DOI: 10.7860/JCDR/2022/60162.17138

Original Article

Ophthalmology Section

Prevalence of Congenital Colour Vision Deficiency in Belagavi, Karnataka, India: A Hospital-based Cross-sectional Study

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ABSTRACT

Introduction: Colour vision deficiency is a common ocular disorder, but it often goes unnoticed due to lack of awareness and screening programmes. If detected early in life, it can help people choose suitable career paths and genetic counselling can help reduce the birth of colour-blind children and future disappointments in life.

Aim: To determine the prevalence of congenital Colour Vision Deficiency (CVD) among the general population in Belagavi at a tertiary level hospital and to spread awareness regarding CVD.

Materials and Methods: This was a hospital-based cross-sectional study, conducted at Jawaharlal Nehru Medical College, Belagavi, Karnataka, India (tertiary care hospital), from February 2022 to July 2022. The study population constituted 3131 people who visited the Ophthalmology Outpatient Department for routine eye examinations. A detailed ophthalmological examination was done, and colour vision was tested using Ishihara's (38 plate) pseudoisochromatic test. Data was analysed using statistical software version 4.2.1 and Microsoft excel.

Results: The mean age of the study population was 40.74±15.86 years. The overall prevalence of congenital CVD was 150 (4.79%). The prevalence of congenital colour vision defects was 13 (0.9%) in females, and 137 (8.12%) in males (p-value <0.001). Deuteranomaly was the most common type of congenital CVD, found among 88 (58.67%), followed by protanopia among 28 (18.67%), followed by protanomaly and deuteranopia, each accounting for 17 (11.33%).

Conclusion: The prevalence of CVD among people belonging to the Belagavi district was remarkable. The prevalence rate was higher in males compared to females.

Keywords: Deuteranomaly, Ishihara's, Ocular disorder, Screening

INTRODUCTION

Colour Vision Deficiency (CVD) or colour blindness is the decreased ability or inability to distinguish different colours under normal illumination conditions [1]. A given colour is an admixture of the three primary colours in different proportion. Protan, deutan, tritan defects involve loss of L, M, S Cone functions, respectively. Each type of colour vision defect arises from rearranged deletions or mutations in the L, M or S photopigment encoding genes [2]. The human rhodopsin gene is present on chromosome 3, while the blue sensitive cone genes are present on chromosome 7 and red-green sensitive cones are located on the q arm of X chromosome [3]. If the ability to appreciate one or more primary colours is defective, the suffix used is anomalous and if absent, then the suffix used is anopia [4].

Colour vision deficiency can be congenital or acquired. Congenital CVD can be red-green (X-linked recessive) or blue-yellow (autosomal dominant). Acquired CVD can occur due to various reasons (ocular or neurological disease, drug toxicity or exposure to certain solvents) [5]. The incidence of CVD is different in different geographical locations and shows racial variations with higher preponderance in men. Large random population surveys showed that the prevalence of CVD in European Caucasians is about 8% in men and 0.4% in women and between 4 % and 6.5% in men of Chinese and Japanese ethnicity [6]. CVD allele frequency varies in the population. An incidence of 4% in African countries, 2.9-11% in Saudi Arabia [7,8], lowest incidence rate of 2% has been observed in North America, south America, Fiji and certain Asian Indian tribes [9].

Colour vision deficiency often remains undetected due to lack of regular screening programs, lack of awareness about the condition and the patient simply gets adapted to the external environment [10]. Colour vision deficiencies neither cause complete blindness nor are there any available therapeutics that can treat CVD [11]. However, it is crucial for individuals to understand their colour vision status and their limitations so that they will be able to adapt better and make more informed career choices if detected early in life. To the best of authors' knowledge, there are no reports regarding the prevalence of colour blindness among the general population in the Belagavi district, which lies in the Northwestern part of Karnataka. Hence, the present study was carried out to determine the prevalence of congenital colour vision deficiency among the general population in Belagavi, the biggest district and second capital of Karnataka state, and to spread awareness about the condition.

MATERIALS AND METHODS

This hospital-based, cross-sectional study was conducted at Jawaharlal Nehru Medical College, Belagavi, Karnataka, India (tertiary care hospital), from February 2022 to July 2022. The Institutional Ethical Clearance (Ref No. MDC/JNMCIEC/374) was obtained prior to the start of the study. Subjects belonging to Belagavi district who visited Ophthalmology Outpatient Department for eye examination were explained about CVD, and those who wished to be a part of the study formed the study population.

