PREVALENCE OF COLOUR VISION DEFICIENCY (CVD) IN STUDENTS OF MEDICAL COLLEGE & TO ASSESS WHETHER COLOUR BLIND MEDICAL STUDENTS FACE ANY PROBLEM IN THEIR MEDICAL TRAINING AND PROFESSION

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ABSTRACT

Aim of the study is to evaluate the presence of congenital colour vision deficiencies among the medical students. Study has been done among the medical students with the help of Ishihara chart. Study provides information, regarding the problems which medical students face during their training due to their CVD. The results of the study point to need for screening for CVD in medical students. This would allow testing for severity, counselling and an informed choice of career.

KEYWORDS

Mydriasis, Tropicamide, Proparacaine, Pupil.


INTRODUCTION

Colour vision deficiency or colour blindness is the inability or decreased ability to see colours or perceive colour differences under normal settings. Colour blindness affects a significant percentage of population.1,2

John Dalton was the first scientist to give a clear description of his own affliction of colour blindness in 1798.3 Colour blindness is an abnormal condition characterized by the inability to clearly distinguish different colours of the spectrum. Human colour vision is normally trichromatic i.e. the mixture of red, green and blue lights.4 Most colour vision defects are congenital and permanent. Red-Green defects (Protan and Deutan) show the highest prevalence in the general population.5

There is no actual blindness but there is a deficiency of colour vision, because of defect in the development of one or more sets of retinal cones that perceive colour in light & transmit that information to the optic nerve. This type of colour blindness is usually a sex linked condition.

The gene that produce photopigments are carried by X-chromosome; if some of these gene are missing or damaged, colour blindness will be expressed in males with a higher probability than in females because males only have one X-chromosome (In females, a functional gene on only one of the two X-chromosomes is sufficient to yield the needed photopigments).5 Being a genetic disorder, the incidence, of colour blindness, varies from race to race and different in the different geographical regions of the world inhabited by people of different ethnicity.6 Asian males have a prevalence of colour vision defects of 4.9% compared to 0.6% in females.7

Studies regarding the difficulties in clinical work of the medical students due to their inherited defect of colour vision are rare. Medical students in most countries are not screened for colour vision defect.

Colour is often used as a sign in medicine, yet there have been few studies into the effect of a CVD on doctor’s medical skills. Some common deficiencies reported by medical practitioners & medical students were in recognizing widespread body colour changes (Like pallor, cyanosis, jaundice, rashes, erythema of skin), colourful charts, slides, test strips, for blood & urine, faeces, microscopy, sputum examination, impression present on ishihara charts, tissue identification in surgery etc.8

Using a literature search, the results indicate the prevalence of CVD in the medical profession & its effect on medical skills, because of certain features of their work, general practitioners may have special problems.

Thus, it is concluded that medical students should be screened for the deficiency and advised about it, and that there should be more study of effect of CVD on clinical work & decision making, in some special branches on medical students.

Aim of the study is to evaluate the presence of congenital colour vision deficiencies among the medical students. Study has been done among the 1st, 2nd, 3rd, & 4th year medical students with the help of Ishihara chart.

REVIEW OF LITERATURE

A study on colour vision deficiency among medical students: an unnoticed problem was done in Nepal medical college, Jorpati, Kathmandu, Nepal.9 in 2010.
The study was carried out among 1st & 2nd year medical students and study population was 120, with the help of Ishihara chart. The study was undertaken only to evaluate the presence of congenital colour vision deficiencies among the medical students.

Another study done on colour vision deficiency in medical & allied occupations by Liaquat Ali, Department of anatomy, university Medical & Dental College, Faisalabad. indicated CVD in 8% cases by congenital cause. Insufficient data is available for acquired causes.

Another study was done by J Anthony B spalding published in British journal of general practice, June 1999. This study was a questionnaire study to determine the range of difficulties that were noticed in their work due to congenital colour vision deficiency. The study was quantitative and done on 40 self-selected doctors. Number of colour vision tests were done to assess the type & severity of their deficiency. A survey done by R Balasundaram & Sagili Chandrasekhara Reddy of colour vision deficiency among 1427 medical students and healthcare personnel in Seremban revealed a prevalence of 3.2% with a marked male predominance (Males 6.7%, females 0.4%). In view of the potential difficulties faced by such personnel in clinical works, early detection of this deficiency allowed appropriate counselling.

