

## Prevalence and Co-Morbidities of Adult-Onset Otitis Media With Effusion

## Abstract

**Background:** Adult-onset otitis media with effusion (AO-OME) is relatively difficult to characterize, because of its associated co-morbidities. **Objectives:** To quantify the burden, assess co-existing diseases, and management of patients with AO-OME. **Design of the Study:** A descriptive observational prospective study. **Setting:** Clinical department in a tertiary hospital. **Materials and Methods:** Adult patients with conductive hearing impairment without ear discharge (excluding other pathologies) nor external ear pathology were eligible. The patients also had tympanometry with type B tracings (tympanograms). **Interventions:** Clinico-demographic characteristics, history of otologic symptoms, affected ear, and hearing impairment were obtained. Pure-tone audiometry (PTA), tympanometry, and radiological investigations were performed. Other existing diseases (co-morbidities) were noted. The main outcome measure was audiological confirmed AO-OME. **Results:** Prevalence of AO-OME was (110/3452) 3.2%. Young adults (age group 18–30 years) constituted 33.7% (28/83), mean age was  $37.3 \pm 11.5$  years, and 46/83 (55.4%) were males and 37/83 (44.6%) were females. The common otologic symptoms were feeling of fullness in the ear in 27.7% (23/83), hearing loss in 24.1% (20/83), and bilateral ear involvement in 32.5% (27/83). PTA revealed 8.2% (9/110) had normal hearing, whereas 62.7% (69/110) ears had conductive hearing loss. Patients had radiological investigations, namely plain X rays in 67.5% (56/83) and computerized tomography scan of sinuses in 10.8% (9/83). Three (3/83) patients (3.6%) each had nasoendoscopy, and nasal and nasopharyngeal examination under anaesthesia and biopsy. The major associated diseases (co-morbidities) were allergy in 38.6% (32/83), infective rhinosinusitis in 24.1% (20/83), and upper respiratory tract infection in 14.5% (12/83). **Conclusion:** Prevalence of AO-OME was 3.2%. AO-OME co-existed commonly with allergy and other inflammatory diseases of the upper respiratory tract. The management was conservative medical management.

**Keywords:** Adults, audiometry, otitis media with effusion, prevalence, tympanometry

## Introduction

Otitis media with effusion (OME) leads to accumulation of sterile fluid in the middle ear cavity. OME is also called serous, secretory, or non-suppurative otitis media.<sup>[1]</sup> In contrast to the exudative purulent secretions, which occur during the infective process in the suppurative middle ear, the fluid in OME is a transudate formed as a result of a gradual decrease in middle ear pressure relative to the atmospheric pressure;<sup>[2]</sup> thus, it is viscid, clear, and sterile. Simply put, OME is a collection of non-infected fluid in the middle ear space.

A lot of research on OME has been on children in whom it was found to be disproportionately common compared to adults.<sup>[3]</sup> Medical literature had shown that OME is associated with enlarged adenoids

or upper respiratory tract infection (URTI) in children, especially those who are aged less than 5 years.<sup>[4,5]</sup> However, there have been some reports of OME occurring in adults; this is termed adult-onset (AO)-OME for clarification and differentiation. More recent publications have reported that AO-OME is not an uncommon disease, hence the need to characterize it in a population of Nigerian adults.<sup>[6]</sup>

Clinical diagnosis of OME is pivoted on history of conductive hearing impairment without otorrhoea, with patent external auditory canal and intact tympanic membrane. The diagnosis is confirmed using pneumatic otoscopy and/or audiological assessment of the functioning of the middle ear cavity, with impedance audiometry (tympanometry), which characteristically shows a flat tracing (the type B tympanogram).<sup>[7,8]</sup> Treatment of OME may be clinical, and this includes the use of

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**Olusola Ayodele Sogebi, Emmanuel Abayomi Oyewole**

Department of Otorhinolaryngology (ORL), Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria

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## Address for correspondence:

Dr. Olusola Ayodele Sogebi, Department of Otorhinolaryngology (ORL), Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria  
E-mails: ayosogebis@gmail.com; olusola.sogebi@oouagoiwoye.edu.ng