Sample size calculation: Convenient sampling technique was used for selection and sample size was estimated using the following formula:

$$n = \frac{p\,(100-p)z^2}{E^2}$$

Where, n was the sample size required,

p was the percentage occurrence of a state or condition (proportion or prevalence),

E was the percentage maximum error required, and

Z was the value corresponding to the level of confidence required.

The prevalence of colour vision deficiency in the Indian population was considered to be 2.98% [12]. Hence, at 95% confidence level and a

maximum error as 20% of prevalence, the sample size was given by:

$$n=\frac{2.98\times(100-2.98)\times1.96^2}{0.596^2}$$

$$n=3126.779\approx3127$$

Inclusion criteria: Subjects aged above or equal to 7 years, hailing from Belagavi district who visited Ophthalmology Outpatient Department for eye examination were explained about colour vision deficiency conditions and Ishihara's test and those who consented to be part of the study were included in the present study.

Exclusion criteria: Subjects with optic nerve diseases, glaucoma, macular and retinal diseases, cataract or any other opacity of the media, red eye, patients diagnosed with diabetes, parkinson's disease, alzheimer's disease, multiple sclerosis, chronic alcoholism, sickle cell disease, leukaemia, subjects with intellectual disability not able to perform the test, subjects under various medications which can affect colour vision, subjects with any other systemic conditions affecting colour vision, and subjects with a history of prolonged exposure to chemicals like prolonged contact with fertilisers and styrene were excluded from the study. All the above-mentioned causal factors for acquired colour vision deficiency were excluded to consider only congenital colour vision deficiency cases. Also, those who did not wish to take part in the study were excluded.

Study Procedure

Relevant information regarding age, gender, religion, place, education status, history of parent's consanguinity, marital status, medical history, and drug history was collected and documented on a structured proforma. A complete ocular examination was done after recording a detailed systemic and ocular history.

Distant visual acuity was tested using Snellen's visual acuity chart held at a six metre distance in a well-illuminated room. A thorough slit-lamp biomicroscopic ocular examination was followed by fundus evaluation either with 90 D lens or IDO using 20 D lens after dilating the pupil. Before pupillary dilatation, colour vision was tested using Ishihara's pseudoisochromatic test (38 plate edition).

The subjects were comfortably seated in a well illuminated room and after recording visual acuity with Snellen's chart, refraction was done wherever required, they were asked to perform the test with their respective Best Corrected Visual Acuity (BCVA) for each eye separately and binocularly as well.

The CVT plates were held at a distance of 2/3rd metre (arm's length distance). The literate subjects were asked to read the numbers seen on the plate, whereas illiterate subjects were asked to trace the pattern lines with their fingers. In the 38-plate edition, plates 1 to 21 are screening plates, and plates 22 to 25 differentiate protans and deutans. Four or fewer errors are considered normal; eight or more errors are considered deficient. Each patient's score was recorded, and they were classified as normal, deutan, or protan congenital colour vision deficient. Those who turned positive for colour vision deficiency were asked detailed history regarding the age of onset of this condition and whether they know what is colour vision deficiency and which type of colour vision deficiency he/she has and the consequences of CVD in their future life. Based on their responses they were considered to be either aware or unaware about CVD.

STATISTICAL ANALYSIS

Data is analysed using the statistical software R version 4.2.1 and Microsoft Excel. Categorical variables are represented by frequency and percentage. Continuous variables are given in Mean, SD/ Median (Min, Max) form. A Chi-square test is used to check the dependency between categorical variables. The Shapiro-Wilk test is used to determine the normality of a variable. Mann-Whitney U test is used to compare the distribution of age over CVD. A p-value ≤0.05 indicates statistical significance.

RESULTS

The mean age of the 3131 subjects was 40.74±15.86 years; 1688 (53.91%) were males and 1443 (46.09%) were females, with a gender ratio of 1.17:1. Majority of the subjects were Hindu by religion. Consanguineous marriage was observed in 496 (15.84%) subjects; 2045 (65.31%) subjects of the study population belonged to rural areas of Belagavi district [Table/Fig-1].

