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IP Indian Journal of Clinical and Experimental Dermatology

Journal homepage: www.ijced.org/

Original Research Article

Vitiligo patients experiencing sensorineural hearing loss: A single-center experience in a tertiary care centre

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ARTICLE INFO

Article history:
Received 18-09-2024
Accepted 07-12-2024
Available online 08-02-2025

Keywords:
Sensorineural hearing loss (SNHL)
Vitiligo
Pure tone audiometry

ABSTRACT

Introduction: Vitiligo is an autoimmune disease distinguished by the gradual and progressive loss of melanocytes, resulting in loss of pigmentation of macules and patches over the skin. The disease's pathophysiology is complex, involving genetic predispositions, environmental triggers, and immune-mediated inflammation, which collectively result in the destruction of myelocytes by autoreactive CD8+ T cells. During the course of the disease, the occurrence of a sensorineural hearing loss (SNHL) is associated with a wide range of factors, including age, age of onset, gender, type and site of vitiligo, and disease duration.

Aims: To study sensorineural hearing loss in vitiligo patients.

Materials and Methods: This study was conducted in a tertiary care center over a period of one year. A total of 100 patients were included in the study after obtaining informed and written consent from each participant. The results of the audiometry tests were used to classify the patients into different categories of hearing loss based on the WHO classification system.

Results: The majority of cases with SNHL are observed in the 41-60 years age group, accounting for 66.7% of the total hearing loss cases. The younger age groups (1-20 years and 21-40 years) show significantly lower rates, 11.1% and 22.2% independently. More than 40 years of age at onset is linked with the development of disease, with male gender comprising 88.9% of the total cases, whereas in the females the numbers are as low as 11.1%.

The remarkable risk factors include younger male age group, later onset of the disease, involvement of the head and neck region with prolonged duration of the disease.

Conclusion: Preliminary screening and early detection of hearing loss in patients with vitiligo, its monitoring and active interventional planning is recommended for patients having the risk factors to expect the correct treatment and absolute reversal. All cases of vitiligo must be vigilantly screened for hearing loss for accurate and timely prevention as well as treatment.

1. Introduction

Vitiligo is a autoimmune skin disease caused by the autodestruction of melanocytes, that leads to the loss of skin color in the form of depigmented macules and patches.[1,2]

With an occurrence of around 0.5-2% amid the global population, with a exceptionally high incidence among teenagers and young adults.[2,3] The pathophysiology of vitiligo is cumbersome, surrounding genetic predilection with environmental triggers, and immune-mediated inflammation. Inclusively the factors cause the inevitable increase in the mortality of melanocytes by autoreactive CD8+ T cells.[2,4,5] Vitiligo is clinically diagnosed by clearly defined white patches that are confirmed using diagnostic equipment such as Wood's lamp.[3] Vitiligo's enduring

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https://doi.org/10.18231/j.ijced.2025.003

behaviour, withstanding the treatment, and substantial struggling of symptoms, a combination of medications that suppress the immune system and the application of phototherapy to promptly manage the condition.[2,3] Vitiligo has dominant psychosocial effect, with a unfavorable influence on patient's quality of life and mental health. There is a societal stigma affliated with the disease due to it's nature.[2]

The presence of melanin in the stria may have a protective function against potentially hazardous substances in the inner ear.[6] Otic melanocytes regulate the activity of Na+/K+-ATPase and potassium channels, which are essential for generating endocochlear potentials. Otic melanocytes transform energy levels into molecular rotation and vibration.[3] A great number of research have studied this correlation, yielding incongruous findings. A study conducted on 71 vitiligo patients showed no association between vitiligo and hearing loss as determined by pure tone audiometry (PTA).[7] In spite of that, several studies have showed that individuals with vitiligo may encounter decreased auditory sensitivity at higher frequencies and notable variations in vestibular function tests when compared to individuals without the condition. This suggests that there may be an association between vitiligo and auditory and vestibular impairments.[8] Moreover, a case-control research found a notable correlation between sensorineural hearing loss and the length of time that vitiligo perseveres. This indicates that the longer the condition lasts, the greater the chance of experiencing auditory impairment.[9] A study revealed a greater occurrence of hearing impairment and abnormalities in the eyes compared to individuals without the condition. This further supports the notion that vitiligo is a systemic disorder that impacts various organ systems, including the auditory system.[10] Vitiligo with it's propensity for loss of melanocytes in the inner ear, may hinder hair cell function and perhaps result in hearing loss. With two school of thoughts certain research may not establish a clear link, whereas siignificant data indicates the warrant for continuous vigilance in the vitiligo patient for assessment of hearing.

