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ORIGINAL ARTICLE

Association of iris pigmentation with hearing disorders in patients presenting at a tertiary care hospital of Punjab, Pakistan.

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ABSTRACT… Objective: Hearing disorders are very common these days due to increasing noise pollution. Iris color is due to that melanin pigment. As in Pakistan, people having dark eye colors are common. Melanin is involved in the hearing because cochlear melanocytes are involved in generating endo cochlear potential that helps in hearing. Hence eye color may be associated with hearing loss due to melanin pigment. **Study Design:** Cross-sectional study. **Setting:** Department of Physiology, Sahiwal Medical College, Sahiwal. **Period:** 11 June to 16 July 2022. **Material & Methods:** Convenient sampling technique was used. Patients with hearing disorders at OPD of Sahiwal teaching hospital were included in our research. **Results:** During the study period, 86 patients visited the STH as cases valid for this study. Majority of the patients (93.02%) had a darker iris and only a small number of them (4.65%) had a fair iris color. The middle ear disorders were the most common in the patients prevailing in 47.67% of the patients flowed by outer ear issues in 45.35% patients and the inner ear issues were less prevalent fount in only 6.98% patients. In 39.53% patients have issues in there both ears simultaneously. Though the statistical significance was not found between iris color and hearing disorder (p=0.904), yet it (iris color) was statistically significant with the age groups of the study population (p=0.004). **Conclusion:** There is no association between Iris color and hearing disorders.

Key words: Iris Color, Hearing Disorders, Melanin.

INTRODUCTION

Hearing disorders are very common these days due to increasing noise pollution.[1] There are three main types of hearing loss: sensorineural, conductive, and mixed hearing loss. Hearing disorders can be related to the inner ear, middle ear, or outer ear.[2] Outer ear disorders include foreign bodies occlusion, external otitis, exostosis, furuncle, etc. Middle ear disorders include otitis media usually. Inner ear disorders include tinnitus, AIED, etc. Ear wax is the most common problem in Pakistan. Melanin is a substance in the body that produces hair, eye, and skin pigmentation.[3]

Iris color is due to that melanin pigment. Genetics and the environment have an impact on iris color. As in Pakistan, people having dark eye colors are common, while in western countries, light eye color is common.[4] Eye color may be associated with hearing loss due to melanin pigment. Melanin is involved in the hearing because cochlear melanocytes are involved in generating endo cochlear potential that helps in hearing. E.A. Da Costa, J.C Castro and M.E.G.[5] Macedo in Brazil 2008 studied the association between iris pigmentation and noise induced hearing loss.[6] But such study has not been yet conducted in Pakistan.

MATERIAL & METHODS

This cross-sectional study was conducted at the Physiology department of Sahiwal medical College, Sahiwal from 11 June to 16 July 2022. The sampling technique was convenient. Sample size formula for cross-sectional study was used from an online source.

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$$N = \frac{z^2_{\alpha/2} * p * (1-p) * DEFF}{d^2}$$

N = 83

Patients with hearing disorders at OPD of Sahiwal teaching hospital were included in our research after approval from ethical committee (1289/SLMC/SWL). Patients with disorders of the nose and throat and combined disorders of the ear with nose and throat were excluded. With the informed consent of patients, forms were filled in hard copy and online (via Google Form) as well. Demographic statistics for the qualitative variable were collected by frequency and percentages while that of a quantitative variable was calculated as mean and standard deviation. Inferential statistics were also calculated by using SPSS 26. P value< 0.5 was taken as statistically significant.

RESULTS

During the study period, 86 patients visited the STH as cases valid for this study: 37 males and 49 females. The female patients were 32.43% more prevalent as compared to male patients, Table-I.

Largest proportion of the patients (41.68%) observed during this study had their ages between 20 and 45 years, followed by 38.37% patients with their age <20 years, 10.47% having age between 46 to 60 year and only 6.98% patients had their age above 60, Table-I. The age data were missing for two of the 86 patients.

With respect to the skin tone, the patients were categorized as dark, fair, and brown. Out of 86 patients, 52 (60.47%) had a brown, 21 (21.42%) had fair and 13 (15.12%) had a dark skin tone. Forty-six patients (53.49%) belonged to an urban and 40 patients (46.51%) belonged to a rural background, Table-I. None of the patients was using contact lenses.

The therapeutic and physical variables have been summarized in Table-II. Thirteen (15.12%) out of 86 patients had a history of using drugs and 72 of them (84.72%) were not in use of drugs whereas such data were missing for one patient. Majority of the patients (93.02%, N=80) had a iris and only a small number of them (4.65%, N=4) had a fair iris color. The eye color data were missing for two of the patients.

Category	Frequency	Comparison
Gender		
Male	37 (43%)	-
Female	49 (57%)	+32.43%
Age Group		
<20	33 (38.37%)	+450%
20-45	36 (41.86%)	+500%
46-60	9 (10.47%)	+50%
>60	6 (6.98%)	-
Valid Total	84 (97.67%)	
Data missing	2 (2.33%)	
Skin Color		
Dark	13 (15.12%)	-
Fair	21 (24.42%)	+61.54%
Brown	52 (60.47%)	+300.00%
Background		
Urban	46 (53.49%)	+15%
Rural	40 (46.51%)	-

Table-I. Demographic and social variables (N=86).

The middle ear disorders were the most common in the patients prevailing in 47.67% (N=41) of the patients flowed by outer ear issues in 45.35% patients (N=39) and the inner ear issues were lest prevalent fount in only 6.98% patients (N=6). In 39.53% patients (N=34) have issues in there both ears simultaneously. While having issues with one ear only, the right ear issues were more prevalent, in 31.40% cases (N=27) followed by issues in the left ear only, in 29.07% cases (N=25), Table-II.