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medications such as decongestants, antihistamines, nasal steroids, and sometimes, antibiotics or antimicrobials.<sup>[9]</sup> Nevertheless, there is an international recommendation against the use of these medications to treat OME in children.<sup>[10]</sup> Non-surgical techniques like autoinflation of the eustachian tube (ET) has also been deployed in the treatment of AO-OME with variable degrees of success.<sup>[11]</sup> Surgical treatment requires drainage of the middle ear effusion through an incision and prevention of a re-accumulation by inserting a ventilation (tympanostomy) tube into the tympanic membrane.<sup>[10,12]</sup> Tympanostomy drainage may be associated with complications including early extrusion, blockage of the tube, myringosclerosis, tympanic membrane atrophy, and persistent otorrhoea.<sup>[13]</sup> Scarcely, there is a risk of infection leading to suppurative otitis media and its sequelae, which may increase the patient's morbidity.<sup>[3,14]</sup>

AO-OME has also been noted to co-exist with some diseases and factors whose identification and treatment can lead to complete or substantial resolution of the effusion.<sup>[15]</sup> Documentation and management of co-existing diseases with AO-OME is thus expedient as it will prevent or minimize the misuse, risks, and morbidity associated with ventilation tube insertion among others.

The objectives of this study included the determination of the burden of AO-OME and the other co-existing diseases with the condition, and the management of patients with AO-OME. This will give an idea of the magnitude, and the predisposing and co-existing diseases that may help with drawing up diagnostic and treatment protocols.

## Materials and Methods

This is a five-year descriptive, prospective study of adult patients who attended the ear, nose and throat (ENT) clinic of a tertiary care level hospital in South-western Nigeria from January 2017 to December 2021. Ethics approval for the study was given by the Health Research Ethics Committee of the hospital.

Consecutive adult patients who were diagnosed with AO-OME based on the clinical symptoms, corroborated with tympanometric (impedance audiometry) tracing of type B (flat) tympanogram, were enrolled into the study. Other common diseases that could present with conductive hearing loss with intact tympanic membranes were ruled out with tympanometry. The patients had no history suggestive of childhood ear diseases nor ear discharge, and otoscopic examinations confirmed intact tympanic membranes, some of which were retracted, and few with fluid levels behind the membrane. All the patients consented to their data being included in the study.

Patients with previously confirmed (histopathological) diagnosis of nasopharyngeal carcinoma (NPC) and those with healed tympanic membrane perforations were

excluded. Elderly patients aged over 60 years were also excluded because of the possibility of having subclinical middle ear malfunctions.<sup>[16]</sup>

Information obtained from the patients included clinico-demographic characteristics such as age, sex, major otologic symptoms, the affected ear, the previous treatment, previous childhood ear disease, and hearing impairment, or ear discharge; other symptoms referred to the nose, throat, head, and neck regions; and history suggestive of allergy. Examination findings of the ear, nose, throat, and neck regions were recorded. Radiological investigations (notably plain X-rays and computerized tomography [CT] scans) were performed as indicated to clarify associated diseases in the nose, paranasal sinuses, and the nasopharynx. Video nasopharyngoscopy equipment was not available in our centre; thus, only selected patients were referred for the examination. The selected patients comprised those with associated weight loss, previous epistaxis, or unilateral cervical lymphadenopathy. Examination under anaesthesia (EUA) of the nose, nasopharynx, and biopsy was performed on patients who had confirmed nasopharyngeal masses by video nasopharyngoscopy.

The results of audiologic tests (pure-tone audiometry [PTA] and Tympanometry) were noted. PTA was conducted using a diagnostic audiometer (Piano Inventis SRL 2013, CE 0123, 2015.02.03, Padua, Italy), whereas tympanometry was performed using a Flute-Viola Inventis tympanometer (Model 2017.04.21). PTA and tympanometric assessments were performed by a clinical audiologist. Audiometry was conducted with the patient sitting in a sound-proof booth. Pure tone sounds at frequencies from 250 Hz to 8 kHz (for air conduction) were introduced into the patient's ear through the head-phone. The lowest intensity of the sound at which the patient consistently responded at each frequency was recorded. The lowest sound intensity response was plotted against the different frequencies to generate the audiogram. This was done for each ear separately. The procedure was repeated for the bone conduction thresholds at frequencies from 250 Hz to 4 kHz for each ear, through a bone vibrator, with appropriate masking.