2. Materials and Methods

2.1. Study design

This study was conducted in a hospital setting over a one-year period at a specialised medical facility. The study comprised 100 participants who were diagnosed with vitiligo. Informed and written agreement was obtained from each participant. The study protocol received approval from the institutional ethical committee, guaranteeing compliance with ethical principles throughout the research process.

2.2. Inclusion and Exclusion criteria

Individuals of all genders and age groups who have been diagnosed with vitiligo were considered suitable for participation in the study. Individuals were enlisted from the outpatient department specialising in ear, nose, and throat (ENT) conditions. In order to preserve the accuracy of the study, participants who had other autoimmune disorders, cutaneous symptoms, or congenital malformations of the ENT system in addition to vitiligo were not included in the study. The meticulous screening process aided in isolating the impact of vitiligo on the auditory system, while eliminating the interference of other factors.

2.3. Data collection

A thorough historical analysis and meticulous examination were performed on all registered patients using a standardised questionnaire. The data collection approach involved documenting demographic data, medical background, and detailed information regarding vitiligo. Patients who reported a decline in their hearing got additional audiometric assessment using Pure Tone Audiometry (PTA). The audiometry test findings were utilised to categorise the patients into various levels of hearing impairment, including mild, moderate, moderately severe, severe, and profound, according to the categorization system established by the World Health Organisation (WHO).

2.4. Audiometric evaluation

The audiometric measurements were conducted in an acoustically isolated environment using a diagnostic audiometer with a single channel. Standard headphones were used to examine air-conduction thresholds in the range between 250 Hz to 8 kHz, whereas bone-conduction thresholds were tested in between 250 Hz to 4 kHz. By employing this dual technique, a thorough evaluation of auditory function was achieved, enabling precise categorization of hearing impairment in the patients.

2.5. Data analysis

The data collected was analysed using the Statistical Package for Social Sciences (SPSS) version 24.0. The demographic and clinical characteristics of the patients were summarised using descriptive statistics, which included frequencies and percentages. In order to assess statistical disparities, the ANNOVA test was utilised, where a p-value of less than 0.05 was deemed to be statistically significant. This comprehensive study facilitated the identification of any substantial correlations between vitiligo and hearing problems.

3. Result

The prevalence of sensorineural hearing loss (SNHL) varies across different age groups, with the highest incidence occurring in the 41-60 years age group, which accounts for 66.7% of all SNHL cases. This suggests a greater occurrence of hearing impairment in elderly individuals, which aligns with the common knowledge that age-related deterioration might impact one's ability to hear. The prevalence of sensorineural hearing loss (SNHL) is notably lower in the younger age groups, specifically 11.1% for persons aged 1-20 years and 22.2% for those aged 21-40 years. This indicates that hearing loss associated with vitiligo primarily affects older adults.

SNHL analysis in reference to the age at which first appearance of vitiligo is observed suggests that those who get vitiligo at a later stage in life (i.e. at or after the age of 40) have a much higher probability (44.4%) of SNHL. Next are those individuals who develop vitiligo between the ages of 31 and 40 (22.2%) and between the ages of 11 and 20 (22.2%). A significant connection was not established in Individuals who developed vitiligo in early childhood (1-10 years) or in between their twenties to thirties with sensorineural hearing loss (SNHL). This emphasizes the much prominent impact of vitiligo that develops later in life on auditory abilities.

Upon analyzing the gender of individuals in relation to chance of occurrence it reveals a significant disparity in the incidence of SNHL, with males representing 88.9% of the cases with SNHL, while the female individuals accounted merely 11.1%. This suggests a gender-based predominance where males with vitiligo are at a much higher risk of developing SNHL when compared to their female compeer. The reasons for this contrariety could be multifactorial, such as genetic and environmental influences that require more extensive study.

Most common type of vitiligo which is associated with SNHL has been found to be vitiligo vulgaris (44.4%), followed by acrofacial (22.2%), facial (11.1%), and acral (22.2%). Almost none of the SNHL cases were observed in patients with focal, mucosal, or segmental type of vitiligo. This very much suggests that more common forms of vitiligo (vulgaris, acrofacial and acral) are more likely to be associated with auditory pathologies, likely due to the significant melanocyte loss.