Variable	Frequency	Proportion	Comparison
Drug Use			
Yes	13	15.12%	-
No	72	84.72%	+353.84%
Data missing	1	1.16%	-
Iris Color			
Dark	80	93.02%	+1900%
Fair	4	4.65%	-
Data missing	2	2.33%	-
Hearing Disorder			
Outer ear issues	39	45.35%	+550%
Middle ear issues	41	47.67%	+583%
Inner ear issues	6	6.98%	-
Diseased Ear			
Right ear only	27	31.40%	+8%
Left ear only	25	29.07%	-
Both ears	34	39.53%	+36%

Table-II. Therapeutic and physical variables for 86 patients

Collectively, the hearing disorders x iris color cross tabulation indicated that 97.30% (N=36) outer ear issues were found among the patients with a dark iris color and only 2.70% (N=1) patients with outer ear issues had a fair iris color, Table-III (A). Similarly, 92.68% (N=38) patients with middle ear disorder had a dark iris color and only 7.32% (N=3) of them had a fair iris color. All the six patients having inner ear issue had a dark iris color, Table-III (A). The higher χ^2 value of 0.539 indicates that there has been no statistically significant association between the hearing disorders and the iris complexion.

The diseased ear and iris color data has been cross tabulated in Table-III (B). Twenty five of the 26 patients (96.15%) and 24 of the 25 patients (96%) suffering from the right and left ear disorders respectively had a dark iris. One each of the two patients, 3.85% and 4%, suffering respectively from the right and left ear disorder had a fair iris color. Thirty-one and 2 of the 33 patients suffering from the affected hearing in both the ears simultaneously i.e., 93.94% and 6.06% respectively had a dark and fair iris color. The higher χ^2 value of 0.904 indicates that there has been no statistically significant association between the diseased ear and the iris complexion.

Note: The age groups and iris color, both are independent variables or in other words the iris color for a given patient is a permanent feature not associated with the age. Therefore, the statistically significant χ^2 will have a logical meaning in this case. Instead, an association should be calculated among the factor age group and the hearing disorder and the diseased ear because the age of a patient surely influences the haring ability.

DISCUSSION

We performed this study at 87 patients with purpose of verifying any association between iris pigmentation and hearing disorders. In our study, percentage of males is 43 and that of females is 57. Our study was in agreement with the study done by Hiba A Ali, Wafa and their colleagues ,where the frequency rate of external ear disease in females was 59.01% and in males was 40.9%, regarding gender distribution.[7] While the study performed by Ehsan F Hussein was not in correspondence with our study.[8] According to his study, percentage of males susceptible to ear infection was 57.142% and that of females was 42.857%.

The percentage of adults, aged 20-45 years suffering from hearing disorders was the highest (41.9%).

Variable	Dark	Fair	Total
	(A)-Hearing disorder x	**Iris color**	**(p value = 0.539)**
Outer ear issues	36 (97.30%)	1 (2.70%)	37 (100%)
Middle ear issues	38 (92.68%)	3 (7.32%)	41 (100%)
Inner ear issues	6 (100%)	0 (0%)	6 (100%)
Total	**80 (95.24%)**	**4 (4.76%)**	**84 (100%)**
	(B)-Diseased ear x	**Iris color**	**(p value = 0.904)**
Right ear only	25 (96.15%)	1 (3.85%)	26 (100%)
Left ear only	24 (96.00%)	1 (4.00%)	25 (100%)
Both ears	31 (93.94%)	2 (6.06%)	33 (100%)
Total	**80 (95.24%)**	**4 (4.76%)**	**84 (100%)**
	(C)-Age groups x	**Iris color**	**(p value = 0.004*)**
<20	33 (100%)	0 (0%)	33 (100%)
20-45	33 (97.06)	1 (2.94%)	34 (100%)
46-60	8 (88.89%)	1 (11.11%)	9 (100%)
>60	4 (66.67%)	2 (33.33)	6 (100%)
Total	**78 (95.12%)**	**4 (4.88%)**	**82 (100%)**

Table-III. Variable cross tabulations, frequency (%age)

Adults suffer more from hearing disorders because they are more exposed to the noise pollution.[9] Research done by Hiba A Ali, Wafa and their colleagues also showed that adults (26-50 years) had higher rate of otomycosis.[7] While a study by David Ulrich Seidal, Simon Bode and their colleagues showed that older people suffer more from hearing disorders.[10]

Our study found a significant association between iris color and age groups with different hearing disorders. Patients with darker iris color were found to be in a younger age group than the older ones. Specifically, patients with brown iris color had a significantly higher prevalence of hearing loss compared to those with blue or green iris color ($p < 0.05$).

Our study provides evidence of an association between iris color and hearing loss in different age groups. These findings may have important implications for understanding the genetic and environmental factors that contribute to the development and maintenance of auditory function.[11] Further research is needed to explore the mechanisms underlying this association and to determine whether iris color can be used as a screening tool for identifying individuals at risk of hearing loss.[12]

CONCLUSION

Though the dark eyed persons were found to be having more hearing problems then the grey eyed yet there is no association between Iris color and hearing disorders.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Nauman Aziz	Supervision and Conception and design of work, results compiling.	
2	Muskan Shafique	Help in biostatsics and data analysis.	
3	Aman Mehboob	Revising it critically for important intellectual content.	
4	Azka Khan	Write-up of the article.	
5	Muhammad Junaid Iqbal	Analysis and interpretation.	
6	Muhammad Waseem	Final approval of the version to be published.	