

Clinical Analysis of Hearing Level in Vitiligo Patients – A Study in A Tertiary Care Centre

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Abstract :

Background: Vitiligo is a progressive depigmenting cutaneous disorder, resulting from the loss of melanocytes. In the inner ear, melanocytes are believed to play an important role in development and normal functioning of stria vascularis. Acoustic abnormalities in vitiligo patients remain obscured for long durations. This study was carried out to determine the presence of subclinical sensorineural hypoacusis in vitiligo patients, if any, in comparison with controls and to detect any relevant demographic or clinical finding characteristic of hypoacusis in vitiligo patients.

Methods: A prospective case control study was undertaken in 100 vitiligo patients (case group), who were compared with another 100 age and sex matched healthy volunteers (control group). All cases underwent detailed ENT and dermatological examination and were subjected to tests like pure tone audiometry, transient evoked otoacoustic emission (TEOAE).

Results: A statistically significant , higher average pure tone hearing threshold was noted in vitiligo patients in comparison with the control group.

Conclusion: Vitiligo is associated with subclinical sensorineural hypoacusis. Pure tone audiometry and TEOAE can be effectively used to assess and follow up vitiligo patients for asymptomatic subclinical sensorineural hypoacusis.

Keywords: Audiometry, Hypoacusis, Melanocyte, Vitiligo

I. Introduction

Vitiligo is a progressive depigmenting cutaneous disorder. Various theories explaining the probable pathomechanism have been proposed, like genetic, autoimmune, neural and autocyctotoxic hypothesis.¹ There is an increasing argument that describes vitiligo as a systemic disorder and not merely a pure cutaneous disorder². These arguments are based upon the finding of several auditory, ocular and neurological abnormalities in vitiligo patients³⁻⁵. Hence a theory of 'melanocyte organ' has been hypothesized, which entails simultaneous destruction and loss of melanocyte function in skin and other organs.⁶

Melanocytes located in retinal pigmentepithelium, uveal tract, leptomeninges and inner ear may also be affected. In the inner ear, melanocytes are believed to play an important role in development and normal functioning of stria vascularis. Their role in endocochlear electrophysiology has been stated. Association of acoustic abnormalities with certain hypopigmentary disorders like Wardenburg's syndrome, Albinism, Alzendrini syndrome and Vogt-Koyanagi-Harada syndrome has been described. White and black skinned individuals differ in levels of noise induced hypoacusis, owing to the quantitative differences in pigment cells in inner ear. Acoustic abnormalities in vitiligo patients remain obscured for long durations.

Numerous reports elucidating the association of sensorineural hearing loss with vitiligo have come up in recent years. Therefore a case control study using conventional audiological tests was carried out to explore this proposed association. To prove the hypothesized association of hypoacusis in vitiligo patients, a prospective case control study was carried out.

II. Aims And Objectives

1. To determine the prevalence of subclinical sensorineural hypoacusis in vitiligo patients, if any, in comparison with controls.
2. To detect any relevant demographic or clinical finding characteristic of hypoacusis in vitiligo patients.

III. Material And Methods

With prior Institutional ethical committee approval, a prospective case control study was undertaken in 100 patients (case group) , who were compared with another 100 age and sex matched healthy volunteers (control group), who fitted well with the inclusion and exclusion criteria's from 1st July 2015 to 30th June 2016 at ENT department of Gauhati medical college and hospital, Guwahati.

Vitiligo patients were randomly recruited from patients who were referred from dermatology department of the same hospital. A fully informed written consent was obtained from all the study subjects (both case and control group) following a detailed discussion about the study purpose and involved methodology.. All patients underwent a dermatological examination to determine the site of first appearance, type, distribution of vitiligo spots, treatment received and its co-existence in other family members. Demographic details and clinical profile of all patients were obtained from hospital history sheet and were recorded on a predesigned proforma Considering the varied causes which may amount to hearing loss, the selection of study cases was based on following criteria:

1) Inclusion criteria-

--Vitiligo patients without any age and sex bias

2) Exclusion criteria –

- Hearing loss due to a known cause (drug induced, noise induced, trauma, otitis media, barotrauma, ear surgery, meningitis, Meniere's disease, labyrinthitis)
- Autoimmune/neurological/vascular/metabolic disorders
- Familial hypoacusis
- Systemic disorders- diabetes mellitus, hypertension

Audiological test battery-

All patients underwent complete ENT examination

- 1) Tuning fork tests
- 2) Pure tone audiometry
- 3) Tympanometry,
- 4) Speech reception threshold evaluation
- 5) Transient evoked otoacoustic emission (TEOAE).

