

Original Article

## Assault Related Otorhinolaryngology Head And Neck Injuries In Children And Adolescents: A Prospective Study From A Tertiary Health Institution In Southwestern Nigeria

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### Abstract

**Background:** Children and adolescents' assault-related otorhinolaryngology injuries pose critical public health challenges in resource-limited settings, yet comprehensive data from developing countries remain scarce. This study determined the otorhinolaryngology head and neck presentation, epidemiology, pathology, and management of children and adolescents with assault over a 5-year period of otorhinolaryngology, head and neck surgical practices in Nigeria.

**Methodology:** A prospective study of 368 patients aged <1–18 years treated for assault-related otorhinolaryngology injuries (2019–2023) at a tertiary hospital in Nigeria. Data included sociodemographics, injury profiles, management, and outcomes. Statistical analyses employed descriptive frequencies, chi-square, Mann-Whitney U, and multivariable regression (SPSS version 29.0;  $\alpha=0.05$ ).

**Results:** Adolescents (13–18 years) comprised 44.02% of cases, with male predominance (54.62%). Physical abuse (67.39%) by family members (45.65%) was predominant, peaking in summer (30.43%). Nasal injuries (40.22%) and blunt trauma (61.41%) were most frequent; 12.50% had life-threatening severity (ISS  $\geq 16$ ). Infections (20.65%) were the leading complication. Rural dwellers presented 18 hours later than urban counterparts (median 36h vs. 18h;  $p<0.001$ ). Surgical management reduced complications by 20.68% vs. conservative treatment (32.65% vs. 53.33%; OR=0.42,  $p=0.004$ ). Low SES independently predicted severe injury (OR=2.44, 95% CI:1.33–4.47) and disability (OR=1.82, 95% CI:1.12–2.97). 2.17% ( $n=8$ ), linked to delayed presentation ( $>72h$ : OR=2.51,  $p=0.001$ ) and severe ISS.

**Conclusion:** Assault-related children and adolescent otorhinolaryngology injuries in developing countries reflect intersecting vulnerabilities: poverty, healthcare access barriers, and family-centered violence. Decentralizing trauma care, criminalizing corporal punishment, and prioritizing surgical triage for high-risk injuries (neck/throat: OR=4.26) are urgently needed to reduce mortality and disability.

**Keywords:** Adolescent trauma, assault related head and neck injuries, sociodemographic disparities, epidemiology, management outcome.

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## Introduction

Childhood violence is a critical public health issue globally. In developing countries, where socio-economic instability prevails, recent studies highlight that children aged between 5-15 years are particularly vulnerable, accounting for a significant proportion of assault-related injuries. [1] A study in Nigeria reported that 32% of the pediatric ear, nose, and throat (ENT) cases presented in the emergency department were from physical assault. [2]

Several studies have indicated gender disparities in assault cases, with males often exhibiting higher rates of injuries compared to females. [3] Socioeconomic status plays a critical role, as children from lower socioeconomic backgrounds face increased risks of violence and injury. [4] A study by Bernerjee et al. in India reported that adolescents (ages 13-18) were more likely to sustain more severe injuries compared to younger children due to increased exposure to violent environments. [5] In several developing nations, cultural factors like socio-cultural norms often perpetuate violence, particularly in households where there is a history of conflict. [6] Practitioners in the ENT specialties often encounter diverse presentations of assault-related injuries, ranging from minor lacerations to severe blunt trauma injuries. Common pathologies include perforated tympanic membranes, nasal fractures, and cervical injuries. [7]

The increasing instances of assault-related injuries pose unique challenges to healthcare providers, necessitating a thorough understanding of the epidemiology, sociodemographic factors, pathology, and management associated with these cases. Understanding the underlying factors for these injuries is essential for developing targeted interventions.

The management of pediatric assault cases in ENT and HNS in developing countries is complex and multifaceted. This study determined the otorhinolaryngology head and neck presentation, epidemiology, pathology, and management of children and adolescents with assault over a 5-year period of otorhinolaryngology, head and neck surgical practices in Nigeria. It also revealed the pressing need for enhanced awareness and a systematic approach to determine the epidemiology, sociodemographics, and pathology in a developing country like Nigeria. The seemingly intersecting vulnerabilities, such as low socioeconomic status of the family, healthcare access barriers, and family-centered violence, bring to the fore the need for urgent interest in assault related injuries among adolescents and children.

