



# Ocular Diseases Among Pathologists and Pathologists' Perceptions on Ocular Diseases: A Survey Study

## Patologlar Arasında Görülen Oküler Hastalıklar ve Patologların Oküler Hastalıklar Hakkındaki Algıları: Anket Çalışması

Orkun AKMAN, Kemal KÖSEMEHMETOĞLU

Department of Pathology, Hacettepe University Faculty of Medicine, ANKARA, TURKEY

### ABSTRACT

**Objective:** The impact of visual disorders and color vision deficiency on the occupational life has been previously investigated by several studies. In this study, we aimed to evaluate the prevalence of visual disorders among Turkish pathologists and their perceptions on visual disorders.

**Material and Method:** A survey composed of 14 questions about ocular diseases and perceptions to these diseases has been introduced to the volunteering pathologists or pathology residents, participating in the 23rd Congress of Pathology.

**Results:** Ninety-three pathologists or pathology residents participated in the survey. Of the participants, 25 (26.9%) were residents, 30 (32.3%) were pathology specialists, and 36 (38.7%) were academicians. The mean duration for working as a pathologist was 15 years. The vast majority (93.5%) of the participants had at least one type of refractive error; the two most common disorders were myopia (77.0%) and astigmatism (64.4%). Sixty-four of the participants (68.8%) claimed an increase in their refractive error after working in the pathology department. Eyeglasses (56/87, 64.4%), contact lenses (14/87, 16.1%), or both (9/87, 10.3%) were used in order to correct the refractive error; however, only 31 of the participants (33.3%) preferred using eyeglasses during microscopy. While 65 participants (69.9%) never had conjunctivitis, 26 participants (28.0%) had at least one conjunctivitis attack. None of the participants claimed to be color blind.

**Conclusion:** Conjunctivitis and refractive errors are quite prevalent among pathologists. Refractive errors were also found to increase during the pathology practice. Most of the pathologists do not consider visual disorders (mostly refractive errors) as a negative factor during their career decision making, except a color vision defect.

**Key Words:** Visual disorders, Refractive errors, Conjunctivitis, Color blindness, Pathology

### ÖZ

**Amaç:** Görme bozuklukları ve renk körlüğünün mesleki yaşama etkisi daha önce farklı çalışmalar tarafından incelenmiştir. Bu çalışmada, Türk patologlar arasındaki görme bozukluklarının yaygınlığı ve görme bozuklukları hakkında kendi algılarının değerlendirilmesi amaçlanmıştır.

**Gereç ve Yöntem:** 23. Patoloji Kongresine katılan ve gönüllü olan patoloj ve patoloji asistanlarına göz hastalıkları ve bu hastalıklara karşı algıları hakkında 14 sorudan oluşan bir anket sunuldu.

**Bulgular:** Doksan üç patoloj veya patoloji asistanı ankete katıldı. Katılımcıların, 25'i (%26,9) asistan, 30'u (%32,3) patoloji uzmanı ve 36'sı (%38,7) akademisyendi. Patoloj olarak ortalama çalışma süresi 15 yıldır. Katılımcıların büyük çoğunluğunda (%93,5) en az bir kırma kusuru vardı; en yaygın iki bozukluk miyopi (%77,0) ve astigmatizma (%64,4) idi. Altmış dört katılımcı (%68,8) patoloji bölümünde çalışmaya başladıktan sonra kırma kusurunda artış olduğunu belirtti. Kırma kusurunu düzeltmek için gözlük (56/87, %64,4), kontakt lens (14/87, %16,1), ya da her ikisi (9/87, %10,3) kullanılmakla birlikte, katılımcıların sadece 31'i (%33,3) mikroskopi sırasında gözlük kullanmayı tercih etmekte idi. Altmış beş katılımcı (%69,9) konjunktivit tarif etmez iken, 26 katılımcı (%28,0) en az bir kez konjunktivit atağı geçirdiğini bildirdi. Katılımcıların hiçbirinde renk körlüğü olmadığı sonucu ortaya çıktı.

**Sonuç:** Konjunktivit ve kırma kusurları patologlar arasında oldukça yaygındır. Kırma kusurlarının patoloji uygulama sürecinde de arttığı bulunmuştur. Patologların çoğu, renk körlüğü hariç görme kusurlarını (çoğunlukla kırma kusurları) kendi kariyerlerine karar vermede olumsuz bir faktör olarak düşünmemektedir.

