Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

Prevalence of Hearing Impairment Among Systemic Lupus Erythematosus Patients

Amna Cheema[1], Muhammad Sikander Ghayas Khan[1]*, Farzana Mazhar[1], Dr. Malik Muhammad Qasim[2], Muhammad Ahmed[1], Syeda Asfara Badar[1], Areej Kazmi[1], Minahil Shanawar[1]

[1]Department of Rehabilitation Sciences, The University of Lahore.

[2]M.Phil, Biochemistry Department, The University of Lahore.

Corresponding Author: Muhammad Sikander Ghayas Khan; Professor; Email: sikander.ghayas@dhpt.uol.edu.pk

Conflict of Interest: None.

Cheema A., et al. (2023). 3(2): DOI: https://doi.org/10.61919/jhrr.v3i2.79

ABSTRACT

Background: Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disease with varied manifestations, including potential auditory complications. Previous studies have indicated varying prevalence rates of hearing impairment among SLE patients, necessitating further research to understand the extent and nature of these auditory issues.

Objective: The primary aim of this study was to assess the prevalence and characteristics of hearing impairment in SLE patients, with a focus on identifying the types and degrees of hearing loss and associated symptoms like tinnitus and vertigo.

Methods: This observational, cross-sectional study involved 38 SLE patients from Sir Ganga Ram Hospital, Lahore, and DHQ Hospital, Bhimber, Kashmir. Participants underwent pure tone audiometry (PTA) to assess hearing impairment. Data were analyzed using SPSS version 24.0, with a focus on qualitative variables like gender, education, and socio-economic status. Patients with SLE-associated co-morbid factors affecting hearing were excluded.

Results: The study found a 29% prevalence of hearing impairment among SLE patients, with sensorineural hearing loss being the most common type (21.1%). Conductive hearing loss and mixed hearing loss were observed in 2.6% and 5.3% of patients, respectively. The majority of hearing impairments were of mild to moderate degree. Additionally, 23.7% of patients reported tinnitus, and 18.45% experienced vertigo.

Conclusion: The study concludes that hearing impairment, particularly sensorineural hearing loss of a mild to moderate degree, is a significant concern in SLE patients. The findings highlight the need for routine audiological assessments, including PTA and High Frequency Audiometry (HFA), in the management of SLE patients to facilitate early detection and treatment of hearing loss.

Keywords: Systemic Lupus Erythematosus, Hearing Impairment, Sensorineural Hearing Loss, Audiometry, Tinnitus, Vertigo.

INTRODUCTION

Systemic Lupus Erythematosus (SLE) is a complex autoimmune disease marked by the production of antibodies that attack various organs and tissues, making it one of the more prevalent autoimmune disorders globally. Its incidence varies widely, with significant regional and ethnic disparities. For instance, the prevalence among Afro-Caribbean individuals in the UK spans a wide range, from as low as 0.3 per 100,000 to as high as 517.5 per million people (1, 2). Studies in Asia have shown contrasting incidence rates in different countries. Nations like Pakistan, Iran, and China report higher incidences (30–50 per 100,000), while others such as Saudi Arabia, India, and Japan report significantly lower frequencies (3).

The gender disparity in SLE prevalence is striking, with females being approximately nine times more likely to be affected than males worldwide. This disparity is of particular concern as SLE is a leading cause of death among young women. In a comprehensive study in the USA involving over 26,000 female patients with SLE, the all-cause mortality rate was found to be 2.6 times higher than in the general population, with SMRs nearly fivefold for infections and renal disease, and more than double for cardiovascular disease (4-8).

Hearing, a critical aspect of human sensory perception, involves the processing and interpretation of sound. Normal hearing thresholds range from 25 to 40 decibels (dB). The medical community often uses terms like "hearing impairment" and "hearing loss" interchangeably, particularly when audiometry indicates hearing below normal thresholds (12, 13). Hearing impairments are

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generally classified into two types: sensorineural hearing loss (SNHL) and conductive hearing loss (CHL). SNHL, often irreversible, arises from damage to the hair cells in the cochlea (15). CHL occurs due to increased resistance in the sound wave's path through components of the ear such as the tympanic membrane, middle ear, or outer ear (16, 17).

Patients with SLE frequently report peripheral auditory changes, particularly sensorineural hearing loss. Despite this, there is a noticeable gap in literature regarding central auditory changes in these individuals. Effective hearing involves the proper functioning of both the external ear and auditory cortex (19). The physiological and anatomical integrity of both peripheral and central auditory systems is vital for the development of language and speech. In audiology, there is a growing trend of employing both quantitative and qualitative behavioural approaches to diagnose central and/or cognitive auditory issues (20, 21).

Pure tone audiometry remains the primary method in audiological diagnostics, focusing mainly on peripheral hearing by assessing air and bone auditory thresholds (22). However, the extent of auditory impairment in SLE patients, especially in underdeveloped countries like Pakistan, remains under-researched. This gap in data is significant, as it leaves unanswered questions about the experiences and needs of these populations.