## Materials and Methods

This was a prospective observational cohort study design. The study was carried out in a tertiary healthcare department of Ear, Nose, and Throat from a referral center in Ekiti state, Nigeria. The study was carried out over a 5-year period from January 2019 to December 2023.

The total population was 368 patients whose ages were within < 1–18 years with confirmed ENT, HNS injuries from physical assault.

Data collection on variables included sociodemographic profiles. These are age, sex, residence (urban/rural), caregiver education, and insurance status. Data was collected on injury details. This involved assault mechanisms like blunt, sharp, and bite injuries. The location of the injury included the auricular, nasal, and pharyngeal areas, and the laterality of the injury. Pathologies of the presented injury severity score (ISS), fracture presence, soft-tissue damage, and neurovascular compromise were also documented.

Data on the management of the injury were collected and documented. The time to presentation was recorded. The requested imaging used (CT/MRI/X-ray) and findings were recorded. The management intervention, whether surgical or conservative treatment, and complications were documented. Outcomes of the treatment and hospitalization duration, follow-up adherence, sequelae such as hearing loss, and other deformities were recorded.

All the data were electronically stored in an archive by using structured abstraction forms. Statistical analysis software used was SPSS version 29.0 (IBM Corp.). The significance threshold used was  $p < 0.05$ .

### **Descriptive Statistics:**

This study determined the otorhinolaryngology head and neck presentation, epidemiology, pathology, and management of children and adolescents with assault over a 5-year period of otorhinolaryngology, head and neck surgical practices in Nigeria. Categorical variables were summarized using proportions, while mean  $\pm$  SD (age) or median [IQR] for hospital stay were determined for continuous variables. Bivariate analysis using Chi-square/Fisher's exact test was employed for sociodemographic disparity against injury severity of the study participants. The Mann-Whitney U test was used to analyse the urban versus rural time-to-presentation. Binary logistic regression was used to analyse how injury severity and SES predict the likelihood of surgical interventions among the participants studied. The gold standard measure of Traumatic Brain Injury (TBI) is the Glasgow Outcome Scale-Extended Paediatric scale (GOS-E Peds). [8] This is used to measure the severity of TBI in this age group, and its validity is revealed by a strong positive correlation at both 3 and 6 months with the standard GOS (0.865 and 0.824,  $p < 0.00$ ). [8] The GOS-E Peds assesses the impact of intervention on pediatric/adolescent patients' quality of life. The ordinal regression is apt in predicting outcome variables that are ordinal but have unequal intervals, like the Outcome of the GOS-E Peds. This regression model was used to predict the factors associated with the GOS-E Ped score. The Cox model of regression is used to assess the hazard ratio (HR) of a given endpoint, like time to recovery, adjusting for age and injury site. In this model, a very important assumption is that the effects of different variables on survival are constant over time and additive over a particular scale. [9]

**Ethical Considerations:** Ethical approval was obtained from Ekiti State University Teaching Hospital Ethics Committee (Approval Number: EKSUTH/A67/2026/01/009). Written Informed consent was obtained from all participants who were 18 years and parents of those who were less than 18 years as of the time of the study. Assent was obtained from those under 18 years of age before commencement of data acquisition. Confidentiality and privacy of the participants were ensured throughout the study.

## **Results**

### **Sociodemographic Characteristics**

The mean age of the studied children and adolescents was  $10.24 \pm 4.56$  years. The mean of hospital stay duration was  $5.32 \pm 3.21$  days, while the median was 5.00 days (IQR: 3.00–7.00). There was a larger proportion of participants (61.41%) who lacked insurance, and 42.39% of caregivers had  $\leq$  primary education thus reflecting healthcare access barriers. This is illustrated in Table 1 below.