Tympanometry was conducted after ensuring that the external auditory canal was clear of debris and the tympanic membrane was intact in each ear. The tympanometer probe was inserted that sealed the external auditory canal and the tympanogram produced was printed for each ear. The results of radiological and other investigations performed by the patients were also noted. Other clinical diagnosis (aside from AO-OME) made were recorded as co-morbid diseases.

The data were recorded on a spreadsheet and were analysed using SPSS version 20.0. Data were presented as descriptive statistics in tabular and graphical formats.

**Results**

110 among the 3452 ears of adults assessed in the clinic had OME, and prevalence of AO-OME was 3.2%. The clinical and demographic characteristics of the patients are shown in Table 1. The young adults within the age group of 18–30 years were 33.7% (28/83), and the average age was 37.3 ± 11.5 years. The prevalence of AO-OME across the age groups decreased with increasing age groups. There were 55.4% (46/83) males and 44.6% (37/83) females. The

major otologic symptoms were feeling of fullness in the ear, 23 (27.7%), and hearing loss/difficulty in hearing, 20 (24.1%). The otologic symptoms in the right ear were in 32.5% (27/83), in the left ear were in 34.9% (29/83), and in both ears, i.e. 54 ears, were in 32.5% (27/83).

Pure tone audiometric assessments of 110 ears showed nine ears (8.2%) had normal hearing and 69 ears (62.7%) had conductive hearing loss. The audiogram representation is shown in Figure 1, whereas tympanograms are represented in Figure 2.

**Table 1: Clinical and demographic characteristics of the patients**

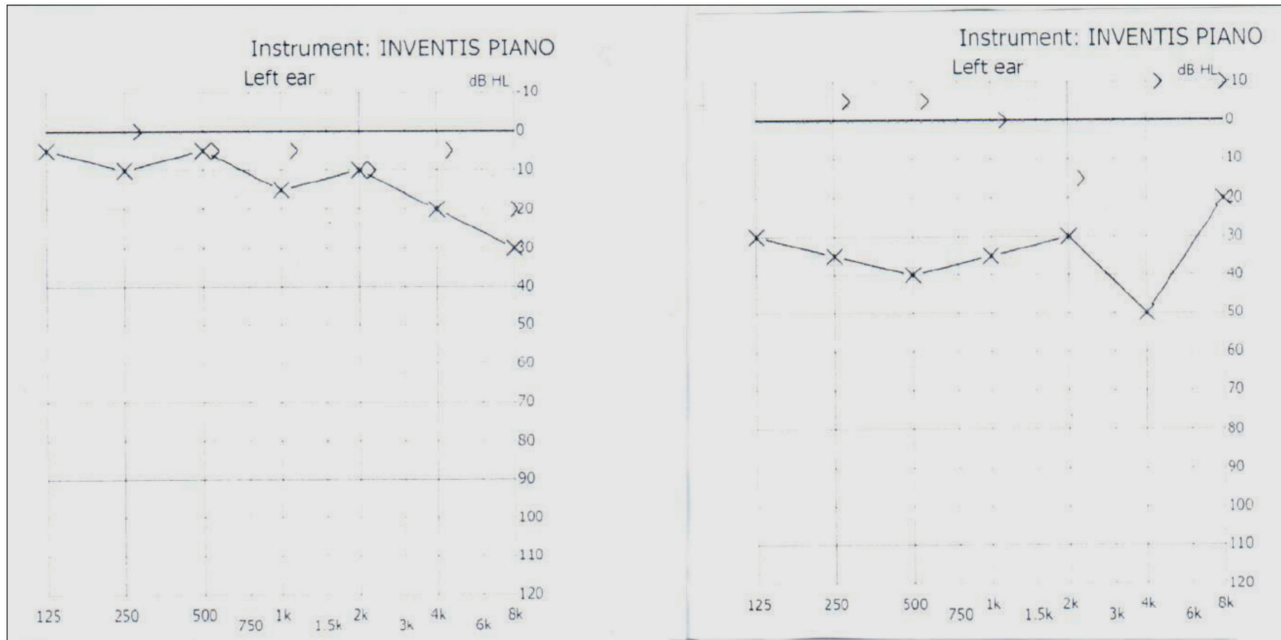
Characteristic	Frequency, n (%)
Age group (years)	
18–30	28 (33.7)
31–40	19 (22.9)
41–50	22 (26.5)
51–60	14 (16.9)
Sex	
Male	46 (55.4)
Female	37 (44.6)
Main otologic symptoms	
Hearing loss/impairment	20 (24.1)
Fullness in the ear	23 (27.7)
Earache	9 (10.8)
Suggestions of barotrauma	14 (16.9)
Feeling of fluid in the ear	11 (13.3)
Imbalance/Vertigo	3 (3.6)
Others	3 (3.6)
Affected ear	
Right	27 (32.5)
Left	29 (34.9)
Both	27 (32.5)