Variables	Frequency (%)
Age (years)	
1-10	125 (3.99%)
11-20	184 (5.88%)
21-30	608 (19.42%)
31-40	421 (13.45%)
41-50	1080 (34.49%)
51-60	420 (13.41%)
61-70	184 (5.88%)
71-80	82 (2.62%)
81-90	27 (0.86%)
Mean±SD Median (Min, Max)	40.74±15.86 43 (7, 88)
Gender	
Female	1443 (46.09%)
Male	1688 (53.91%)
Religion	
Christian	47 (1.5%)
Hindu	2024 (64.64%)
Muslim	1056 (33.73%)
Other	4 (0.13%)
Educational status	
Illiterate	370 (11.82%)
Primary	155 (4.95%)
SSLC	988 (31.56%)
Beyond SSLC	1618 (51.68%)
Marital status	
Married	2654 (84.77%)
Unmarried	477 (15.23%)
Parent's consanguinity	
No	2635 (84.16%)
Yes	496 (15.84%)
Locality	
Rural	2045 (65.31%)
Urban	1086 (34.69%)

[Table/Fig-1]: Demographic characteristics.
SSLC: Senior secondary school leaving

The estimated overall prevalence of congenital CVD was 150 (4.79%). Deuteranomaly was the most common type prevalent in the population accounting for 88 (58.67%) subjects. The prevalence of congenital CVD was higher among males than females. Awareness regarding CVD amongst those who were positive for CVD was present in 80 (53.33%) subjects. Out of 150 subjects who had congenital CVD, majority were Hindus [Table/Fig-2].

Congenital CVD was more in females born out of consanguineous marriage. Whereas, in case of males, CVD was more in males born out of non consanguineous marriage. Overall, there was no significant association of parent's consanguinity and CVD. [Table/Fig-3].

Variables	Gender		Total	p-value
	Female	Male		
CVD				
Absent	1430 (99.1%)	1551 (91.88%)	2981 (95.21%)	<0.001[C]
Present	13 (0.9%)	137 (8.12%)	150 (4.79%)	
Type of CVD				
Deuteranomaly	6 (46.15%)	82 (59.85%)	88 (58.67%)	0.6887[MC]
Deuteranopia	1 (7.69%)	16 (11.68%)	17 (11.33%)	
Protanomaly	2 (15.38%)	15 (10.95%)	17 (11.33%)	
Protanopia	4 (30.77%)	24 (17.52%)	28 (18.67%)	
Awareness				
No	8 (61.54%)	62 (45.26%)	70 (46.67%)	0.2607[C]
Yes	5 (38.46%)	75 (54.74%)	80 (53.33%)	
Religion				
Hindu	5 (38.46%)	79 (57.66%)	84 (56%)	0.2019[MC]
Muslim	8 (61.54%)	53 (38.69%)	61 (40.67%)	
Christian	0	5 (3.65%)	5 (3.33%)	
Other	0	0	0	

[Table/Fig-2]: Association of prevalence, type, awareness of CVD and religion with gender.
C: Chi-square test; MC: Chi-square test with monte carlo simulation

Parent's consanguinity	Sub category	Gender		Total
		Female	Male	
No	Absent	1185 (99.58%)	1314 (91.12%)	2499 (94.95%)
	Present	5 (0.42%)	128 (8.88%)	133 (5.05%)
Yes	Absent	245 (96.84%)	237 (96.34%)	482 (96.59%)
	Present	8 (3.16%)	9 (3.66%)	17 (3.41%)
p-value		0.0015[MC*]	0.0056[C*]	0.1144[C]

[Table/Fig-3]: Distribution of CVD according to parent's consanguinity.
MC: Chi square test with Monte Carlo simulatio; C: Chi square test; * indicates statistical significance

DISCUSSION

Colour vision deficiency is not a rare disorder of vision but, due to lack of regular screening facilities and social unawareness,it goes unnoticed many times. Colour vision deficiency is profoundly seen in men than women who mostly remain as carriers of the defective gene. CVD is commonly congenital and X-linked red green colour blindness is the widest spread form of vision impairment [1].

The present study was conducted in Belagavi district, Karnataka in all age groups for early detection of CVD. The overall prevalence of congenital CVD was 4.79 %. The study has proven the fact that males have a higher prevalence (8.2%) than females (0.9%), which reinforces the X-linked recessive trait of the defect.