**Anahtar Sözcükler:** Görme bozuklukları, Kırma kusurları, Konjunktivit, Renk körlüğü, Patoloji

## INTRODUCTION

The impact of ocular disorders such as refractive errors and particularly color vision defects on occupational life has been a subject to many studies (1-7). Similar studies were also conducted on medical professionals (8-11) and more specifically pathologists or microscopists (12-15). In this study, we investigated the prevalence of some ocular disorders such as refractive errors, conjunctivitis and color vision deficiencies among pathologists, and evaluated the perceptions of pathologists regarding ocular diseases, particularly color vision defects.

## MATERIAL and METHODS

A survey composed of 14 questions (Table I) about ocular diseases has been introduced to the pathologists or pathology residents participating in the 23<sup>rd</sup> Congress of Pathology. Ninety three pathologists responded to the survey. The calculations of frequencies and means and comparison between groups with Chi square test were all performed using SPSS 15.0. A p value less than 0.05 was regarded as significant.

## RESULTS

### Demographical Features

The mean age of the responders was 41.5 years (range 24-68). The distribution of participants among different age groups was as follows: 22 (23.7%) in the 21-30, 18 (19.4%) in the 31-40, 33 (35.5%) in the 41-50, 16 (17.2%) in the 51-60, and 3 (3.2%) in the 61-70 years age group; one of the responders did not claim age (Figure 1). Seventy-one (76.3%) were female and 22 (23.7%) were male. The numbers of the academicians, specialists and residents were evenly distributed (Figure 2). Two (2.2%) of the responders did not assign a job title. The mean working duration was 15.1 years; 26 (28.0%) had worked for less than 5 years, while 46 (46.5%) had worked over 15 years.

### Ocular Disorders

The answers to some of the questions are summarized in Table II. Sixty-five of the participants (69.9%) had not experienced conjunctivitis before, whereas 26 (28.0%) suffered from at least one attack of conjunctivitis. Of these 26 participants, 13 (59.1%) had 1 attack, 6 (27.3%) had 2 attacks, and 3 (13.5%) had more than 2 attacks. The conjunctivitis prevalence was the same between participants equal to or below the age of 40 and those over the age of 40 ( $p=0.317$ ). Just over one third of the participants regularly used eyeglasses during microscopy. Use of eyeglasses during microscopy was likely to decrease the occurrence

of conjunctivitis (19.4% vs. 33.3%,  $p=0.162$ ), although the difference did not reach the level of significance (Figure 3).

Refractive errors were reported by 87 participants (93.5%, Figure 4). The most common disorder was myopia (67, 77.0%) followed by astigmatism (56, 64.4%) and hypermetropia (22, 25.3%). Thirty-seven of 67 (55.2%) participants with myopia had both astigmatism and myopia together. Medians for severity of myopia, astigmatism and hypermetropia were 2.5 D (0.5-8), 1 D (0.3-2) and 1.5 D (0.3-2), respectively. In order to correct refractive errors, participants preferred eyeglasses (56, 64.4%) more than contact lenses (14, 16.1%). Nine of the participants (10.3%) used both contact lenses and eyeglasses together, whereas 7 responders (8.0%) with refractive error did not use any correction. Sixty-four participants (68.8%) claimed an increase in refractive error of a median value of 1 D (0.3-5) after working in the pathology department. The majority (92.5%) affirmed that the presence of a visual disorder had no effect on their career decision as a pathologist; 7 (7.5%) did not answer this question.

None of the participants claimed to have any type of color vision deficiency. However, only 65 (69.9%) of them previously undergone a color vision test, and 2 participants did not answer this question. Two female pathologists (2.2%), one of whom was not screened for a color vision defect, specified that they have difficulty in interpretation of special stains such as Ziehl-Neelsen or amyloid stains (Congo red/Crystal violet). Regarding the question about acceptance of a color blind pathologist, 57 (61.3%) of the participants claimed that a color blind pathologist should not perform pathology; five (5.5%) did not comment on this question.

## DISCUSSION

Ametropia is the second most common health problem among pathologists (16). Similarly, we showed that refractive errors are quite common among Turkish pathologists. The prevalence of ametropia among Turkish pathologists is higher than the prevalence among the overall Turkish population (3%) as reported by the Ministry of Health in 1990 (17) and the prevalence among Turkish primary school children (10%) (18). Moreover, myopia is found to be responsible for the most of the refractive errors. A high prevalence of myopia among certain occupations using microscopy is also reported elsewhere, and mainly attributed to the higher education level and close work (14, 15). Adams et al. also demonstrated the progression of preexisting myopia and new onset myopia among clinical microscopists in their study. Our results are also

