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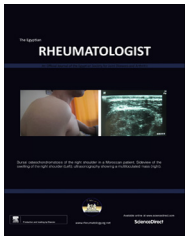

ORIGINAL ARTICLE

# Auditory disorders in patients with systemic lupus erythematosus: Relation to clinical parameters

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**KEYWORDS**

Systemic lupus erythematosus (SLE);
Audiovestibular manifestation;
Pure tone audiometry (PTA);
Sensorineural hearing loss (SNHL);
SLE disease activity index (SLEDAI)

**Abstract** *Aim of the work:* To evaluate the hearing disorders in SLE patients with particular regard to their frequency and relationship to disease duration and activity.

*Patients and methods:* Twenty female SLE patients were enrolled in the study. Assessment of disease activity was done using the SLE disease activity index (SLEDAI). Another 20 otologically healthy subjects of matched age and sex served as controls. Auditory assessment was performed and included otoscopic examination, pure tone audiometry (PTA), acoustic immittance testing and speech audiometry.

*Results:* The PTA was abnormal in 13 (65%) patients; 4 had tinnitus and 1 vertigo. The PTA results showed a highly significant statistical difference from the control ($p < 0.001$). Otoscopic examination, acoustic immittance testing and speech audiometry of all patients were normal. A significant difference was found in the age at disease onset between those with and without abnormal PTA ($p = 0.023$). Moreover, there was a significantly lower hearing level (right ear) at 12,000 Hz in juvenile-onset ($N = 6$) ($20.83 \pm 3.76$ db) compared to adult-onset cases ($32.5 \pm 15.66$ db) ($p = 0.02$). No significant difference was present in the audiovestibular manifestations ($p = 0.114$), clinical, laboratory parameters or disease activity between those with or without hearing loss. However, hearing levels were significantly lower in those with lupus nephritis and those receiving hydroxychloroquine.

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*Conclusion:* Pure tone audiometry revealed SNHL in 65% of SLE patients. Absence of audio-vestibular manifestations does not exclude inner ear affection. Age at disease onset is remarkably associated with hearing loss in SLE. Lupus nephritis and hydroxychloroquine use are associated with lower hearing levels and possible early hearing loss.



## 1. Introduction

Systemic lupus erythematosus (SLE) is associated with several comorbidities, including hearing and vestibular disorders [1]. Sensorineural hearing loss (SNHL) is remarkably present in SLE [2]. Different mechanisms leading to SNHL in SLE patients and in those with antiphospholipid syndrome (APS) have been proposed, such as secondary vasculitis, microinfarctions of the capillaries or arterioles in the temporal bone and thrombosis in the otologic region [3]. Hearing loss in SLE may be potentially due to autoimmunity, vasculitis, premature presbyacousis and drug ototoxicity [4]. Gazquez et al. [5] showed autoimmunity to be associated with the pathophysiology of Meniere's disease (MD), an inner ear disorder characterized by episodes of vertigo with hearing loss and tinnitus. They found an elevated prevalence of systemic autoimmune disease such as SLE with MD. This finding suggested an autoimmune background in the pathophysiology of hearing loss. In the mouse model of SLE, immunoglobulin G deposits on the thickened basement membranes of capillaries in the stria vascularis and ultimately significant hearing loss (HL) have been reported [6].

In an SLE patient with serous effusion and hemorrhage in both middle ears, the right cochlea, vestibule, semicircular canals and vestibular aqueduct were filled with dense fibrous tissue and new bone formation. The histopathologic examination revealed a dense perivascular accumulation and infiltration of inflammatory cells and vasculitis in the fibrous tissue [7].

Localization of hearing loss in SLE is known as a cochlear lesion but other sites may be also involved. In the work of *Maciaszczyk and his colleagues* [8], an increase of neural conduction was observed in SLE patients compared to controls, which suggested subclinical retrocochlear or central involvement of the auditory pathway.

In the study by *Maciaszczyk et al.* [8] it was found that SLE patients had poorer hearing thresholds than the age-matched controls. Furthermore, *Roverano et al.* [9] showed that 66% of SLE patients revealed an asymptomatic SNHL at high frequencies with statistically significant differences when compared with the control group. Sudden SNHL may be a manifestation of SLE and may have an important impact on the health of these patients [10].

The aim of this study is to evaluate the hearing disorders in patients with SLE with particular regard to their frequency and relationship to disease duration and activity.

## 2. Patients and methods

Twenty female patients with SLE fulfilling the updated American College of Rheumatology (ACR) revised classification criteria for the SLE [11] were enrolled into the study. Assessment of disease activity was done using the SLE disease activity index (SLEDAI) [12]. The control group consisted of 20 otologically healthy persons matched to the SLE group for age and sex. The patients were selected from the outpatient clinic and inpatient section of Rheumatology and Rehabilitation department, Faculty of Medicine, Cairo University Kasr el Ainy Hospital. An informed consent was obtained from all participants in the study, and the study was approved by the Institutional Review Board (IRB) of faculty of medicine, Cairo University.

Patients or control with any of the following were excluded from the study: Diabetes, uncontrolled hypertension for more than one year duration, history of ototoxicity due to drugs e.g. Aminoglycosides, history of noise exposure e.g. occupational as working in a factory, history of fever which causes affection of hearing e.g. Measles, Mumps, Rubella & Meningitis, history of neurological disease that causes affection of hearing e.g. multiple sclerosis (MS) and a family history of hearing loss.

All patients included in this study were subjected to:

1- Comprehensive history taking including auditory symptoms such as hearing loss, tinnitus, vertigo, earache and thorough general and clinical examination of the cardiopulmonary, abdominal, neurological and musculoskeletal systems.
2- Routine laboratory investigations including complete blood count (CBC), erythrocyte '/isedimentation rate (ESR), liver and kidney functions, and urine analysis, in addition to estimation of total albumin in 24 h urine, immunological assays (anti-nuclear antibody; ANA, anti-double stranded deoxyribonucleic acid antibodies; anti-dsDNA, anti-cardiolipin antibodies, and lupus anticoagulants), and serum complement levels (C3 and C4).
3- Auditory assessment was done by an audiologist and included the following: otoscopic examination [13], pure tone audiometry (PTA) [14], acoustic immittance testing (tympanometry and acoustic reflex) [15] and speech audiometry [16].

*Statistical analysis:* Data were statistically described in terms of mean ± standard deviation (SD), median and range, or frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student $t$ test for independent samples when variables were normally distributed and Mann–Whitney $U$ test for independent samples when not normally distributed. For comparing categorical data, Chi square ($\chi^2$) test was performed. Exact test was used instead when the expected frequency is less than 5. $p$ values less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.