Awareness of colour blindness among nurses

Anuradha P*1, Madhumitha S S2

1Department of Ophthalmology, Saveetha medical college, Thandalam, Chennai
2Saveetha medical college, Thandalam, Chennai

**ABSTRACT**

The primary aim of this study is to find the awareness of colour blindness among 100 nurses in a hospital. Colour blindness or colour vision deficiency is the decreased ability to see and distinguish colours. It is one of the most common inherited disorders in human beings. It can also be acquired. It occurs due to the disorder or defect in the development of one or more of the three sets of colour sensing cones of the eye. There is no cure for colour vision deficiency. This study is a hospital-based descriptive cross-sectional study. Ethical clearance for the study was obtained from the institutional review board. A structured questionnaire on awareness of colour blindness was prepared. This was given to 100 nurses in the hospital. The data obtained were analysed with the help of a statistician. The result was that the nurses knew what colour blindness is, but they did not know much about the aetiology, transmission, treatment of the disorder. The nurses should be made more aware of colour blindness.

**INTRODUCTION**

Colour vision is the ability to discriminate colours based on the wavelength of light. This is due to the photoreceptors in the retina, mainly the cones. Colour blindness is the decreased ability to see and distinguish colours. It is mostly between red, green and blue, which are the three primary colours. It is also called colour vision deficiency. The retina has two types of specialised cells, the rods and the cones. The rods are sensitive to dim lights and can detect light and dark, whereas the cones can detect colours. The brain uses input from these cone cells for colour perception. Colour blindness is due to disorder in the cones of the eyes either due to its absence or in its working. The most common cause is due to the inheritance of genes responsible for colour blindness. These genes are present mainly on X-chromosomes. So it affects males more than females (Akhtar, 2015). Sometimes it can also occur due to acquired causes. Specific chronic illness like multiple sclerosis, diabetes mellitus, macular degeneration, leukaemia, retinitis pigmentosa, Parkinsonism can develop colour blindness. In early Parkinsonism, the patients experience tritanopia (Birch et al., 1998). Conditions like cataract and glaucoma can also cause colour vision deficiency (Pacheco-Cutillas et al., 1999). It can also be due to accidents that cause damage to the optic nerve or retina of the eye. Certain medications like indomethacin and ethambutol can also lead to this disorder (Koliopoulos and Palimeris, 1972). The subject can have monochromacy, dichromacy or trichromacy. The most common type is the red-green deficiency (Wong, 2011). This can become very challenging in daily life. They cannot be allowed to become a pilot, electrician, doctor, engineer, driving and other jobs wherein colour dif-
differentiation play an important role. Ishihara test is the most common diagnostic test done for colour blindness. It is the most widely used screening test worldwide for the detection of colour blindness. There is no complete cure for this disorder. Current management chiefly aims at counselling (Simunovic, 2010). Awareness of this disorder is fundamental to guide these patients to choose their career, especially among medical personnel. Hence this awareness study was taken up in our hospital to study the awareness of colour vision among nurses.

**MATERIALS AND METHODS**

The study is a community-based cross-sectional descriptive study involving 100 nurses in a tertiary health care centre, Saveetha Medical College and Hospital, Chennai. Ethical clearance for the study was obtained from the institutional review board (IRB). A structured questionnaire with 17 questions about aetiology, mode of transmission and management was prepared for this study. This questionnaire was validated by two experts in the field of ophthalmology. This was distributed to the nurses to evaluate the level of awareness about the colour blindness. This data was collected, entered into a computer and analysed with the help of a statistician. Then the level of awareness about colour blindness among the nurses was calculated. The age group and gender of the subjects were also correlated with the level of awareness on colour blindness. These data were presented with the help of pie charts and tables.

**RESULTS**

The study was conducted among 100 nurses. Their age distribution was as shown in Table 1 and Figure 1. Majority of the people involved in the study were in the age group 19 to 23 (60%) followed by people in the age group 24 to 28 (32%) as given in Table 1, Figure 1.
Table 1: age distribution of the participants

| S.no. | Age   | Frequency | Percentage |
|-------|-------|-----------|------------|
| 1     | 19-23 | 60        | 60%        |
| 2     | 24-28 | 32        | 32%        |
| 3     | 29-33 | 3         | 3%         |
| 4     | 34-38 | 3         | 3%         |
| 5     | 39-43 | 2         | 2%         |
| 6     | 44-48 | 1         | 1%         |

Table 2: Gender distribution of participants

| S.no. | Gender | Frequency | Percentage |
|-------|--------|-----------|------------|
| 1     | Males  | 10        | 10%        |
| 2     | Females| 90        | 90%        |

Table 3: what are the three primary colours?

| S.no. | What are the 3 primary colours? | Frequency | Percentage |
|-------|---------------------------------|-----------|------------|
| 1     | Correct response                | 23        | 23%        |
| 2     | Incorrect response              | 46        | 46%        |
| 3     | Not aware                       | 31        | 31%        |

Table 4: Have you heard of the term colour blindness?

