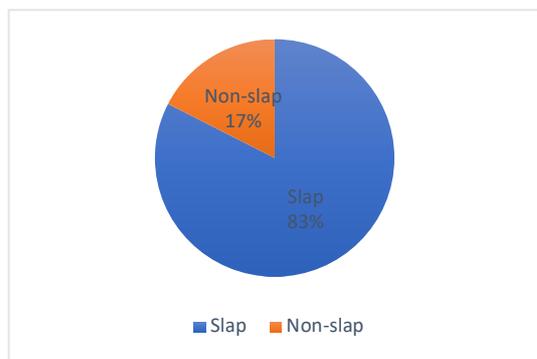


Fig 3: Distribution of patients who had TM from Assaults.

As shown in Fig 3 below, assaults by slap (83%) were the commonest contributor of Tympanic membrane perforation as compared to other modalities of assaults (17%).

Accidents as a cause of traumatic TM perforation was commoner amongst males (76.2%) than females (23.8%), and more on the left side 61.9%. Assault was also twice as common amongst males (69.6%) compared to females (30.4%) and also noted to be more on the left side (61.8%). Other distributions of causes of traumatic TM perforation by sex and laterality are as shown in table 3 below. There was a significant association between the various causes of TM perforation and side of the ear affected. However, there was no association with sex (p-value< 0.05).

IV. DISCUSSION

Traumatic perforation affects all age group though more in young people as our study has shown; the mean age of our participants was 22.23 ±15 Years, this findings collaborates with reports from previous similar surveys [2], [7], [15], [18]–[20]. This implies that the population who risk their auditory function as a result of traumatic TM perforation are the very young population upon whom the future of the nation revolves. We estimated a prevalence of 4.9% in relation to other otologic cases managed in our center. Reference [11] recorded a prevalence of 2.1% of traumatic TM perforation compared to all the patients seen in their clinics during the period of study. Reference [7] also estimated a slightly higher prevalence of 8.6%.

Children in their first decade of life (0-9 years) were shown to be more commonly affected, mainly from inadvertent trauma while using cotton bud (23.1%) to clean the ears. Other common causes among this age group were attempted foreign body removal by a non-specialist doctor (23.1%) and patent medicine dealers (15.4%). Reports by some local studies also agrees with our findings [21], [22]. Cotton bud is about the most commonly found commodity in most homes and its usage should be strongly discouraged. In our locality, when a child inserts foreign body in any facial orifices, it is commonplace for caregivers to attempt removing it first and when they fail, they consequently resort to a patent medicine dealer or non-specialist, such that finally on presentation, the ENT specialist is now left with management of complications that were incurred from previous unskilled attempts. Studies have shown that more complications occur when patients has failed attempts at foreign body removal by a non ENT specialist [7], [10], [22]. Amongst teenagers in our study, slap by school teacher/prefects/senior students topped the list of causes; a form of punitive measure that must be strongly discouraged.

Overall, males (66.1%) were twice as affected as the females (33.9%) in our study. This collaborates with findings from similar local and international studies [3], [7], [8], [17], [23]. This male preponderance could be explained by the nature of male occupation and the fact that they are more involved in violence compared to their female counterpart.

In our study, the left ear (54.3%) was shown to be more commonly affected than the right (43.5%). Reference [21] also made a similar finding in their study. The reason adduced for this left preponderance being probably because the commonest cause of traumatic TM perforation was assaults, most commonly by slap, and most assailants are right handed and likely most of the acts of trauma occurs with the assailant and victim facing each other making left ear to be more predominantly affected compared to the right side. In this present review, the commonest mechanism of assault causing

traumatic TM perforation was slap (83%), this collaborates with the findings by [18], [21], [24], [25].

Amongst patients who had traumatic TM perforation from assault, the commonest mechanism was through slap (83%). These slap injuries could be from domestic violence (22%), which are mostly conflicts between spouses, security agents like police/soldiers/ Vigilante men (15.1%) or by class teacher, prefects or senior students (10.2%). We observed that domestic violence was the commonest cause similar to other studies [2], [7]. However, other studies have shown that slaps from security agents which was second commonest cause in our study topped their aetiology [11], [21]. Reference [21] was however carried out in a more populous city of Ilorin which has more potentials for conflicts between security men and law offenders.

Other causes of traumatic tympanic membrane perforation could be from blast injury, blunt or penetrating injury as well as thermal injury. In our study, work place accident (3.2%) topped the list of the various types of accidents, followed by fireworks (1.6%), whereas road traffic accidents and others constituted the least causes. A similar trend was also observed in other studies [2], [26], [27]. Whereas in a work done by [28] at Iraq blast injury from war and bombing was the commonest cause.

V. CONCLUSION

We have been able to establish the prevalence of traumatic TM perforation in our locality which is 4.6%. Cotton bud trauma and unskilled attempts at foreign body removal were the leading causes in children; amongst teenagers, slap at school constituted the commonest factor. In older individuals, domestic assaults by spouse and relatives, as well as assaults by security agents accounted for most of the cases. These findings tallied with previous reports, thus demonstrating an unchanging pattern over the years. Ignorance of possible sequelae is likely a major factor, hence the plea for increased public enlightenment and advocacy for attitude modification and respect for human ear.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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