The detailed results of other diagnostic investigations performed on the patients are shown in Table 2. The radiological investigations were plain X rays of the sinuses in 56 (67.5%) and CT scan of the sinuses in nine (12.8%) patients. The results revealed nasopharyngeal mass, isodense sinus lesion in two (22.2%) each, and inflammatory mucosa in five (55.6%) of the patients. Three patients (3.6%) had nasoendoscopy, which reported deviated nasal septum in one (33.3%) and engorged turbinates in two (66.7%) of the patients. Three patients (3.6%) had nasal and nasopharyngeal EUA and biopsy, with two (66.7%) having nasopharyngeal mass.

The other clinical diagnoses in the patients were reported as co-morbidities. Eighty patients had co-morbidities; these were allergy in 32 (38.6%), infective rhinosinusitis in 20 (24.1%), and URTI in 12 (14.5%) patients. There was no co-morbidity found in three (3.6%) patients as shown in Table 3.

**Discussion**

The prevalence of AO-OME of 3.2% ears of adults in this study gives credence to the assertion by earlier researchers that the disease is not uncommon.<sup>[6,17]</sup> The



**Figure 1: Pure tone audiograms (left: normal hearing, right: conductive hearing loss)**

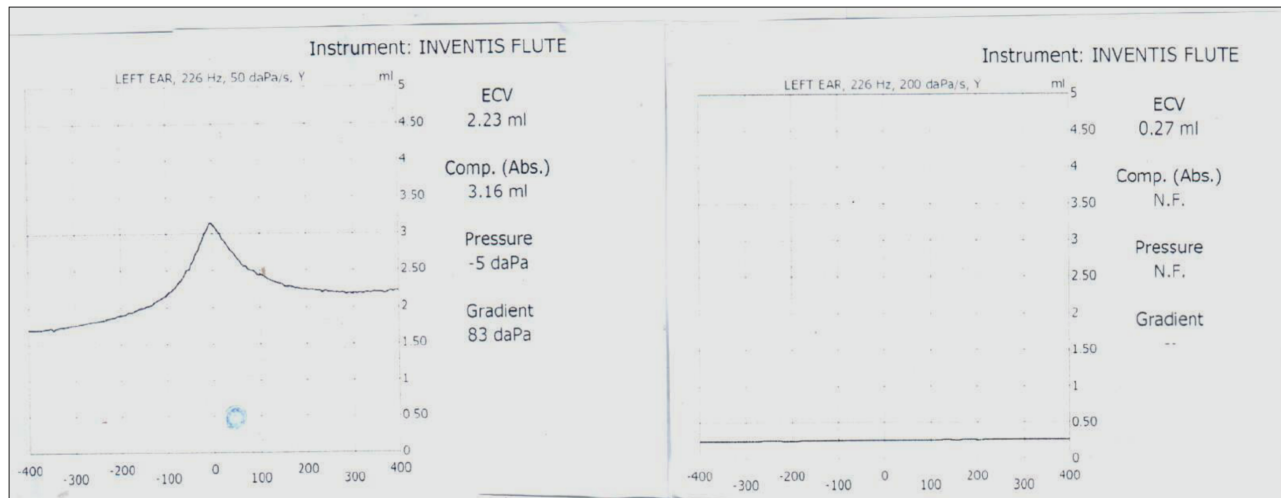


Figure 2: Tympanograms (left panel: normal (type A) tympanogram, right panel: flat (type B) tympanogram) representing OME