The region of vitiligo corresponds with the prevalence of SNHL as well. The highest incidence of SNHL is seen in patients with vitiligo lesions in the axial skeleton mostly in the head and neck region (33.3%), followed by patchy lesion in the lower extremities (22.2%), upper limb (22.1%), trunk (11.2%), and then on the mucosa (11.1%). Higher association of the head and neck region with SNHL maybe is due to their close vicinity to auditory structures, marking the importance of vigilant monitoring of hearing in these patients.

Examining the time duration of vitiligo, it is quite conspicuous that patients who have had the condition for a longer period (1-5 years) in their life are the most commonly affected group, which almost represents 35.2% of the cases. This is followed by patients with vitiligo duration of 1-6 months (23.1%), 5-10 years (18.7%), 6 months-1 year (12.1%), and those with the condition for more than 10 years (9.9%).

4. Discussion

Our study inference indicates that SNHL is most prevalent in the 41-60 years of age group, with an incidence of 66.7% of the cases within this category. This corresponds with the study by Prabha et al., which found that most of the SNHL cases were diagnosed in patients aged 41 to 60 years (63.6%), showing a higher risk of auditory abnormalities as the age increases.[11] Similarly, Salih et al. reported a statistically important difference in pure tone audiogram at higher frequencies between vitiligo cases and controls, peculiarly affecting adults in the older age group.[12] It also shows the association to age-related deterioration of auditory structures, which may be aggravated by the melanocyte deprivation in patients with vitiligo . The study by Shankar et al. also adds on a positive note to this, a notable correlation between age and auditory deficinecies in vitiligo patients.[13] Surprisingly, Sharma et al. did not find a proven age-related difference in SNHL prevalence, putting the need for further research to understand the impact of age on hearing loss in vitiligo.

Vitiligo with late onset (above 40 years) is associated with a higher incidence of SNHL (44.4%). Prabha et al. noticed almost very similar findings, with patients in older age group showing a higher prevalence of SNHL.[11] Ardic et al. in their study suggest that melanocytes play a prophylactic role in the inner ear, and their loss with time due to vitiligo may result in hearing impairment as well.[14] Study by Salih et al. noted that patients with vitiligo showed significant audiometric irregularities when compared to controls, showing the importance of considering age of onset in the monitoring in addition with the management of auditory state in vitiligo.[12]

The influence of delayed onset vitiligo on auditory outcome perhaps is due to the accruing effects of prolonged melanocyte erosion, which requires further investigation.

In this study conducted by us, patients that were mostly found with sensorineural hearing loss were males whereas the females getting affected by the same were much less in numbers which is very much similar to the observation made by Ardic et al in their study.[14] However it can be found in some studies which show exactly the opposite result with female patients being affected more with sensorineural hearing loss and in some with equal incidences.[15] Sharifian et al. reported a higher incidence of hearing loss in female vitiligo patients, which contrasts with

our findings and suggests that gender-related susceptibility to SNHL in vitiligo may vary across different populations.[16]

Vitiligo vulgaris, acrofacial, and acral types were more frequently associated with SNHL in our study. This is supported by Prabha et al.,[11] who found vitiligo vulgaris as the most usually occurring variant corresponding to SNHL. Similar observations were noted by[11] Salih et al with marked hearing ir-regularities in cases of vitiligo, although they did not differentiate between the varieties of vitiligo.[12] The study conducted by Hong et al. also shows a much higher occurrence of SNHL in cases with non-segmented vitiligo. This very well demonstrates that more extensive kind of vitiligo may present a potentially higher danger to auditory functioning. Generalized vitiligo as a risk factor[17] was identified by Sharma et al[15] and Mohamed et al.[18]

5. Conclusion

The phenomenon of SNHL in individuals with vitiligo is affected by various factors, such as age, age at which vitiligo first appeared, gender, type and location of vitiligo, and the length of time the disease has been present. Advanced age, delayed onset, male sex, various forms of vitiligo, involvement of the head and neck, and longer duration of the disease are notable risk factors for the development of sensorineural hearing loss (SNHL) in individuals with vitiligo. Patients displaying these risk factors should undergo regular auditory screening and get early intervention techniques to minimize the potential impact on hearing.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Cite this article: Shukla S, Saxena R, Suhag A, Rizvi S. Vitiligo patients experiencing sensorineural hearing loss: A single-center experience in a tertiary care centre. *IP Indian J Clin Exp Dermatol* 2025;11(1):22-25.