A study was done in COLOMBO to determine the prevalence of defective colour vision and its reported effects in life of medical students. 608 medical students in the Faculty of Medicine, Colombo were screened for colour blindness using Ishihara pseudoisochromatic charts (17 plates). Individuals found to be colour blind were given a self-administered questionnaire and subjected for further examinations with Fransworth Munsell 100 Hue test, refraction errors and fundoscopy at the Eye Hospital, Colombo.

The present study done in Bhopal (M.P), was done by me, to find out the prevalence of colour vision deficiency in students of medical college and to assess the problems CVD poses in their medical training. In this study medical students age 18 to 25 years were taken, study population was 600 students. This study focuses simply on the prevalence of colour vision deficiency among medical students & not on the cause of defect (i.e. whether congenital or acquired). Study also provides information, regarding the problems which medical students face during their training due to their CVD.

AIMS & OBJECTIVES
- To know the prevalence of colour blindness among the students of the medical college.
- To assess whether colour blind medical students face any problem in their medical training and profession.

MATERIAL & METHODS
Present study was conducted between July & September of 2013, at Medical colleges of Bhopal, M.P. This cross sectional study was conducted among medical students of 1st, 2nd, 3rd & 4th year MBBS students in the age group 18 to 25 years. Sample size was 600 students, both male & female with their best corrected visual acuity were taken into account. Informed consent from the students was obtained.

The colour vision testing was performed by Ishihara chart ("The series of plates Designed as a Test for colour-Blindness" by professor emeritus of the university of Tokyo member of Japan Academy, having 38 plates). The subject were seated in a well illuminated room & asked to read the Ishihara chart, keeping it 75 cm away from the eyes and the time given for telling the number was less than 5 seconds. Each eye was tested separately.

Normality or defectiveness of colour vision was determined by assessment of the readings of plates 1 to 21. If 17 or more plates are read normally, the colour vision was regarded as normal. If only 13 or less than 13 plates were read normal, the colour vision was regarded as red green deficient. However, in references to plates 18, 19, 20, and 21, only those who read the numerals 5, 2, 45, and 73 and read them easier than those on plates 14, 10, 23, and 17, were recorded as abnormal.

To know about the difficulty faced by colour blind medical students, they were asked a series of questionnaire, pertaining to their medical training & the problems if any, they were facing because of colour blindness. Special emphasis was given to specific signs/diagnostic modalities, which a medical student goes through during his medical training like pallor, cyanosis, jaundice, rashes, erythema of skin, colourful charts, slides, test strips, for blood & urine, faeces, microscopy sputum examination, impression present on ishihara charts, tissue identification in surgery etc.

RESULTS
In the present study 600 medical students (287 boys & 313 girls, Age 18–25 years) from medical colleges of Bhopal, M.P. was assessed for colour vision deficiency. Among them 18 out of 600 were found to be colour blind, as shown in Fig. 1.
Among 287 boys assessed for colour vision deficiency 13 were found to be colour blind & out of 313 girls only 5 were found colour blind, none of the boys or girls were found to be totally colour blind. (Fig. 2)

Regarding problems faced by medical students in their medical training due to CVD, we found out that among all students, none of the CVD students faced any major difficulty in assessing and reading various diagnostic modalities, slides, charts & other clinical signs, which would markedly affect their diagnostic and treatment capabilities.

Although in our study, we found that 3 out of 18 CVD students faced some minor problems because of their defect, for which they needed some professional help & training. Rest of the CVD students managed their medical curriculum easily or similar to normal colour vision students. (Fig. 3)

**Fig. 3: Showing students having some difficulties in their medical training**

### DISCUSSION

The present study was undertaken to determine the prevalence of colour vision deficiency in medical students and to assess the problem they pose in their medical training. In this study 600 medical students were taken.

Regarding the Prevalence of colour blindness, in our observation of 600 students 18 (3%) had colour vision deficiency, none of them was total colour blind.

Liaquat Ali.  Department of anatomy, university medical & dental college, Faisalabad, worked on "colour vision deficiency (CVD) in the medical & allied occupations" and found Prevalence of CVD among students was 2.4%. Grieve, 1946. The result of colour vision testing on 16,180 candidates (Age 18-30 years) shows prevalence of CVD is 6.63% Rawlinson, 1993. In England. Prevalence of CVD was evaluated in a population of 235 dental undergraduates, and found prevalence of colour blindness was 3%, which is same as our study.