Table 2: Results of diagnostic investigations performed on the patients

Investigation	Number, n (%)
PTA (in 110 ears)	
Normal hearing	9 (8.2)
Conductive hearing loss	69 (62.7)
Sensorineural hearing loss	5 (4.5)
Mixed hearing loss	27 (24.5)
*Plain X-rays of paranasal sinuses (in 56 patients)	
Normal	4 (7.1)
Mucosal thickening	32 (57.1)
Haziness	18 (32.1)
Fluid level	2 (3.6)
*CT of sinuses (in 9 patients)	
Nasopharyngeal mass	2 (22.2)
Isodense sinus lesion	2 (22.2)
Inflammatory mucosa	5 (55.6)
*Nasoendoscopy (in 3 patients)	
Deviated nasal septum	1 (33.3)
Engorged turbinates	2 (66.7)
*Nasopharyngoscopy (in 8 patients)	
Normal findings	5 (62.5)
Nasopharyngeal mass	3 (37.5)
*EUA nose, nasopharynx, and biopsy (in 3 patients)	
Normal	1 (33.3)
Nasopharyngeal mass	2 (66.7)

PTA: pure-tone audiometry, CT: computerized tomography, EUA: examination under anaesthesia

\*Findings are multiple, most important finding documented

hospital prevalence found in this study is slightly higher than the 2.6% recorded in another otolaryngology clinic in a metropolitan area in the same geographical region of the country.<sup>[17]</sup> AO-OME appeared more common among the young adults, with one-third (33.7%) being 18–30 years old, with a mean age of 37.3 years, albeit there was no statistically significant difference in the proportions of the young and the middle aged adults ( $P = .075$ ). Previous

Table 3: Co-morbidities existing with AO-OME

Factor	Frequency, n (%)
Not discovered	3 (3.6)
Allergy	32 (38.6)
Asthmatic bronchitis	3 (3.6)
Nasal smear eosinophilia	8 (9.6)
Positive skin sensitivity tests	3 (3.6)
Infective rhinosinusitis	20 (24.1)
URTI	12 (14.5)
Suggestion of nasopharyngeal tumour	8 (9.6)
Others (nasal polyps, septal deviation)	8 (9.6)

AO-OME: adult-onset otitis media with effusion, URTI: upper respiratory tract infection

reports had been silent on which group of adults tend to be affected more. Therefore, further clarifications on the age categorization of adults affected by AO-OME are required.

Although the pathogenesis of OME is considered multifactorial,<sup>[5,18]</sup> one prominent theory is eustachian tube dysfunction (ETD), which leads to a prolonged reduction of the pressure in the middle ear cavity. This ultimately provokes an inflammatory response with transudation of viscid fluid, which is rich in glyco and mucoproteins and contains inflammatory cells into the middle ear cavity.<sup>[19]</sup> The ETD may affect either or both ears; thus, OME may be uni- or bilateral. ETD presents with type C tympanogram. As it is not all cases of ETD that will eventually progress to OME, it will be technically incorrect to classify type C tympanogram tracings as representing OME, which tympanogram pattern is type B (flat). In our study, we found almost equal affection of the right and left ears, and about one-third (32.5%) had bilateral involvement. No report on predilection towards either of the ears was found in the literature, although a study reported that close to half (48.0%) of their patients had bilateral involvement.<sup>[20]</sup> Most of the symptoms in the patients could be attributed to the mechanical effect of the accumulated viscid fluid in the ear.



Such effects include a feeling of ear blockage and hearing impairment, which were the main otologic complaints in our patients.

Theoretically, the type of hearing impairment should be conductive in type,<sup>[21]</sup> as it occurred in close to two-thirds of our patients. Less than one-tenth of the patients had normal hearing, presumably those with lesser fluid accumulation in the middle ear cavity, which has not disturbed sound conduction through the cavity. Some patients also had associated sensorineural hearing impairment, possibly from presbycusis (which has been reported to start earlier amongst our population)<sup>[22]</sup> and presented with mixed hearing loss. Some middle ear lesions that could present with conductive hearing loss without otorrhoea include tympanosclerosis, otosclerosis, incudo-stapedial joint stiffness, and ossicular chain discontinuity. These however present with tympanometric tracings different from the type B (flat) that was used in this study. It is however difficult to explain the pure sensorineural hearing loss found in 4.5% of the ears of our patients. Sometimes, patients may report movement of fluid in the ear, but other symptoms may be related to the co-morbid diseases in the patients.