Audiological parameters-

The conducting audiologist was unaware of the allotted patient group.

- Average pure tone hearing threshold (APT-HT) for frequencies (250–8000 Hz) were calculated for both ears in each patient.
- We used the following scale of degree of hearing loss:
 - minimal >16–25 dB;
 - mild >25–40 dB;
 - moderate >40–55 dB;
 - moderate to severe >55–70 dB;
 - severe >70–90 dB, and
 - profound >90 dB hearing loss (Clark, 1981).
- Transient Evoked Otoacoustic Emissions (TEOAE's) were recorded. The amplitude of TEOAE's in three frequency bands (1, 2, 3 KHz) was analyzed and reproducibility percent were recorded.
- All the data collected was analyzed statistically using a two tailed student's- t test. A p value of 0.05 or less was considered statistically significant.

IV. Results And Observations

1) Sensorineural Hypoacusis-

	CASES	CONTROLS
Sn Hypoacusis Present	22	5
Sn Hypoacusis Absent	78	95

Table 1: Sensorineural (Sn) Hypoacusis In Vitiligo In Cases And Controls

SN hypoacusis was detected in 22 patients in the vitiligo patient group and 78 subjects in the control group. The difference is statistically significant (p value 0.0001, by Fischer's exact test).

2)Degree Of Hearing Loss-

Degree Of Deafness	Vitiligo Patients	% Of 56
Mild	14	63.63
Moderate	3	13.63
Moderately Severe	2	9.09
Severe	2	9.09
Profound	1	4.54
Total	22	100

Table 2 : Break Up Of Patients With Sn Hypoacusis According To Degree Of Deafness

Above table shows that mild degree of hearing loss was most frequently encountered in vitiligo patients(63.63%).

2) Auditory Frequency Affection-

Table 3 : Frequency Of Sound At Which Maximum Sn Hypoacusis Was Detected

Above table shows that most commonly high frequency sound waves were affected in sensorineural hypoacusis in vitiligo cases(81.81%).

Frequeuncy Of Max Sn Hypoacusis	Cases
Low Frequency (250 -500 Hz)	1(4.54%)
Mid Frequency (500 Hz -4khz)	3(13.63%)
High Frequency (4-8 Khz)	18(81.81%)
Total	22

5)Age And Sex Distribution-

Age Group(Years)	Total Number Of Cases	Cases With Hypoacusis	Cases Without Hypoacusis
0-9	19	3	16
10-19	11	1	10
20-29	27	3	24
30-39	17	5	12
40-49	14	4	10
50-59	5	3	2
60-69	5	2	3
70-79	1	1	0
80-89	1	0	1
Total	100	22	78

Table 4 : Sn Hypoacusis In Relation To Age At Presentation Of Vitiligo

Above table shows that most cases of SN hypoacusis were detected in age group 20-50 years(58%).

Vitiligo Patients	With Hypoacusis	Without Hypoacusis	P.0.05
Male	12	37	
Female	10	41	

Able5 : Sensorineural Hypoacusis In Relation To Sex

Of the 22 vitiligo patients with SN hypoacusis, 12 (54.54%) were males and 10 (45.45%) were females. In 78 vitiligo patients without SN hypoacusis, 37 (47.43%) were males and 41 (52.56%) were females. The difference is not statistically significant (p value 0.6543, by Fisher’s exact test).

