



Evaluation of relationship between skin involvement and hearing loss in patients with vitiligo

Ahmad Yeganeh Moghaddam¹, Mansour Sayyah², Elham Alian Fini³, Rezvan Talaei^{4*}

¹Department of Otolaryngology, Kashan University of Medical Sciences, Kashan, Iran.

²Trauma Research Center, Kashan University of Medical Sciences, Kashan, Iran.

³Faculty of Medicine, Kashan University of Medical Sciences, Kashan, Iran.

⁴Autoimmune Diseases Research Center, Department of Dermatology, Kashan University of Medical Sciences, Kashan, Iran.

Vitiligo is a common acquired depigmented disorder of the skin that can lead to social negative outcomes, including reduced quality of life. Melanocytes disorder can also occur within other organs, such as ear. Different areas of the inner ear, such as the cochlear duct and vestibular system, have melanocytes. This study was conducted with the aim of evaluating the relationship between skin involvement and hearing loss in patients with vitiligo. This cross-sectional study was performed on 98 patients with vitiligo referring to the Dermatology Clinic of Shahid Beheshti Hospital of Kashan, Iran, in 2013. The skin involvement was evaluated using the Vitiligo Area Severity Index (VASI) by a dermatologist. Then, the patients were referred to an ear, nose, and throat specialist. The patients were subjected to audiometry, tympanometry, and auditory brainstem response (ABR). The inclusion criteria were age of 10-50 years without other underlying diseases and no causes of depigmentation and leukoderma. On the other hand, the patients with congenital hearing impairment and those taking ototoxic drugs, such as aminoglycosides, vancomycin, and thiazides, were excluded from the study. The severity of vitiligo did not have a statistically significant relationship with conductive hearing loss. Additionally, there was no correlation between vitiligo and sensory neural hearing loss. The clinical manifestation duration of vitiligo showed no significant relationship with conductive and sensory neural hearing loss. As the findings indicated, conductive and sensory neural hearing loss demonstrated no significant relationship with the incidence of clinical manifestation and extent of skin involvement.

Keywords: Vitiligo, Hearing loss, Audiometry

Introduction

Vitiligo is an acquired pigmentary disorder resulting from the progressive destruction of melanocytes. It is characterized by milky-white patches with circumscribed margins, which lead to several undesirable social outcomes for the patients, such as reduced quality of life [1]. The prevalence of the disease has been estimated as 1.8%, and Africa has been reported to the highest prevalence of this disease. Furthermore, this disorder more commonly occurs in females than in males [2].

Clinical manifestations of the disease appear in children and adolescents. The upper extremities are reported as the most commonly affected areas [3,4]. Although vitiligo is a disease with an unknown etiology, it may be stimulated by a

number of factors, including sunburn and exposure to phenolic chemicals that cause an imbalance in the oxidant and antioxidant system in melanocytes [5].

Melanocytes produce melanin, which is a pigment found in the skin, hair follicles, eyes, bones, heart, brain, and inner ear [6]. Melanocytes are present in different areas of the inner ear, such as cochlear ducts and vestibular system [7,8]. Any disorders in these pigments can lead to inner ear dysfunction [9]. Based on the evidence, the incidence of the cochlear disorder was considerable in vitiligo patients with a preponderance of male [10]. In a study that involved the evaluation of the internal ear function of 20 patients with Vogt-Koyanagi-Harada disease, a melanocyte ester related autoimmune disorder, the internal ear involvement was demonstrated to have a very high incidence in this autoimmune disease.

Given the important role of melanocytes in the regulation of both auditory and equilibrium

* Corresponding author: **Rezvan Talaei**, Associate Professor, Autoimmune Diseases Research Center, Department of Dermatology, Kashan University of Medical Sciences, Kashan, Iran.
E-mail: talaeirezvan@gmail.com

functions of the inner ear, the autoimmune disorder of these pigments impairs the inner ear function [11]. Waardenburg syndrome, as a kind of pigmented disorder, is also associated with sensory hearing loss [12]. In another study, it was found that hearing loss was very common in patients with Waardenburg syndrome.

Furthermore, abnormalities in the temporal bone were observed in all patients with hearing impairment and Waardenburg syndrome [13]. Additionally, hearing loss is reported to be common in patients with systemic lupus erythematosus autoimmune disease [14]. Given the impairment in melanocytes function and the subsequent impairment in melanin production in vitiligo, inner ear melanocyte dysfunction can also affect the function of the inner ear and cause hearing loss.

The early diagnosis of these disorders in the early stage can prevent their progression, help improve auditory function, and prevent hearing loss in these patients. With this background in mind, the present study was conducted to investigate the relationship between skin involvement and hearing loss in patients with vitiligo.

Materials and Methods

This cross-sectional study was performed on 98 vitiligo patients who referred to the Dermatology Clinic of Shahid Beheshti Hospital in Kashan, Iran, during 2012-2014. The diagnosis of the disease and evaluation of skin involvement extent were performed by a dermatologist using Vitiligo Area Severity Index (VASI). In the VASI scale, the percentage of skin involvement in vitiligo is calculated in terms of hand units.