The objective of this research is to comprehensively understand the prevalence and characteristics of hearing impairment among SLE patients, particularly in under-researched regions. This endeavor aims to not only illuminate the extent of the issue but also to contribute to the development of targeted interventions and support systems for these patients. By enhancing our understanding of the auditory challenges faced by SLE patients, we can better tailor medical care and support services to their needs, ultimately improving their quality of life and health outcomes.

MATERIAL AND METHODS

This study was an observational, cross-sectional investigation conducted over a six-month period following approval from the departmental research committee. The research took place in two locations: Sir Ganga Ram Hospital in Lahore and DHQ Hospital in Bhimber, Kashmir. The sample comprised 38 patients with Systemic Lupus Erythematosus (SLE), selected based on a prevalence rate of 6.6%. The sample size calculation utilized an online calculator, adhering to a 95% confidence level and a 5% confidence interval (26).

Patients diagnosed with SLE were identified through a thorough history-taking process (27). These patients were initially recruited from the rheumatology wards of the respective hospitals. Following recruitment, they were transferred to the Audiology Outpatient Department (OPD) for further evaluation. In the Audiology OPD, each patient underwent pure tone audiometry (PTA), which included both air and bone conduction tests. The procedure began with the placement of headphones on the patient's ears. Patients were then instructed to indicate whenever they heard a tone, facilitating the accurate assessment of their hearing capabilities (28, 29).

The data collected during the study were meticulously recorded and then transferred to an SPSS spreadsheet for analysis. The statistical analysis was performed using SPSS software, version 24.0. This analysis focused on qualitative variables such as gender and education, which were reported as frequencies and percentages. The study included both male and female patients aged between 35 and 50 years, all diagnosed with SLE.

Crucially, the study's design incorporated stringent inclusion and exclusion criteria to ensure the validity and reliability of the findings. Only SLE patients without co-morbid factors that could potentially affect hearing were included in the study. These co-morbid factors comprised immune-mediated diseases, inner ear diseases, traumatic brain injury, Meniere's disease, metabolic diseases, cardiovascular diseases, exposure to significant noise levels, and the use of ototoxic medication not related to SLE treatment. Additionally, any patient with a family history of hearing loss was excluded from the study (30). This approach ensured that the observed auditory impairments could be more confidently attributed to SLE, rather than other confounding variables.

The methodology of this study was designed to provide a comprehensive understanding of the prevalence and characteristics of hearing impairment in SLE patients. By focusing on a specific patient population and employing rigorous data collection and analysis methods, the research aimed to yield insights that could inform future clinical practices and policy-making in the realm of autoimmune diseases and associated auditory impairments.

RESULTS

Table 1 presents demographic information and socio-economic status of the study participants. The age distribution of the 38 patients showed that the majority (50.0%) were in the age range of 46-50 years, followed by 39.5% in the 41-45 age range, and 10.5% in the 35-40 age range. Regarding gender, a higher proportion of participants were female (65.8%), compared to male participants (34.2%). In terms of socio-economic status, a significant majority of the patients (81.6%) were from the middle class, while 13.2% belonged to the lower class and a small fraction (5.3%) were from the upper class.

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Table 1 Demographic Information

Variables	Sub-Variables	f (%)
Age	35-40	4(10.5%)
	41-45	15(39.5%)
	46-50	19(50.0%)
Gender	Male	13(34.2%)
	Female	25(65.8%)
Socio economic status	Lower class	5(13.2%)
	Middle class	31(81.6%)
	Upper class	2(5.3%)

Table 2 focuses on the duration of SLE, the presence of hearing loss, and related symptoms. Regarding the duration of SLE among patients, 44.7% had been living with the condition for 6 to 10 years, followed by 31.6% for 0 to 5 years, 15.8% for 11 to 15 years, and 7.9% for 16 to 20 years. Among the participants, 26.3% reported hearing loss while 73.7% did not. For those with hearing loss, the duration varied: 10.5% had hearing loss for 1 to 2 years, 7.9% for 2 to 3 years, 5.3% for less than 1 year, and 2.6% for 3 to 4 years. Tinnitus was reported by 23.7% of the patients, with 13.2% experiencing bilateral tinnitus and 10.5% unilateral. Vertigo was reported by 18.4% of the participants.