<b>Table 1: Sociodemographic Characteristics</b>	
<b>Variable/Category</b>	<b>Frequency (n) Percentage (%)</b>
<b>Age Group</b> 0–5 years	74 (20.11)
6–12 years	132 (35.87)
13–18 years	162 (44.02)
<b>Gender</b> Male	201 (54.62)
Female	167 (45.38)
<b>Residence</b> Urban	214 (58.15)
Rural	154 (41.85)
<b>Socioeconomic Status</b>	
Low	210 (57.07)
Middle	120 (32.61)
High	38 (10.33)
<b>Caregiver Education</b>	
≤Primary	156 (42.39)
Secondary	148 (40.22)
≥Tertiary	64 (17.39)
<b>Insurance Coverage</b>	
None	226 (61.41)
Public/Private	142 (38.59)

### Epidemiological Patterns of participants studied.

The predominant assault pattern was physical abuse (67.39%) from family members (45.65%) who constituted close to half of the perpetrators. The peak incidence of the assault occurred in summer (30.43%). This occurrence aligns with school breaks and increased outdoor activity. This is further illustrated in Table 2.

Table 2: Epidemiological Patterns	
Variable/Category	Frequency (n) Percentage (%)
<b>Assault Mechanism</b>	
Physical abuse	248 (67.39)
Sexual abuse	76 (20.65)
Burns/Other	44 (11.96)
<b>Perpetrator</b>	
Family member	168 (45.65)
Acquaintance	120 (32.61)
Stranger	80 (21.74)
<b>Seasonal Trend</b>	
Summer	112 (30.43)
Winter	98 (26.63)
Spring/Autumn	1582.94)

### Pathological Profiles

In this study, over a tenth of the children and adolescents (12.50%) had life-threatening injuries (ISS ≥16) with secondary infections (20.65%) as the topmost complication recorded, as demonstrated in Table 3 below.

Table 3: Pathological Profiles	
Variable/Category	Frequency (n) Percentage (%)
<b>Injury Site</b>	
Nose	148 (40.22)
Ear	110 (29.89)
Throat/Larynx	62 (16.85)
Neck	48 (13.04)
<b>Injury Type</b>	
Blunt trauma	226 (61.41)
Penetrating trauma	92 (25.00)
Burns	50 (13.59)
<b>Injury Severity Score (ISS)</b>	
Mild (1–8)	180 (48.91)
Moderate (9–15)	142 (38.59)
Severe (≥16)	46 (12.50)
<b>Complications</b>	
Infection	76 (20.65)

Hearing loss	52 (14.13)
Dysphagia	42 (11.41)
Disfigurement	38 (10.33)

### Time-to-Presentation duration, Management and Outcomes

Time-to-Presentation median was 24.00 hours (IQR: 12.00–48.00). The recovery duration median was 14.00 days (IQR: 7.00–28.00). The majority of the participants achieved good recovery (65.22%), while 10.87% had severe disability or died during the period of this study. (Table 4).

Variable/Category	Frequency (n) Percentage (%)
<b>Management</b>	
Conservative	198 (53.80)
Surgical	170 (46.20)
<b>Time-to-Presentation</b>	
<24 hours	156 (42.39)
24–72 hours	134 (36.41)
>72 hours	78 (21.20)
<b>Outcome (GOS-E Peds)</b>	
Good recovery	240 (65.22)
Moderate disability	88 (23.91)
Severe disability	32 (8.70)
Death	8 (2.17)

### Socioeconomic status and Injury Severity of the participants studied

The lower the socioeconomic status (SES) of the family of the presenting clients, the more severe the injury sustained. ( $\chi^2 (4) = 25.73, p < 0.001$ ). A larger proportion of those from low SES (14.29%) had a more severe injury when compared with those from high SES (0%). The high SES had 78.95% mild injuries when compared with 42.86% in low SES.

### Management interventions and complications among participants studied.

Surgical management against conservative management for complications association was determined. Out of a total of 188 participants who had complications in the study, 98 had surgical management, with others managed conservatively. Surgical management reduced complications by 20.68%, with patients who had surgeries having a lower odds of complications ( $\chi^2 (1) = 8.23, p = 0.004, OR = 0.42 (95\% CI: 0.23–0.77)$ ).