The results were comparable to the results of the study done by Shrestha P and Pradhan PMS, who found the prevalence of CVD to be 5.2% (0.74% in females and 9.77% in men) in the Nepalese population [13]; 4.71% prevalence rate (8.73% in men and 1.69% in women) was observed in a study done among adult Kashmiri population [10]; 2.98% (3.89% in males and 0.18% in females) prevalence was noted from a study done at pre-employment screening in Indian population [12]. Globally, 4.8% CVD prevalence was reported in Singapore population [14], 3.5% (6.8% in men and 0.6 % in females) in Sudanese population [15], 4.1% (3.6% among male and 0.6% among female students) prevalence was noted in Ethiopian school children [16]. However, the present results are different from the prevalence rates reported in studies done in Iran (13.93%) [17], Turkey (7.33%) [18], Saudi Arabia (21.3%) [19]. A detailed comparative analysis of the present study with other reported studies in various geographic locations is given in [Table/Fig-4].

In terms of religion, CVD was more prevalent among Hindus and lowest among Christians. In the present study, parents' consanguinity had a statistically significant association among females who had colour vision deficiency though it was not statistically significant among men. Cultural practices like consanguineous marriages

Name of authors	Location	Sample size	Mean age (years)	Gender distribution		Overall prevalence of CVD	CVD Prevalence (%)		Type of CVD (%)
				Male	Female		Male	Female	
Masood T et al., [10]	Kashmir, India	3110	34.72±14.862	1462	1648	4.71%	8.5	1.3	Deuteranomalia (52.74%) Protanopia (21.23%) Deuteranopia (14.38%) Protanomalia (11.64%)
Naresh S, [20]	Patiala, Punjab, India	2097	10 to 60	1306	791	2.43%	3.83	0.13	Simple deuteranomaly 0.92% Extreme deuteranomaly 0.77% Protanopia 0.69% Simple protanomaly 0.61% Deuteranopia 0.61% Extreme protanomaly 0.15% Tritanopia 0.08%
Kim H and Ng JS [21]	South Korea	2686	35.6±8.4	1180	1506	3.9%	6.5	1.1	Proton defect (27.6%) Deutan defect (61.2%) Unclassified defect (10.2%) Tritan (1%)
Ugalahi MO et al., [22]	Ibaden, South West Nigeria	1635	13.9±1.9	769	866	2.3%	3.8	0.9	Protan defect (35%) Deutan defect (32%)
Reddy AVP et al., [23]	Guntur, Andhra Pradesh, India	1629	10 to 15	841	788	1.9%	1.71	0.184	Protanopes (90.3%) Deuteranopes (9.7%) Tritanope (0%)
Hashemi H et al., [17]	North east Iran	2628	31.54±16.9	877	1751	13.93%	15.85	12.96	Tritanopia 6.96% Deuteranopia 3.92% Tritanomalous 2.21% Protanopia 0.8% Protanomalous 0.34% Deutranomalous 0.38%
Kundu BK and Chakma B, [12]	New Delhi, India	13179	28±6.79	9879	3300	2.98%	3.89	0.18	-
Shrestha P and Pradhan PMS [13]	Kathmandu, Nepal	267	27.42±7.90	-	-	5.24%	9.77	0.74	Strong deutan 28.57% Strong protan 28.57% Total colour blindness 42.85%

Alrasheed SH et al., [15]	North Kordofan state, Sudan	1100	40.4±16.6	544	556	5.5%	9	2.2	Protanopia 1.2% Deuteranopia 2.4% Tritanopia 2.0 %
Woldeamanuel GG and Geta TG [16]	Wolkite, Southern Ethiopia	844	11.75±2.5	471	373	4.1%	3.6	0.6	Protan defects 42.9% Deutan defects 57.1%
Present study	Belagavi, Karnataka, India	3131	40.74±15.86	1688	1443	4.79%	8.12	0.9	Deuteranomaly (58.67%) Protanopia (18.67%), Rotanomaly (11.33%) Deuteranopia (11.33%)

[Table/Fig-4]: Comparative study of various inclusive parameters [10,12,13,15-17,20-23].

are an important factor in the prevalence as congenital CVD is transmitted as an X linked recessive condition [5].