Adenoid enlargement has been proven to be a common aetiological or associated disease in children with OME.<sup>[19]</sup> Diagnosis of adenoid hypertrophy or other nasopharyngeal tumours will require a minimal procedure of EUA and biopsy with histological confirmation, which were performed in only a few of our patients. However, one patient had histological confirmation of nasopharyngeal lymphoid hyperplasia despite being a non-smoker. Although this may not be common among adults, smoking-induced nasopharyngeal lymphoid hyperplasia and adult-onset adenoidal hypertrophy were reported to be co-morbidities in AO-OME in 19% of patients in a study.<sup>[6]</sup> The more common associations seen in AO-OME are inflammatory diseases of the upper respiratory tract. These diseases often lead to blockage or obstruction of the ET for a variety of reasons, thus setting up a cascade of events previously described in the patients. Sinus infections and allergies may also cause oedema of the epithelial lining of the ET. In this study, the common co-morbid diseases were allergy, infective rhinosinusitis, and URTI. Previous researchers had also reported similar associations with AO-OME. Dang and Gubbels in a review on AO-OME observed associations with common medical conditions such as URTI, sinusitis, allergic rhinitis, and adenoidal hypertrophy.<sup>[23]</sup> Ho *et al.* reported URTI (23.0%), allergic rhinitis (18.4%), and sinusitis (17.3%) as the most common causes of isolated OME among 87 adult patients in Taiwan.<sup>[24]</sup> Paranasal sinus disease, predominantly of the ethmoid system, was found to be the dominant co-existing factor in 66% of patients in a study in the USA.<sup>[6]</sup> In our adult patients, infective rhinosinusitis affected more of the maxillary, rather than the ethmoid sinuses.<sup>[25]</sup>

Identification and treatment of co-existing diseases and their underlying pathological changes are important if reasonable long-term outcome is expected.<sup>[26]</sup> A few associations like allergy can be discovered during clinical evaluation. Most of our cases of allergy in 32 patients (38.6%) presented with symptoms ranging from seasonal or perennial itchy ears, eyes, and throat, to excessive sneezing in response to some common allergens.

Three patients (3.6%) had histories suggestive of asthmatic bronchitis. Eight (9.6%) of these patients had nasal smear cytology with predominant eosinophilia, and three (3.6%) had skin sensitivity tests to confirm allergy and the common allergens to which they reacted. Most of other co-morbid diseases were confirmed by investigations, which may be multiple and varied depending on the clinical suspicion and differential diagnoses. In this study, the common investigations were plain X-rays of the paranasal sinuses and CT scan of the sinuses, which were performed to assess diseases of the nasal cavities, paranasal sinuses, and the postnasal space. The results revealed different inflammatory diseases of the nose and the sinuses in 50 (60.2%) patients and nasopharyngeal mass in two (2.2%) patients. Nasopharyngoscopy and nasal endoscopy, which also corroborated these findings, had been noted as a reliable method in the investigation of etiologic factors in AO-OME.<sup>[21]</sup>

Perhaps, the most dreadful co-existing disease with AO-OME is NPC. It has been noted that AO-OME can be a presenting feature of NPC.<sup>[23]</sup> The common presenting symptoms of NPC in our environment are bilateral cervical lymphadenopathy, spontaneous and recurrent epistaxis, and hearing loss.<sup>[27]</sup> None of our patients with AO-OME presented with these classical features. However, based on clinical suspicion, three patients had flexible/video nasopharyngoscopy to assess the postnasal space with particular emphases on the ET openings and the fossa of Rosenmuller from where such malignancy commences.<sup>[28]</sup> One (1.2%) of the patients was found to have blockage of ET opening by nasopharyngeal masses. A more reliable method of confirming the diagnosis is EUA and biopsy of the nasopharynx. Out of the three patients who had this procedure, one (1/83 [1.2%]) had a confirmed diagnosis of NPC. NPC is a midline (central) lesion that may extend sideways, and its treatment is basically radiotherapy, although chemotherapy can be administered as an adjunct. Somefun *et al.* had previously noted that in Nigeria, OME as a single clinical feature or in association with allergy or sinusitis is most unlikely to harbour NPC.<sup>[17]</sup> Moreover in Taiwan, an endemic region, incidence of NPC among adults suffering from OME but featuring no other symptoms and signs of NPC was 5.7% (five of 87 patients).<sup>[24]</sup> Owing to this relatively low incidence, the practice of routine nasopharyngoscopy in AO-OME is now being questioned, especially in places where NPC is not common.<sup>[23]</sup>