In this regard, one hand unit is approximately equal to 1% of the total body surface area. On the other hand, the amount of depigmentation was calculated as 100%, 90%, 75%, 50%, 25%, and 10% for complete depigmentation, no pigment is present, specks of pigment present, depigmented area exceed the pigmented area, pigmented and depigmented areas are equal, pigmented area exceeds depigmented area and only specks of depigmentation present, respectively.

Total body VASI score was calculated using the following formula:

$$\text{VASI} = \sum S \text{ All Body Site [Hand units]} \times [\text{Residual Depigmented}]$$

The VASI scores of 1-25%, 26-50%, 75-51%, and 76-100% were considered as mild, moderate, severe, and serious involvements, respectively. The patients were then referred to an otolaryngologist for otoscopic examination.

Moreover, the patients who were healthy underwent audiometry (to investigate conductive hearing loss), tympanometry, and auditory brainstem response (ABR) (to investigate the sensory-neural hearing loss). The participants who had hearing impairment were divided into four levels of mild, moderate, severe, and deep. Furthermore, pure tone audiometry (PTA) was performed on ABR patients to confirm the accuracy of the results.

The patients aged 10-50 years without any underlying diseases or the depigmentation and leukoderma caused by vitiligo were included in the study. On the other hand, the exclusion criteria were congenital hearing impairment and history of ototoxic drug intake, such as aminoglycosides, vancomycin, and thiazide. The study protocol was approved by the Ethics Committee of Kashan University of Medical Sciences, Kashan, Iran. Additionally, written informed consent was obtained from all participants. Data analysis was performed in SPSS version 18. The data were presented as mean and standard deviation. The Chi-square and Mann Whitney U tests were applied to investigate the relationship between qualitative data. P-value less than 0.05 was considered statistically significant.

Results

This study was performed on 98 patients with vitiligo. Table 1 presents the demographic and clinical characteristics of the patients. The mean age of the patients was 25.98±0.96 years. According to the results, 67 (68.4%) subjects were female. In this study, 19 (19.4%) subjects had thyroid disease. Furthermore, 9 (9.2%) and 4 (1.4%) cases had conductive hearing loss and neural hearing loss, respectively. Additionally, 9 (9.2%) and 4 (1.4%) patients were detected with audiometric disorder and abnormal ABR, respectively. The level of both mentioned disorders were reported as mild.

Based on the results of logistic regression analysis, hearing loss showed no significant relationship with gender, skin involvement, duration of clinical manifestation, thyroid disease, family history, and age ($P > 0.05$) (Table 2). Likewise, ABR demonstrated no significant relationship with gender, skin involvement, duration of clinical manifestation, thyroid disease, family history, and age ($P > 0.05$) (Table 3).

Table 1. Demographic and clinical specifications of the samples

Gender	Female	67	4.68%
	Male	31	6.31%
Education	Illiterate	4	7.3%
	Elementary school	23	5.23%
	Junior high school	20	4.20%
	Senior high school	30	6.30%
	Academic education	21	4.21%
Thyroid disease	Yes	19	4.19%
	No	79	6.80%
Conductive hearing loss	Yes	9	2.9%
	No	89	8.90%
Sensory hearing loss	Yes	4	9.95%
	No	94	1.4%

Discussion

The destruction of melanocytes in vitiligo results in the absence of melanin, and therefore the inner ear dysfunction. This disease affects endolymph calcium homeostasis and cochlear function [9, 15]. The aim of this study was to determine the relationship between the extent of skin involvement and hearing loss severity in patients with vitiligo. Based on our results, hearing loss demonstrated no significant relationship with gender, skin involvement extent, duration of clinical manifestation, thyroid disease, family history, and age. Moreover, no significant association was observed between ABR as a consequence of the disease and the abovementioned variables.

In line with our findings, Fleissig et al. (2013) reported no relationship between the extent of skin involvement and hearing loss in vitiligo patients [16]. In a study performed on two groups of patients with vitiligo and healthy subjects, it was demonstrated that the auditory frequency was not different between the two groups [17]. In another study, the rate of hearing loss was found to have no relationship with age and duration of the disease [18].

The results of a study investigating patients with vitiligo revealed that these patients had lower hearing thresholds than healthy subjects. In the mentioned study, the vitiligo patients showed a decrease in peak I and an increase in wave I and III, compared to the control group. Furthermore, the vitiligo patients were reported to have a significant increase in the action potentials in the left ear, in comparison with the healthy subjects [19].

In a study carried out by Aslan et al., 22 patients with vitiligo were compared with 22 healthy individuals of the same age and gender in terms of auditory threshold. They observed that

hearing threshold was significantly lower in patients with vitiligo than in the healthy controls. Additionally, the patients with vitiligo were reported to have a significantly lower hearing loss threshold at high frequencies, compared to the control group [20].

Based on the evidence, men with vitiligo are more susceptible to hearing loss than women [21]. In another study, hearing impairment was reported to be significantly prevalent in patients with vitiligo [16]. Arya et al. found that patients with vitiligo have a decline in cochlear function, and consequently hearing impairment. Therefore, they recommended a complete auditory monitoring for these patients [22].

Conclusion

The findings of the present study revealed no significant relationship between the extent of skin involvement and hearing loss severity in vitiligo patients. It is recommended to perform further studies with a larger sample size. Additionally, it is suggested to conduct cohort studies for better assessment of auditory function in vitiligo patients.

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Conflicts of interest

None declared.

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