In the current study, only 11.82% of the study population were illiterates and more than 50% of the study population were beyond SSLC, but still, out of 150, 80 (53.33%) of the people who had congenital CVD were unaware of their condition. Colour vision deficiency is reported to be associated with low literacy rate [1], poor socio-economic status [18], specific geographical locations [17], consanguinity [5].

Though, there are no remarkable associations observed between levels of CVD, educational status and career selection, people with CVD struggle a lot in different phases of life [24,25]. Like during childhood, in schools they struggle in subjects where colours are involved like use of graphs or charts in maths, use of chemical agents in science labs or maps in social studies [25,26]. After completing education, when they move for job, they may find it difficult to meet work expectations that can turn out to be an obstacle for their career growth [26,27]. Normal colour vision requirements are a part of many occupations both public and private sector like police services, various medical branches, military services, fashion designing, driving etc in which colour plays a significant role. The psychological impact of a person being denied of a job when he is diagnosed as colour blind or colour vision deficient can be devastating. If its for the first time it might result in complaints, litigations, refusing to accept. So, it is highly important to create social awareness about CVD and screening programs are needed at the right time to help people make careful choice of career paths and to overcome the future challenges.

Population-based screening programmes should be initiated for early detection and to plan appropriate strategies. Colour vision screening programmes in schools should be mandatorily complemented with visual acuity testing. Parents and children can be counselled for future career plans. Pros and cons of enrolling for human trials for gene therapy for CVD which is more likely to be useful if applied early in life should be discussed [28]. Youngsters should be motivated to overcome this ailment and be a productive, useful asset to the society.

Limitation(s)

Current study was a hospital-based screening, the sample size was small, home to home survey was not done. The Ishihara's pseudoisochromatic plates was used for the detection of colour blindness, which detects only red-green deficiency, so the prevalence of Tritan (blue colour) deficiency, though rare, could not be found.

CONCLUSION(S)

With time, patience, and practice, people can adapt to colour vision deficiency since it often goes undetected, mainly due to lack of awareness about the defect. Although it is not a life-threatening disorder, it greatly hinders people from choosing certain career opportunities, leading to psychological trauma. So, there is a need to create awareness about colour vision deficiency and its impact on various stages of life. Genetic counselling in the general population will help decrease the number of children with this deficiency. The Ishihara's pseudo isochromatic plates test is a cost-effective, easily portable, non invasive, fast, and sensitive testing modality for both diagnosis and screening of congenital red-green colour vision deficiency. Population-based screening programmes should be initiated for early detection and to plan appropriate strategies.