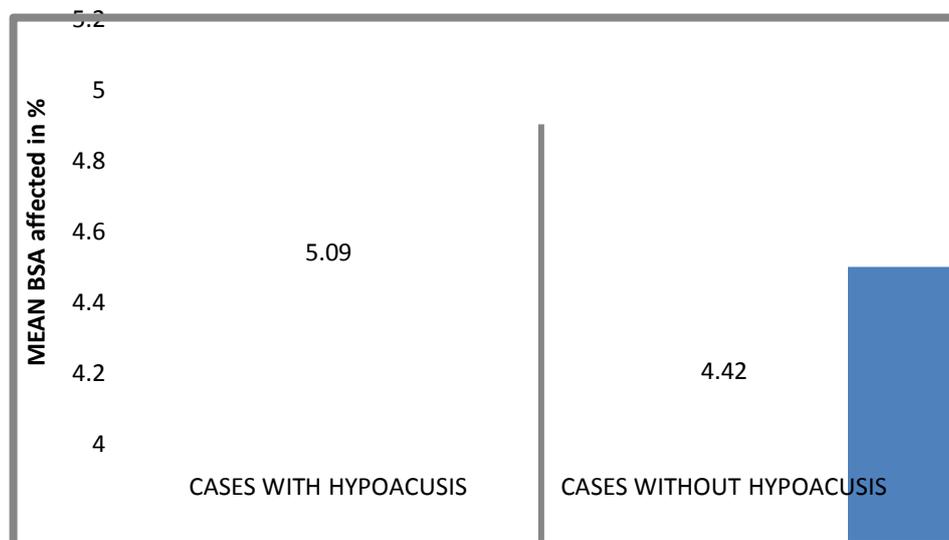
6)Type Of Vitiligo And Sensorineural Hypoacusis-

Type Of Disease	With Hypoacusis	Without Hypoacusis
Vitiligo Vulgaris	13(59.09%)	42(53.84%)
Acrofacial Vitiligo	2(9.09%)	4(18.18%)
Universal Vitiligo	0(0%)	1(4.54%)
Focal Vitiligo	4(18.18%)	18(23.07%)
Segmental Vitiligo	1(4.54%)	3(3.84%)
Mucosal Vitiligo	2(9.09%)	10(12.82%)
Total	22	78

Table6 : Sensorineural Hypoacusis In Relation To Type Of Vitiligo

Above table shows that most common type of vitiligo associated with hypoacusis was Vitiligo vulgaris(59.09%).

Graph: Sensorineural Hypoacusis In Relation To Extent Of Body Surface Area Involvement By Vitiligo



The mean body surface area involvement in the 22 vitiligo patients with SN hypoacusis was 5.09+_{1.62} (MEAN +_{SEM}) and in the 78 vitiligo patients without SN hypoacusis was 4.42+_{0.73} (MEAN+_{SEM}). The difference is statistically not significant (p value 0.6819, unpaired t test).

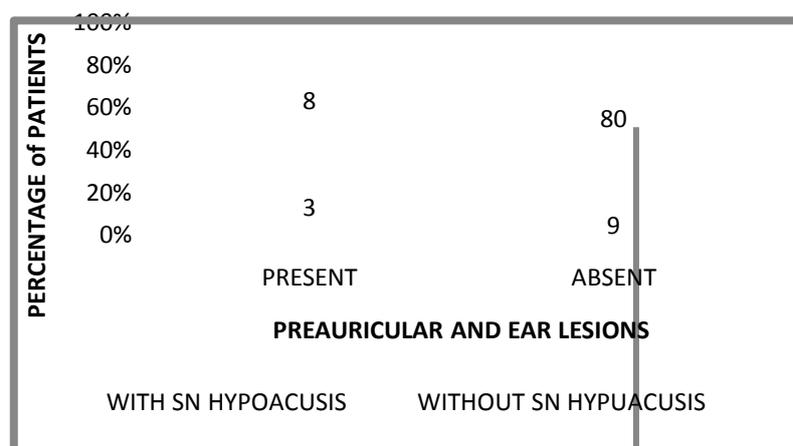
Vitiligo Patients	Leucotrichia Present	Leucotrichia Absent	Total
With Sn Hypoacusis	5(22.72%)	17(77.27%)	22
Without Sn Hypoacusis	19(24.35%)	59(75.64%)	78

7) Relation With Leucotrichia -

Table 7 : sensorineural hypoacusis in relation to presence of leucotrichia:

Of the 22 vitiligo patients with SN hypoacusis 5(22.72%) had leucotrichia and of the 78 vitiligo patients without SN hypoacusis 19(24.35%) had leucotrichia. The difference is not statistically significant (p value 0.6005, by Fishers’s exact test).

8) Sensorineural Hypoacusis In Relation To Presence Of Lesions On The Ear And Periauricular Area:



The difference is not statistically significant (p value 0.3347, by Fisher,s exact test).

V. Discussion

The present study has been undertaken to determine the association of the disease with hearing function.