| S.no. | Have you heard of the term colour blindness? | Frequency | Percentage |
|-------|----------------------------------------------|-----------|------------|
| 1     | Yes                                          | 70        | 70%        |
| 2     | No                                           | 30        | 30%        |

Table 5: Did you know it is the decreased ability to see colours?

| S.no. | Did you know it is the reduced ability to see or distinguish colours? | Frequency | Percentage |
|-------|-----------------------------------------------------------------------|-----------|------------|
| 1     | Yes                                                                   | 63        | 63%        |
| 2     | No                                                                    | 37        | 37%        |

Table 6: Can it exist in one eye alone?

| S.no. | Can it exist in one eye alone? | Frequency | Percentage |
|-------|--------------------------------|-----------|------------|
| 1     | Yes                            | 40        | 40%        |
| 2     | No                             | 34        | 34%        |
| 3     | Not aware                      | 26        | 26%        |

Table 7: Do you know why it occurs?

| S.no. | Do you know why it occurs? | Frequency | Percentage |
|-------|----------------------------|-----------|------------|
| 1     | Yes                        | 33        | 33%        |
| 2     | No                         | 67        | 67%        |
Table 8: A common cause of it?

| S.no. | Most common cause? | Frequency | Percentage |
|-------|--------------------|-----------|------------|
| 1     | Genetic            | 69        | 69%        |
| 2     | Infection          | 19        | 19%        |
| 3     | Not aware          | 12        | 12%        |

Table 9: Mode of transmission?

| S.no. | Mode of transmission? | Frequency | Percentage |
|-------|------------------------|-----------|------------|
| 1     | Inheritance            | 51        | 51%        |
| 2     | Contact                | 32        | 32%        |
| 3     | Not aware              | 17        | 17%        |

Table 10: Can vit A deficiency cause it?

| S.no. | Can vit a deficiency cause it? | Frequency | Percentage |
|-------|---------------------------------|-----------|------------|
| 1     | Yes                             | 50        | 50%        |
| 2     | No                              | 29        | 29%        |
| 3     | Not aware                       | 21        | 21%        |

Table 11: Can any drug cause it?

| S.no. | Can any drug cause this? | Frequency | Percentage |
|-------|--------------------------|-----------|------------|
| 1     | Yes                      | 31        | 31%        |
| 2     | No                       | 46        | 46%        |
| 3     | Not aware                | 23        | 23%        |

Table 12: More common in?

| S.no. | More common in?          | Frequency | Percentage |
|-------|--------------------------|-----------|------------|
| 1     | Males                    | 45        | 45%        |
| 2     | Females                  | 38        | 38%        |
| 3     | Not aware                | 17        | 17%        |

Table 13: Most common type?

| S.no. | Most common type?       | Frequency | Percentage |
|-------|-------------------------|-----------|------------|
| 1     | Red green               | 43        | 43%        |
| 2     | Red yellow              | 45        | 45%        |
| 3     | Not aware               | 12        | 12%        |

Table 14: Monochromacy means?

| S.no. | Monochromacy means?     | Frequency | Percentage |
|-------|-------------------------|-----------|------------|
| 1     | Total colour blindness  | 29        | 29%        |
| 2     | Partial colour blindness| 51        | 51%        |
| 3     | Not aware               | 20        | 20%        |
Table 15: Diagnosis is by?

| S.no. | Diagnosis is by?        | Frequency | Percentage |
|-------|-------------------------|-----------|------------|
| 1     | Ishihara chart          | 33        | 33%        |
| 2     | Visual acuity           | 59        | 59%        |
| 3     | Not aware               | 8         | 8%         |

Table 16: Are people with colour blindness not allowed to perform specific jobs?

| S.no. | Are people with colour blindness not allowed to perform certain jobs? | Frequency | Percentage |
|-------|------------------------------------------------------------------------|-----------|------------|
| 1     | Yes                                                                    | 46        | 46%        |
| 2     | No                                                                     | 37        | 37%        |
| 3     | Not aware                                                              | 17        | 17%        |

Table 17: Are people with colour blindness allowed to drive vehicles?

| S.no. | Are people with colour blindness allowed to drive vehicles? | Frequency | Percentage |
|-------|-------------------------------------------------------------|-----------|------------|
| 1     | No                                                          | 64        | 64%        |
| 2     | Yes                                                         | 23        | 23%        |
| 3     | Not aware                                                   | 13        | 13%        |

Table 18: Can it be completely cured?

| S.no. | Can it be completely cured? | Frequency | Percentage |
|-------|------------------------------|-----------|------------|
| 1     | No                           | 55        | 55%        |
| 2     | Yes                          | 39        | 39%        |
| 3     | Not aware                    | 6         | 6%         |

Table 19: Do you know anyone who is colour blind?

| S.no. | Do you know anyone who is colour blind? | Frequency | Percentage |
|-------|----------------------------------------|-----------|------------|
| 1     | Yes                                    | 30        | 30%        |
| 2     | No                                     | 70        | 70%        |

Figure 6: Can it exist in one eye alone?

Figure 7: Do you know why it occurs?