In the course of management, it is important to identify co-existing diseases as it gives a holistic view of the pathology that needs to be addressed and treated. This may sometimes be a herculean task and co-morbidities may not be found, as it occurred in 3.6% of our patients. Finkelstein *et al.* had also reported that the cause of AO-OME could not be determined in 1.8% of their patients.<sup>[6]</sup> Notwithstanding, we advocate diligent search for other diseases with necessary investigations. Another reason why this is necessary is in relation to the outcome of treatment. AO-OME often resolves with the fluid draining on its own within a few weeks, provided the co-existing diseases have been treated.<sup>[29]</sup> Patients with allergy are thus advised on avoidance of allergens and other triggers that precipitate the symptoms, cessation of smoking, and treatment with anti-allergy medications. Infective rhinosinusitis is treated with systemic antibiotics based on the bacteriology in the sinus effluent with nasal decongestant deployed as an adjunct. Appropriate treatment of sinusitis resulted in resolution of OME in most patients.<sup>[6]</sup> However, the effusion may sometimes not easily resolve or may recur, because some co-morbidities are recurrent.

URTI may be self-limiting, especially if it is of viral aetiology, with patients presenting with constitutional symptoms such as fever, malaise, and watery (non-purulent, non-mucoid) nasal discharge. The infection may specifically involve inflammation of the mucosa of the nose (rhinitis), the paranasal sinuses (sinusitis), and the pharynx (pharyngitis). Sometimes, the infection may be diffused, and not localised, and it is expressed as URTI. Consequently rest, vitamins and symptomatic treatment may suffice. In cases of URTI of bacterial origin, systemic antibiotics is the main treatment. This conservative medical management of the co-existing diseases without insertion of the ventilation tube was deployed in most of our patients and led to remission of the OME.

There may, however, be punctuations of remissions and recurrences; the recurrences may be from incomplete resolution of the underlying pathology or from associated factors.<sup>[30]</sup> In a study in England, endoscopic examination 15–27 months following ventilation tube insertion for AO-OME revealed that 26.4% of patients still had evidence of inflammation at the lateral nasal wall and 51% at the ET orifice.<sup>[30]</sup> Most patients on treatment of chronic OME appear to have an abnormal ET function with difficulty in passively opening the ET and weak active muscular function.<sup>[31]</sup> This underscores the importance of complete and adequate treatment of the underlying and co-existing pathology. Unfortunately, we could not follow our patients up extensively because most of them defaulted appointments once they were relieved of their symptoms. Contact through telephone conversations did not yield any positive result.

Therefore, inability to do a thorough and prolonged follow-up on our patients is regarded as a limitation of this study. Moreover, the prevalence recorded in this study is hospital

based on patients who had medical consultations in an ENT department, and the prevalence value will likely be different if the entire population was considered. We also recognize the relatively small sample size and the inability to propose a cause–effect relationship between co-morbid diseases and AO-OME as limitations. AO-OME and the co-morbid diseases may actually be independent pathologies. Healed tympanic membrane perforation is better assessed by pneumatic otoscopy, so some patients with this could have been inadvertently missed. Further studies to clarify these will provide a better understanding of AO-OME.

In conclusion, 3.2% of ears (combined) were affected by AO-OME, suggesting it is not an uncommon disease. Suspected allergy and other inflammatory diseases of the upper respiratory tract were the common co-morbidities. Our management strategy includes finding the co-morbidities and conservative medical management of such, without the insertion of a ventilation tube.

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#### Ethics approval

Ethical approval for the study was given by the Health Research Ethics Committee of the Olabisi Onabanjo University Teaching Hospital, Sagamu (approval number OOUTH/HREC/255/2019AP).

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Nil.

#### Conflicts of interest

The authors have no conflicts of interest to declare

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