Association Of Vitiligo With Audiological Defects

In our study, 22 patients with vitiligo and 5 subjects in the control group were detected to have sensorineural hypoacusis, the difference was statistically significant (p value 0.0001). Sensorineural high hypoacusis has been reported in 4-18.9% of patients with vitiligo¹¹⁻¹². The Iranian study reported much higher frequencies because of the basis of difference in the skin type as it was suggested that black skinned persons are less commonly affected by noise induced hypoacusis than are white skinned persons.

These findings are in accordance with our observation as well. The higher prevalence of hypoacusis found in our study as compared to the Indian studies could be because, unlike those studies, our study comprised of patients in extremes of ages as well, thus age related hearing loss might contribute to the overall prevalence of hypoacusis in vitiligo. But as our control group was age matched and hypoacusis was detected statistically significant, so other than age it was the presence of vitiligo in the case that influenced the hearing.

Degree Hearing Loss In Vitiligo Patients With Hypoacusis

The pioneer study in this respect found all of its patients to suffer from minimal to moderate deafness¹³. Indian studies reported 66.66% and 61.88% patients to suffer from mild hearing loss while the rest of the patients had moderate degree of hearing loss.

In our study most commonly 14 patients (63.63%) were found to have mild degree of hearing loss.

Frequencies Of Sound Of Maximum Sensorineural Hypoacusis

In our study, frequencies of sound of maximum sensorineural hypoacusis with maximum hearing loss at high frequency was found in 18(81.81%) cases, at mid frequency in 13.61% and at low frequency of sound in 4.54%. Other previous studies also found a maximum number of their vitiligo patients having hearing loss at high frequency¹². Hence suggesting that the basal turns of cochlea are probably affected more in vitiligo.

Age At Presentation Of Vitiligo Patient With Hypoacusis

In our study the mean age at presentation of vitiligo patients with hypoacusis was 39.17+₋ 2.26 years and of vitiligo patients without hypoacusis was 27.01+₋ 1.20 years. The difference was statistically significant (p,0.05). The minimum age of which hypoacusis was recorded in the cases was 2.9 years and the maximum age was 70 years. Also, hypoacusis was found significantly higher in the older age group in our study. However, previous studies did not observe any association between age and hypoacusis in vitiligo¹¹. The association in our study could be attributed to the fact that the present study also included in the extremes of ages unlike the previous studies.

Duration Of Illness Of Vitiligo Patients With Hypoacusis

There was no significant difference noted in the mean duration of illness between vitiligo patients having hypoacusis and those not having hypoacusis. However, 62.5% patients suffered from vitiligo for less than 5 years and 37.5% patients suffered from vitiligo for 5 years or more which was found to be statistically significant when compared to vitiligo patients without sensorineural hypoacusis, implying that patients with longer duration of vitiligo tended to live more audiological abnormalities. Previous authors have stated that hypoacusis in vitiligo was not related to the duration of the disease¹², which is in contrast to our finding. Our findings are in agreement with Aslan and colleagues¹⁴, Ardie and colleagues, who found a statistically significant association between the duration of vitiligo and hearing loss.

Gender Association Of Vitiligo Patients With Hypoacusis

In our study among the vitiligo patients with SN hypoacusis, 54.54% were males and 45.46% were females and it was found that there was no significant difference of audiological abnormalities in vitiligo patients in relation to sex. Also Sharma et al, Al-Mutairi et al found no relation to sex like ours.

Type Of Vitiligo In Vitiligo Patients With Hypoacusis

Al-Mutairi et al found hypoacusis distribution among all clinical types of vitiligo. Our finding being consistent with this report which could also be due to greater proportion of localized cases detected in our study because of early reporting of cases due to increased concern of the disease.

Body Surface Area In Vitiligo Patients With Hypoacusis In Our Study

In our study no statistical significance difference was found between the involvement of the body surface area in vitiligo patients with hypoacusis and those without hypoacusis, as the mean body surface area involvement in vitiligo patients with SN hypoacusis was 5.09+₋ 1.62 and in vitiligo patients without SN hypoacusis was 4.42+₋ 0.73 with p>0.05. Similarly no such relation was detected by an Indian author earlier consistent with our finding.