Table 2 Duration of SLE, the Presence of Hearing Loss, and Related Symptoms

Variables	Sub-Variables	f (%)
Duration of SLE	0 to 5 years	12(31.6%)
	6 to 10 years	17(44.7%)
	11 to 15 years	6(15.8%)
	16 to 20 years	3(7.9%)
Hearing Loss	Yes	10(26.3%)
	No	28(73.7%)
	Total	38(100%)
Duration of hearing loss	less than 1 year	2(5.3%)
	1 to 2 years	4(10.5%)
	2 to 3 years	3(7.9%)
	3 to 4 years	1(2.6%)
	None	28(73.7%)
Tinnitus	Yes	9(23.7%)
	No	29(76.3%)
Both ears	Unilateral	4(10.5%)
	Bilateral	5(13.2%)
	None	29(76.3%)
Vertigo	Yes	7(18.4%)
	No	31(81.6%)

Table 3 provides detailed information on the type and degree of hearing loss among the participants. Of the 38 patients, 29% had some form of hearing loss, while 71% had normal hearing. Among those with hearing loss, 21.1% had sensorineural hearing loss, 2.6% had conductive hearing loss, and 5.3% had mixed hearing loss. The affected side was unilateral in 18.4% of the cases and bilateral in 10.5%. As for the degree of hearing loss, 21.1% of the patients had mild to moderate hearing loss, 5.3% had moderate to severe, and 2.6% had severe to profound hearing loss. The remaining 71% of the participants had normal hearing levels.

Table 3 Type and Degree of Hearing Loss

Variables	Sub-Variables	f (%)
Hearing loss	Normal Hearing	27(71%)
	Hearing Loss	11(29%)
Type	Normal Hearing	27(71%)

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Variables	Sub-Variables	f (%)
	Conductive Hearing Loss	1(2.6%)
	Sensorineural Hearing Loss	8(21.1%)
	Mixed Hearing Loss	29(5.3%)
Affected side	Unilateral hearing loss	7(18.4%)
	Bilateral hearing loss	4(10.5%)
	Normal	27(71%)
Degree	Normal	27(71%)
	Mild to Moderate	8(21.1%)
	Moderate to Severe	2(5.3%)
	Severe to Profound	1(2.6%)

DISCUSSION

The findings of the current study underscore the significant prevalence of hearing impairment among patients with Systemic Lupus Erythematosus (SLE), indicating a prevalence rate of 29%. This figure is slightly higher than what was reported in a 2022 study by Sarmar Tharwat, which found a 24% prevalence of hearing loss in SLE patients (31). Furthermore, Erick Yuen's 2021 research also highlighted a comparable prevalence rate, with 27% of SLE patients reporting hearing impairment (13). These comparative studies collectively suggest that hearing impairment is a noteworthy concern in the SLE patient population.

A detailed analysis of the types of hearing loss in the current study reveals that the majority (21.1%) of SLE patients suffer from sensorineural hearing loss, while a smaller proportion experience conductive (2.6%) and mixed hearing loss (5.3%). This predominance of sensorineural hearing loss is consistent with findings from a 2022 study by Huixian Chen, which reported 80% of SLE patients with sensorineural hearing loss (32). Additionally, Saad Mahmoud Alzokm's 2022 study found various degrees of sensorineural hearing loss, often more pronounced at higher frequencies, further supporting the current study's findings (33).

In terms of the degree of hearing loss, the present study shows that a significant portion of patients (21.1%) exhibit mild to moderate hearing loss. This observation aligns with Huixian Chen's 2022 study, which also reported mild to moderate hearing loss in SLE patients (32). These consistent findings across different studies highlight the need for medical practitioners to be vigilant about monitoring hearing function in SLE patients.

The duration of SLE appears to play a role in hearing impairment. In the current study, 44.7% of patients with hearing issues had been living with SLE for 6 to 10 years. This is comparable to the findings of Saad Mahmoud Alzokm, who reported an average SLE duration of 6.4 ± 4.4 years among patients with hearing problems (33). This correlation suggests a potential link between the duration of SLE and the development of hearing impairment.

Tinnitus was found to be a significant symptom in the current study, affecting 23.7% of patients. This finding is slightly lower compared to Sarmar Tharwat's 2021 study, where 32.4% of SLE patients reported tinnitus (31). Vertigo was also a notable symptom, observed in 18.45% of patients in this study, contrasting with Abir.N's 2014 research, which found a lower prevalence (10%) of vertigo in SLE patients (34).

The strength of the discussion lies in its comprehensive analysis and comparison with relevant studies, providing a broad perspective on the prevalence and types of hearing impairment in SLE patients. The inclusion of various studies for comparison, such as those by Sarmar Tharwat (31), Erick Yuen (13), Huixian Chen (32), and Saad Mahmoud Alzokm (33), adds depth and context to the findings, enhancing the reliability and relevance of the conclusions drawn. However, a notable weakness is the lack of exploration into the potential underlying mechanisms linking SLE to hearing loss, which could have provided more insight into the pathophysiology of the condition. Additionally, the discussion could have benefitted from addressing potential biases or limitations in the study design and methodology, which are essential for a balanced and critical evaluation of the research findings.

CONCLUSION

In conclusion, this study highlights a high rate of hearing loss among patients with SLE, predominantly of the sensorineural type and often in the mild to moderate range. Accompanying symptoms like tinnitus and vertigo further complicate the clinical picture. These findings underscore the importance of incorporating audiometric evaluations, including Pure Tone Audiometry (PTA) and High Frequency Audiometry (HFA), into the routine assessment of SLE patients. Such proactive audiological assessments are essential for the early detection and management of hearing loss, whether it arises directly from SLE or as a side effect of its treatment.

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