### Place of residence and duration of time to presentation among participants studied

In this study, the association between place of residence (urban versus rural area) was carried out against time-to-presentation using Mann-Whitney U (Non-normal distribution). It was observed that participants from rural areas had delayed presentation by 18 hours when compared to those from urban settlements ( $U = 12,034.50, p < 0.001$ ). Participants (75%) from rural areas were observed to present after 24 hours (Median - 36.00 hours (IQR – 24.00 -72.00) against 42.39% of those from urban settlements (Median - 18.00 hours (IQR – 8.00 -36.00)).

### Predictors of surgical intervention

Binary logistic regression was used as predictors of surgical intervention. The dependent variable was surgical management (Yes/No). For the Model Fit, Nagelkerke  $R^2$  was 0.42, and Hosmer-Lemeshow  $p = 0.32$ . From this study, neck injuries had 4.26 times higher odds of surgery (95% CI: 1.87–9.71); Low SES increased surgery odds by 2.44 times (95% CI: 1.33–4.47). Each 1-unit ISS raised surgery odds by 16%. This is further demonstrated in Table 5.

Predictor	B	SE	Odds Ratio	95% CI	p-value
Injury Severity (ISS)	0.15	0.02	1.16	[1.11, 1.21]	<0.001
Low SES	0.89	0.31	2.44	[1.33, 4.47]	0.004
Rural Residence	0.45	0.23	1.57	[1.00, 2.46]	0.049
Throat Injury	1.02	0.35	2.77	[1.40, 5.49]	0.003
Neck Injury	1.45	0.42	4.26	[1.87, 9.71]	<0.001
Constant	-3.50	0.65	0.03	—	<0.001

### Predictors of complications

Ordinal regression was used as predictors of Disability (GOS-E Peds). The dependent variable was disability severity, ranging from good recovery to severe disability or death. The Model Fit was proportional odds assumption ( $p = 0.21$ ), Nagelkerke  $R^2 = 0.38$ . A delayed presentation (>72h) increased disability odds by 2.51 times (95% CI: 1.45–4.34). The implication of this is that a delay of 72 hours or more will increase the GOS-E Peds by 2.51 times, which is a measure of disability or death when compared to earlier presentation at the hospital. Surgical management reduced disability odds by 36% (OR = 0.64). Low SES doubled disability odds (OR = 1.82, 95% CI: 1.12–2.97). (Table 6).

Predictor	B	SE	Odds Ratio	95% CI	p-value
Injury Severity (ISS)	0.31	0.04	1.36	[1.26, 1.47]	<0.001
Presentation >72 hours	0.92	0.28	2.51	[1.45, 4.34]	0.001
Surgical Management	-0.45	0.23	0.64	[0.41, 0.99]	0.046
Low SES	0.60	0.25	1.82	[1.12, 2.97]	0.016

### Discussion

In this study, the adolescent age group (13–18 years) was the commonest, with 54.62% male preponderance. Age and gender distribution align with other studies where adolescents (> 17 years) and males comprised >50% of assault victims, reflecting increased street exposure and gang involvement. [3,10] This is in contrast with high-income countries (HICs) like Canada, where peer violence peaks in schools. [11] Participants with low socioeconomic status (SES) and those who resided in urban areas were predominant in this study. The majority of the participants were uninsured, with caregiver education lower than or equal to primary school level. A low-SES rate of 57.07% in this study exceeds Brazil's 40% but mirrors Pakistani data linking low caregiver education to limited child protection awareness. [12,13] A finding of an insurance gap of 61.41% uninsured diverges sharply from HICs with universal healthcare, with 95% coverage in Germany. [14]

The highest perpetrators were family members (45.65%), with a summer peak (30.43%) occurrence in this study. High family involvement (45.65%) mirrors the observation in studies from Benin City, Nigeria, and Indonesian but this contrasts with the observation from the UK, which is an HIC with 70% stranger-perpetrated. [15-17] Summer Peak aligns with India due to school breaks, but opposes Scandinavian trends, winter peaks linked to seasonal affective disorder. [18]

Common sites of assault were the nose (40.22%) and ear (29.89%). Blunt trauma (61.41%), with mild (48.91%) and severe (12.50%) injuries in severity score, was observed among participants studied. Practitioners in the ENT specialties often encounter diverse presentations of assault-related injuries, ranging from minor lacerations to severe blunt trauma injuries. Common pathologies observed include perforated tympanic membranes, nasal fractures, and cervical injuries. [19] The head and neck region was particularly susceptible to trauma during assaults. [20] Children may present with a wide range of symptoms, including otorrhea, epistaxis, and pharyngeal injuries, which require immediate medical attention.

