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Letter to the Editor

Red-Green Color Vision Deficiency and Lack of Awareness among Rural School Students in India

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Dear Editor-in-Chief

Color vision deficiency (CVD) occurs when there is an error in the development of one or more types of retinal cone cells that receive color in light and transmit that information to the optic nerve (1). Among them, red-green CVD shows the highest prevalence (2). Red-Green CVD is divisible into severe or dichromatic forms [protanopia and deuteranopia] and milder or anomalous trichromatic forms [protanomaly and deuteranomaly] (2, 3). Color is used as a systematic identifier in some learning systems in school. In addition, students start growing their interest in career selection at school level. It is regrettable that a large section of school students are not aware of their color vision status (4). CVD does not cause complete blindness and there is no available therapeutics that can treat CVD. However, employment in certain professions like working as pilot, loco driver, traffic police, defense servant and a few others require a normal color vision as their eligibility criterion and hence color blind persons are likely to be rejected from such professions.

The present study was to determine the occurrence of CVD among students of Nalgoradham Baikuntha Vidyapith, a village based high school of West Bengal, India as well as to explore the awareness of CVD among them and their family members. The study was approved by the institutional Managing Committee and the Principal of Nalgoradham Baikuntha Vidyapith. Overall, 738 students (345 males and 393 females) were subjected to 38 plate edition of Ishihara Test Plates (ITP) following the recommendation of Ishihara (5).

The data obtained was analyzed statistically with student's *t* test using Epi Info (SPSS, Chicago, IL, USA) software and a *P* value less 0.05 was considered significant.

Of the 738 students, 30 were affected (4.06%). The total number of affected males was 22 (6.37%) while affected females were 08 (2.03%). Out of 345 males, 10 (2.9%) were dichromatic (protanopic and/or deuteranopic). Similarly, out of 393 females, 3 (0.76%) were dichromatic. Six males (1.74%) and 1 female (0.25%) were protanopic while 4 males (1.16%) and 2 females (0.51%) were deuteranopic. Among the 738 students, only 2 males were both protanopic and deuteranopic. To avoid statistical bias, their data were included separately as protan as well as deutan. Additionally, we found that 17 (2.30%) students were anomalous trichromates (protanomalic and/or deuteranomalic). Among 345 males, 12 (3.47%) students exhibited anomalous trichromacy of which 3 (0.87%) were protanomalic and 9 (2.61%) were deuteranomalic. Among 393 females, 2 (0.51%) were protanomalic and 3 (0.76%) were deuteranomalic. Statistical differences have been represented in Fig. 1 and 2.

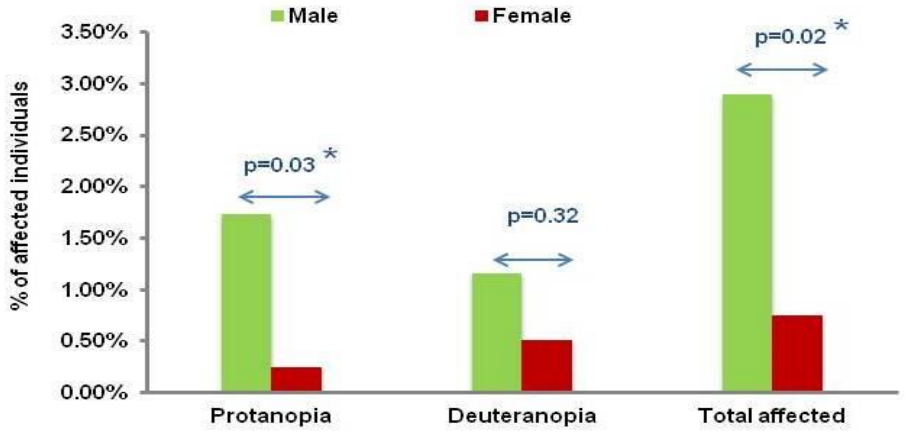

Fig.1: Distribution of protanopic and deuteranopic males and females.
*denotes *p* value significant

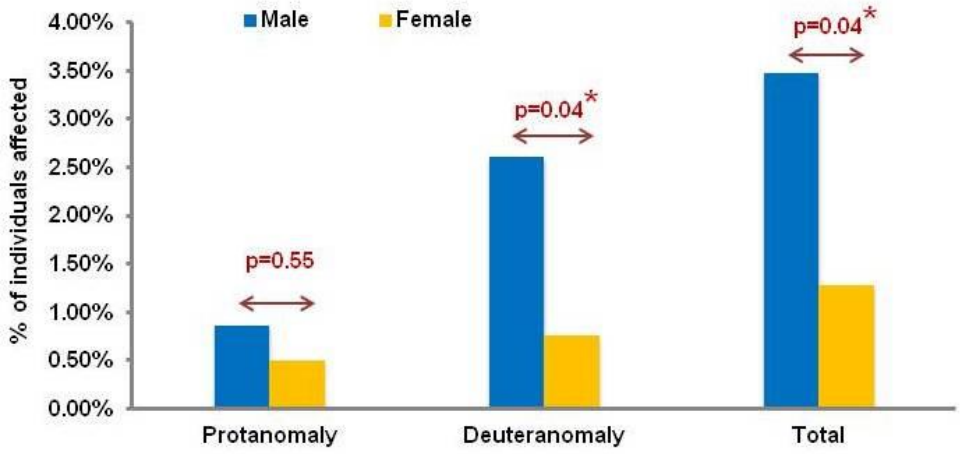

Fig.2: Distribution protanomalic and deuteranomalic males and females.
*denotes *p* value significant

In the post-screening survey on awareness of CVD, we found that 26 (86.6%) out of 30 affected students were 1st generation learners and none of the affected students was aware of their deficiency. Interestingly, out of 30 families of affected students, only 2 (6.67%) were aware of CVD.

In the current study, the overall prevalence of red green CVD was 4.06%, which is quite high as compared to another study from a neighboring country, Nepal that reported 2.1% of prevalence (6).Though our study shows a prevalence of 6.37% among males, another study from Manipur, India shows prevalence as high as 14.93% among males of Meitei population, while 3.75% prevalence among males of Naga population (1). Again, the Caucasian population shows 8% prevalence in males (7). Additionally, the present study shows 2.03 % prevalence among females though a study from Nepal (6) shows 0% prevalence among female school students. Hence it can be concluded that this part of the world shows considerable prevalence of CVD. Notably, in the present study,

deuteranomalic males show highest prevalence (2.61%) among all types of red green CVDs. We found that 93.23% of the families of the affected students lack minimum awareness on CVD of which most are below poverty level with a very poor literacy rate. However, this unawareness renders a CVD affected individual, mild or severe, male or female, highly vulnerable to rejections in the vast area of professional field while selecting a career, emphasizing upon the need to identify an affected individual at an early age. Organizations such as "Color Vision Awareness" often arrange awareness programs in British schools. The Education Ministry of Japan issued guidance on how to make classroom accessible to students with CVD. Such initiatives, if taken by India, will benefit a large section of our youth in selecting the right career pathway. BRIC (Brazil, Russia, India, China) countries are acknowledged as being rapidly developing and a large proportion of the population in these countries belongs to the juvenile age group Therefore, it is vital to introduce such tests in school curriculum to raise awareness and to get a clear picture of this deficiency among school students in India.

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