The prevalence rates as observed in the present study are within similar range compared to those found in the studies of Rawlinson (3%) and Liaquat Ali (2.4%), but lower than the observation of Grieve (6.63%).

Regarding Sex, Prevalence, out of 600 medical students assessed for CVD, 287 were Boys & 313 were Girls. Prevalence of colour vision deficiency among boys was found 4.52% and among girls 1.62%. Prevalence is higher among boys. O. Matthew Oriowo and Abdullah Z Alotaibi worked on "Colour vision screening among Saudi Arabian children" and found Prevalence of CVD was 3.3%. Prevalence among girls was 0.75% & among boys was 5.85%.

A study "OP 10 Prevalence of Defective Colour vision among students in faculty of Medicine, COLOMBO" shows the Prevalence of CVD was 1.89%. Prevalence among boys was 3.67 % & girls was 0%. Dr. Niroula and CG Saha studied on "Incidence of colour blindness among some school children of Pokhra, western Nepal" & observed prevalence of CVD in boys 3.8% & in girls was 0%.

The Study of R Balasundaram, Sagili Chandrasekhar Reddy: Prevalence of colour vision deficiency among medical students and Health personnel. showed the prevalence of CVD in male students was 5.2% & in female students was 0.3%. Kherumian et al. 1956. The prevalence of CVD was assessed in 5,651 students of the University of Paris. prevalence among male & female students was 9.33% & 0.51% respectively. Mann & Turner found Prevalence of CVD in Austria, using Ishihara chart, In males 7.4% & in females 0.7%.

In our study, Pattern of distribution of prevalence rates among males & females are not significantly different from that found among above mentioned studies. However, prevalence for females in the present study is higher than the previous studies.

The result for males in the present study indicate slightly higher prevalence than those of the Dr. Niroula & CG Saha’s (3.8%) study and the study conducted in COLOMBO (3.67%), lower prevalence than those of O Matthew Oriowo and Abdullah Z Alotaibi (5.85%), R Balasundaram, Sagili Chandrasekhar Reddy (5.2%), Kherumian et al. 1956 (9.33%), Mann & Turner (7.4%).

With regards to problems faced by medical students due to CVD in their medical training, previous studies and research are rare. In our study, we found out that, colour blind medical students faced no major difficulty and only 3 out of 18 students (16.66%) faced some minor problems in their medical training curriculum.

Those CVD students, who found difficulty in their training, may need special attention from medical faculty. Special training modalities should be developed to assist these students to compensate in the areas where they are lacking. They should be taught to identify various colours, according to contrast variations and a protocol should be set for it. This is important because these students would be future doctors & surgeons who need to perform efficiently & perfectly for betterment of the patients.

For those students who managed to cope up with their Colour Vision Deficiency & did not face any more difficulty in their training as compared to normal colour vision students, no special training would be required still they could be watched carefully by faculties and should be advised or counselled to take specialized branches of medicine & surgery keeping in view of their CVD and the problems it may pose to them.

### CONCLUSION

Present study is aimed at evaluating the prevalence of CVD among medical students and to assess the problem they poses in their medical training. Our study found the prevalence rate of CVD in students of medical college in Bhopal as 3%, which is not significantly different from the prevalence rate among general population.
The above facts given in discussion point to need for

- Screening for CVD in medical students. This would allow testing for severity, counselling and an informed choice of career.
- A more detailed examination of effects of CVD on decision making is necessary for general practice and also in a number of specialities; for example, ophthalmology, ENT, paediatrics, gastroenterology and pathology.

**SUMMARY**

- Out of 600 medical students 18 students were found colour blind.
- Prevalence rate of colour vision deficiency is 3%
- Sex difference was also present.
- Out of 287 male students 13 was found colour blind.
- And, out of 313 female students only 5 was found colour blind.
- Prevalence rate among males is 4.52%
- Prevalence rate among females is 1.62%.
  that shows the prevalence rate of CVD for males are higher than for females.
- Only 3 out of 18 CVD students faced some minor problems in medical training & decision making because of CVD, for which they needed some professional help & training.

**BIBLIOGRAPHY**