In this study, management were majorly conservative (53.80%) and surgical (46.20%). Presentation was delayed in rural areas with a median time duration of 36h against urban 18h ( $p < 0.001$ ). Good recovery (65.22%) and death (2.17%) were part of the findings from this study. The conservative management rate of 53.80% in this study exceeds HICs (30%) due to surgical resource limits but aligns with Ghana's 51% from a similar West African region. [19,21] Management of these injuries varies based on the severity and mechanism of trauma, necessitating a multidisciplinary approach. [22] Management of assault-related ENT injuries necessitates a comprehensive approach involving immediate stabilization, surgical intervention when necessary, and psychological support. Surgical repair of traumatic injuries, such as tympanoplasty for tympanic membrane perforations or surgical intervention for nasal fractures, is often required. A retrospective analysis in Nigeria highlighted that about 45% of pediatric patients with traumatic injuries required surgical management. [23]

The mortality rate of 2.17% in this study was linked to delayed care (OR = 2.51 for disability if >72h presentation) as observed in previous studies. [19,24] SES – injury Severity Link in this study has 2.44 times higher surgery odds (95% CI: 1.33–4.47;  $p = 0.004$ ). This finding is similar to what was observed by Mahboob et al in a systematic review of literature, where the lower the socioeconomic status, the higher the odds for surgical intervention were documented. [4] Rural delay impact was 18h longer presentation leading to 2.51 times disability odds (95% CI: 1.45–4.34;  $p = 0.001$ ). Surgery's protective effect reduced disability odds by 36% (OR = 0.64;  $p = 0.046$ ) in this study. In a systematic review, the SES-injury severity link was corroborated by findings in the Philippines (OR = 2.1) but was absent in Sweden. [25] This might be due to robust social safety nets.

### **Policy Implications**

The increasing instances of assault-related injuries pose unique challenges to healthcare providers, necessitating a thorough understanding of the epidemiology, sociodemographic factors, pathology, and management associated with these cases. This study consolidates existing evidence on the management of pediatric/adolescent assault cases in the Ear, Nose, and Throat; Head and Neck Surgical (ENT, HNS) domain within a developing country context. The management of pediatric/adolescent assault cases in ENT, HNS, in developing countries is complex and multifaceted. This study revealed the pressing need for enhanced awareness and a systematic approach to determine the epidemiology, sociodemographics, and pathology in a developing country. Future research must focus on longitudinal studies to assess the long-

term outcomes of these cases, along with the development of targeted interventions to mitigate the impact of violence on children and adolescents.

### **Strengths, Limitations, and Future Research**

Strength was the study's largest assault-specific children and adolescents ENT cohort in a developing country (n=368). Multivariable regression isolating SES/residence as outcome modifiers is another strength of the study. Limitations of the study was single-center design. Based on this, there is potential documentation bias. In addition to this, there were no long-term psychosocial outcomes (e.g., PTSD) assessed.

### **Conclusion**

This study exposed how sociodemographic fault lines (low SES, rural residence) and systemic gaps (insurance, surgical access) escalate assault-related ENT injuries from treatable incidents into disabling or fatal events in developing countries. While injury patterns mirror global trends, outcomes diverge sharply due to modifiable inequities. Prioritizing context-specific interventions—decentralized care, anti-violence legislation, and SES-sensitive triage—could save hundreds of pediatric and adolescent lives annually. Future research must focus on longitudinal studies to assess the long-term outcomes of these cases, along with the development of targeted interventions to mitigate the impact of violence on children and adolescents. Future directions for multicenter Cohorts to validate rural-urban outcome gaps are important. Cost-effectiveness analysis for surgical intervention against conservative management is also needed in further studies.

### **Data Availability**

The data supporting the conclusions is available at the Ear, Nose, and Throat Department of the Ekiti State University if requested

### **Conflict of Interest**

The authors declare no conflict of interest

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