The gender distribution of people involved in the study was as in Table 2, Figure 2. 90% of nurses
involved in the study were females, as shown in Table 2, Figure 2. This may be due to the female preponderance in the occupation. The questionnaire had 17 questions. The response to each question was as shown in Table 3 and Figure 3. Only 23% of the people were aware of the primary colours. 46% answered it incorrectly, and 31% were unaware as in the Table 3, Figure 3. As shown in the Table 4, Figure 4 70% of people who undertook the study have heard of the term colour blindness. 63% of people who took part in the study knows the actual meaning of colour blindness. 37% of people are unaware of it as in the Table 5, Figure 5. When questioned if colour blindness can be unilateral 40% answered it right, 34% is incorrect, 26% are not aware as shown in the Table 6, Figure 6. Only 33% are aware of the mechanism. 67% are unaware as given in the Table 7, Figure 7. As in Table 8, Figure 8 69% of people are aware that the common cause of it is genetic. 19% have answered it incorrectly, and 12% are not aware. 51% of people are aware that the disease is inherited. 32% of people answered it incorrectly, and 17 % are unaware as shown in the Table 9, Figure 9. Only 50% of the people are aware that it can occur due to vitamin A deficiency as depicted in the Table 10, Figure 10. Only 31% are aware that it can occur due to the intake of a particular drug as in the

Table 11, Figure 11. 45% of people have answered it correctly that it is more common in males. 38% of people have answered it incorrectly that it occurs in females. 17% of people are not aware as shown in the Table 12, Figure 12. 43% of people know that red, green colour blindness is the most common type of colour blindness. 45% answered it incorrectly. 12% are not aware as given in the Figure 13, Table 13. As given in the Table 14, Figure 14 Only 29% are aware of the term monochromacy. 51% answered it incorrectly, and 8% are not aware as shown in the Table 15, Figure 15. 46% of people are aware that they are not allowed to engage in specific jobs. 37% of people answered it incorrectly 17 % are unaware as depicted in the Table 16, Figure 16. As in Figure 17, Table 17 64 % of people are aware that colour blind people cannot be allowed to drive vehicles. 23% have said that they can be allowed to drive vehicles and 13% are not aware. 55% are aware that colour blindness cannot be cured entirely. 39% have answered that it can be wholly cured and 6% are not aware as given in the Table 18, Figure 18. From the Table 19, Figure 19 this we come to know that only 30 % of people involved in our study have seen or known someone who is colour blind, 70% of people do not know someone who is colour blind.

**DISCUSSION**

Awareness of colour blindness among people, especially in people belonging to the health sector, can be very crucial. In this study conducted among 100 nurses, 70% have heard of the term colour blindness, and 63% knows what colour blindness is, whereas in an awareness study conducted among secondary school children in Emohua Local Government Area of Rivers State only 23.4% were aware (Awoyesuku, 2019). Unilateral colour blindness is a rare condition wherein one eye is colour blind, other is normal. About 40% of nurses who took part in this study are aware of it. In this study, when asked about the most common cause of colour blindness, 69% answered it right as genetic. A study by kohl s et al. state that congenital total colour blindness is due to the mutation in the gene encoding alpha-subunit of cone photoreceptor cGMP gated channel (Kohl et al., 1998). Vitamin A deficiency can also lead to colour blindness, and this was known to only 50% of people who attended this study. A study on a middle-aged colour blind woman who had vitamin B12 deficiency had improvement in the colour vision on treatment with vitamin B12 injection. The study also stated that the vitamin
B12 deficiency damages the optic nerve, which in turn results in visual problem (Enoksson and Norden, 2009). Colour vision deficiency can also be acquired due to the use of certain drugs like sildenafil, digoxin, ethambutol (Prescrire Int, 2012).

In this study, only 31 out of the 100 nurses knew that a drug could cause colour blindness. The preponderance of colour blindness in males and of red, green type was known by 45%, 43% respectively. A study conducted on school children also revealed a male, red, green colour deficiency preponderance (Venkata and Reddy, 2017). Using the Ishihara plates is the easiest way to diagnose colour blindness (Ishihara, 1987). Amongst the nurses who participated in this study, only 33% knew about the diagnostic method for colour blindness. About 64% of nurses knew that the colour blind people could not be allowed to drive vehicles. Colour-blind individuals cannot be allowed to drive vehicles as the perception of traffic signals, and warning signs are difficult for them. These people are also not allowed to become pilots, nurses, doctors, electricians, engineers, i.e., wherever the perception of colours is essential. Congenital colour blindness cannot be cured entirely, and this was known by 55% of nurses. A recent study by wenzel.k suggests that regular wearing of glasses for colour blindness can gradually improve the colour vision in them by the learning process, not by bringing change in the cones (Wenzel, 2020). This disorder affects about 1 in 12 men, 1 in 200 women.

CONCLUSION

It can be concluded that the nurses are not fully aware of colour blindness. Most of them know what colour blindness is and the most common aetiology of it. But they are not aware of the mechanism, challenges that it causes in daily life, the occupations which they cannot be employed in, diagnostic method and treatment. So more efforts should be taken, and nurses should be taught well about this disorder and how a colour blind person should be dealt with.

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Conflict of interest

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