REFERENCES

[1] Fareed M, Anwar MA, Afzal M. Prevalence and gene frequency of colour vision impairments among children of six populations from North Indian region. Genes Dis. 2015;2(2):211-18.
[2] Venkatesh N Prajna, Deepak P Edward, Manali Hazarika. Physiology of the eye. N Venkatesh Prajna, Peyman's principles & practice of ophthalmology, 2nd edition vol.1. New Delhi: Jaypee: 2019.p. 47-52.
[3] Adelman RA, Parnes AJ, Bopp S, Saad Othman I, Ducournau D. Strategy for the management of macular edema in retinal vein occlusion: The European Vitreo Retinal Society macular edema study. Biomed Res Int. 2015;2015:870987.
[4] Kharel S, Mainalee M. Congenital Color Vision Deficiency (CVD) in children living in high altitudes of nepal. J Mol Genet Med. 2017;11(4):01-02.
[5] Shah A, Hussain R, Fareed M, Afzal M. Prevalence of red-green color vision defects among Muslim males and females of Manipur, India. Iran J Public Health. 2013;42(1):16-24.
[6] Birch J. Worldwide prevalence of red-green colour deficiency. J Opt Soc Am A. 2012 29(3):313-20.
[7] Osuobeni EP. Prevalence of congenital red-green color vision defects in Arab boys from Riyadh, Saudi Arabia. Ophthalmic Epidemiol. 1996;3(3):167-70.
[8] Voke J, Voke P. Congenital dyschomatopsias among Saudi Arabians. Saudi Med J. 1980;1:209-14.
[9] Gegenfurtner KR. Cortical mechanism of color vision. Nat Rev Neurosci 2003;4(7):563-72.
[10] Masood T, Nazeer M, Farooq S, Saleem SM. A study of color vision deficiency in an adult Kashmiri population. International Journal of Current Advanced Research. 2017;06(07):4849-53. Doi: http://dx.doi.org/10.24327/ijcar.2017.4853.059.
[11] Chakrabarti A, Chakraborti S. Red-green colour vision deficiency and lack of awareness among rural school students in India. Iran J Public Health. 2015;44(7):1018-20.
[12] Kundu BK, Chakma B. Prevalence of colour vision defect in the Indian population-results from a pre-employment screening centre of a tertiary care hospital. International Journal of Contemporary Medical Research. 2020;7(9):I19-I23.
[13] Shrestha P, Pradhan PMS. Congenital colour vision deficiency among patients attending outpatient department of ophthalmology in a Tertiary Care Centre: A descriptive crosssectional study. JNMA J Nepal Med Assoc. 2022;60(247):278-81. doi: 10.31729/jnma.7319. PMID: 35633257; PMCID: PMC9226731.
[14] Chan YK, Tay MT, Lim MK. Xq28: Epidemiology and sex-linkage between redgreen colour blindness and G6PD deficiency. Ann Acad Med Singapore. 1994;2(3):318-22.
[15] Alrasheed SH, EL Awad ME, Abdulbagi AA, Abdu M. Congenital and acquired colour vision deficiency among population in North Kordofan State of Sudan. Sudanese J Ophthalmol. 2017;9(1):22-27.
[16] Woldeamanuel GG, Geta TG. Prevalence of color vision deficiency among school children in Wolkite, Southern Ethiopia. BMC Res Notes. 2018;11:838. https://doi.org/10.1186/s13104018-3943-z.
[17] Hashemi H, Khabazkhoob M, Pakzad R, Yekta A, Heravian J, Nabovati P, et al. The prevalence of color vision deficiency in the northeast of Iran. J Curr Ophthalmol. 2017;31(1):80-85. PMID: 30899851; PMCID: PMC6407150.
[18] Citirik M, Acaroglu G, Batman C, Zilelioglu O. Congenital color blindness in young Turkish men. Ophthalmic Epidemiol. 2005;12(2):133-37.
[19] Dahlan HM, Mostafa OA. Screening for color vision defects among male Saudi secondary school children in Jizan City, Kingdom of Saudi Arabia. Med J Cairo Univ. 2013;81(2):513-17.
[20] Sutender Naresh. Study of color blindness in Jat Sikhs. Indian J Physiol Pharmacol. 1995;39(2):127-30.
[21] Kim H, Ng JS. Prevalence of Color Vision Deficiency in an Adult Population in South Korea. Optom Vis Sci. 2019;96(11):866873. Doi: 10.1097/OPX.0000000000001441. PMID: 31688694.
[22] Ugalahi MO, Fasina O, Ogun OA, Ajayi BG. Prevalence of congenital colour vision deficiency among secondary school students in Ibadan, South-West Nigeria. Niger Postgrad Med J. 2016;23(2):93-96.
[23] Reddy AVP, Babu GR,Prasad KV. Prevalence of colour blindness in school children in Guntur City, Andhra Pradesh. International Journal of Contemporary Medical Research. 2017;4(11):2266-68.
[24] Ramachandran N, Wilson GA, Wilson N. Is screening for congenital colour vision deficiency in school students worthwhile? A review. Clin Exp Optom.

2014;97(6):499-06.
[25] Mehta B, Sowden PT, Grandison A. Philadelphia PA: John Benjamins Publishing Company; 2018. Does deuteranomaly place children at a disadvantage in education settings?: A systematic literature review. In Progress in Colour Studies: Cognition, language and beyond L MacDonald, C Biggam & G Paramei (eds) pp. 341-55.
[26] Chan XBV, Goh SMS, Tan NC. Subjects with colour vision deficiency in the community: What do primary care physicians need to know? Asia Pac Fam Med. 2014;13:10.
[27] Steward JM, Cole BL. What do color vision defectives say about everyday tasks? Optom Vis Sci. 1989;66(5):288-95.
[28] Hassall MM, Barnard AR, Maclaren RE. Gene therapy for color blindness. Yale J Biol Med. 2017;90(4):543-51.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Sep 16, 2022
- Manual Googling: Oct 18, 2022
- iThenticate Software: Oct 29, 2022 (20%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Sep 10, 2022**
Date of Peer Review: **Oct 01, 2022**
Date of Acceptance: **Oct 30, 2022**
Date of Publishing: **Nov 01, 2022**