Leucotrichia In Vitiligo Patients With Hypoacusis

There was no association detected between vitiligo patient with SN hypoacusis and leucotrichia as 22.72% case with hypoacusis had leucotrichia and 24.35% cases without SN hypoacusis had leucotrichia, the difference between statistically not significant ($p > 0.05$). Maheswari et al noticed that all these case of sensorineural hypoacusis had leucotrichia and thought that probably leucotrichia could be a marker for suspecting hypoacusis in vitiligo patients¹⁵.

Ear/Periauricular Vitiligo And Sensorineural Hypoacusis

In our study while deriving the relation between hypoacusis in vitiligo patients with vitiligo lesions on ear and periauricular area, no significant association was found as 3 cases with SN hypoacusis had ear and / or periauricular lesion, while 8 case without SN hypoacusis also had lesions on the ear and/or periauricular area ($p > 0.5$). Maheswari et al reported vitiligo originating at the head and neck region was strongly associated with hypoacusis (54.55%, 6 of 11 cases) but no specific mention of periauricular area was made¹⁵.

VI. Conclusion

Vitiligo is not merely a cutaneous hypopigmentary disorder but is also responsible for subclinical sensorineural hypoacusis. a statistically significant correlation was found between SN hypoacusis and age at presentation, duration of illness. Whereas no correlation was found with the other factors like gender, clinical type, body surface area, leucotrichia and ear/periauricular vitiligo.

It is probably related to the loss of protective function of melanocytes in inner ear, synchronous with cutaneous hypopigmentation. Pure tone audiometry and TEOAE can be effectively used to assess and follow up vitiligo patients for asymptomatic subclinical sensorineural hypoacusis. These patients should be appropriately informed regarding the associated risk with noise exposure and use of ototoxic drugs.

References

- [1]. Alkhateeb A, Fain PR, Thody A, Bennett DC, Spritz RA. Epidemiology of vitiligo and associated autoimmune diseases in Caucasian probands and their families. *Pigment Cell Res.* 2003;16:208-214.
- [2]. Mills MD, Albert DM. Ocular and otic findings in vitiligo. In: Hann SK, Nordlund JJ, eds. Oxford: Blackwell Science Ltd.;2000:81-8.
- [3]. Sharma L, Bhawan R, Jain RK. Hypoacusis in vitiligo. *Indian J Dermatol Venereol Leprol.* 2004; 70:162-4.
- [4]. Cowan CL Jr, Halder RM, Grimes PE. Ocular disturbances in vitiligo. *J Am Acad Dermatol.* 1986; 15:17-24.
- [5]. Ozuer MZ, Sahiner T, Aktan S. Auditory evoked potentials in vitiligo patients. *Scand Audiol.* 1998; 27:255-8
- [6]. Ortonne JP, Bose SK. Vitiligo: where do we stand? *Pigment Cell Res.* 1993;6:61-72.
- [7]. Daneshpazhooh M, Mostofizadeh GM, Behjati J, Akhyani M, Mahmoud ROBATI R. Anti thyroid peroxidase antibody and vitiligo : a controlled study. *BMC Dermatol* 2006; 6:3.
- [8]. Kenny, J.A.Jr. Vitiligo. *Dermatol Clin.* 1988;6:425-434.
- [9]. Grimes PE Vitiligo. An overview of therapeutic approaches. *Dermatol Clin.* 1993 Apr;11(2):325-38.
- [10]. Lerner AB, Nordlund JJ. Vitiligo. What is it? Is it important? *JAMA* 1978;239:1183-87.
- [11]. Tosti A, Bardazzi F, Tosti G, Monti L. Audiologic abnormalities in cases of vitiligo. *J Am Acad Dermatol* 1987;17:230-3.
- [12]. Gopal K, Rama Rao GR, Kumar YH, AppaRao MV, Vasudev PS. Vitiligo: A part of a systemic autoimmune process. *Indian J Dermatol Venereol Leprol* 2007;73(3):162-165.
- [13]. Al-Mutairi N, Al-Sebeih KH. Late onset vitiligo and audiological abnormalities: Is there any association?. *Indian J Dermatol Venereol Leprol* 2011;77:571-6.
- [14]. Aslan S, Serarslan G, Teksoz E, Dagli S. Audiological and transient evoked otoacoustic emission findings in patients with vitiligo. *Otol Head Neck Surg* 2010;142(3):409-14.
- [15]. Maheswari A, Panigrahi R, Mahajan S. Vitiligo associated hypoacusis : a case control study. *Int J Otolaryngology Head Neck Surgery* 2016;2:77-81.