**Table I:** Questionnaire

- 1- Age
- 2- Sex
- 3- Title/degree
- 4- How many years have you been working for as a pathologist?
- 5- Have you ever had conjunctivitis (such as adenovirus)? If yes, how many times?
- 6- Which of the following vision defects do you have? What is the severity in diopters?
  - a. Myopia .....
  - b. Hypermetropia .....
  - c. Astigmatism .....
  - d. Other (please specify)..... .....
- 7- What do you use in order to correct your refractive error?
  - a. Eyeglasses
  - b. Lenses
  - c. Laser
  - d. Nothing
- 8- Do you use eyeglasses during routine microscopy?
  - a. Yes
  - b. No
- 9- Did you notice any worsening in the vision after starting pathology practice?
  - a. Yes, increased ..... diopters.
  - b. No
- 10-Do you have color vision defect?
  - a. Yes, I have ..... (protan, deutan, tritan) color vision defect.
  - b. No
- 11-Have you been tested for color vision deficiency?
  - a. Yes
  - b. No
- 12-Have you notice any difficulty in detection the cells with metachromasia, bacteria stained with Ziehl-Neelsen or amyloid stained with Congo red or crystal violet?
  - a. Yes
  - b. No
- 13- Did your visual disorders have an influence on decision making for pathology subspecialty?
  - a. Yes
  - b. No
- 14-Is it acceptable that people with color vision deficiency may deal with pathology specialty properly?
  - a. Yes
  - b. No

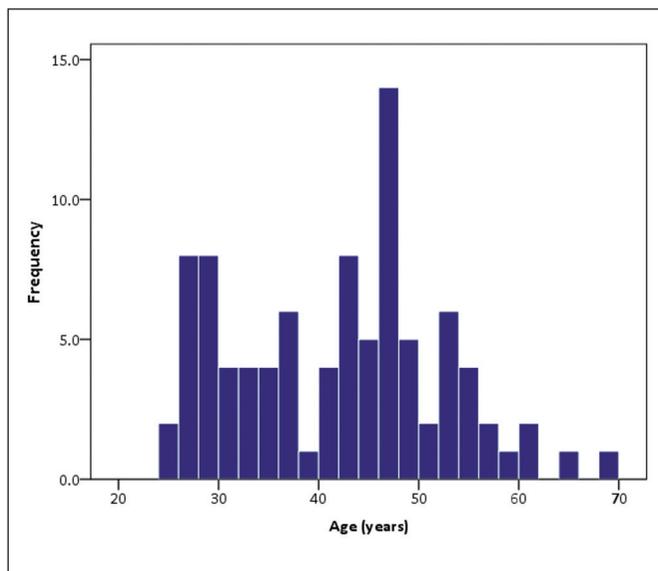


Figure 1: Distribution of age.

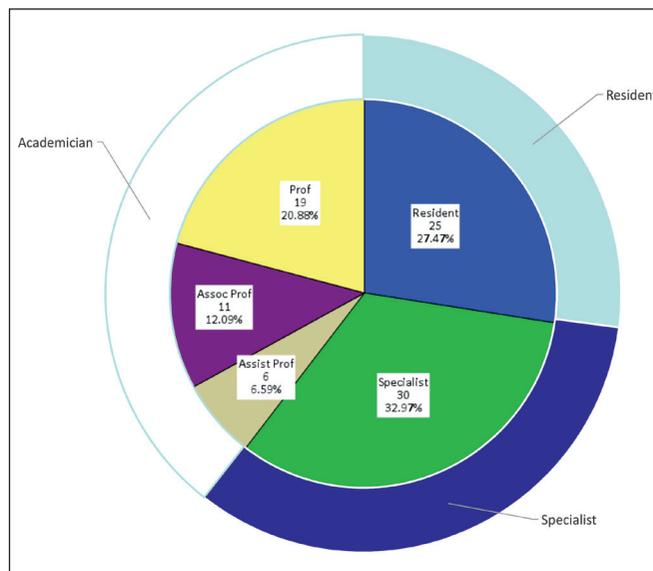


Figure 2: Distribution of job titles.

Table II: Answers to some of the questions

	Yes (%)	No (%)
Do you use eyeglasses during routine microscopy?	31 (33)	62 (67)
Did you notice any worsening in the vision after starting pathology practice?	64 (70)	27 (30)
Do you have color vision deficiency?	0 (0)	93 (100)
Have you been tested for color vision deficiency?	65 (71)	26 (29)
Have you noticed any difficulty in detection the cells with metachromasia, bacteria stained with Ziehl-Neelsen, or amyloid stained with Congo red or crystal violet?	2 (2)	91 (98)
Did your vision disorders have an influence on decision making for pathology subspecialty?	0 (0)	86 (100)
Is it acceptable that people with color vision deficiency may deal with pathology specialty properly?	31 (35)	57 (65)

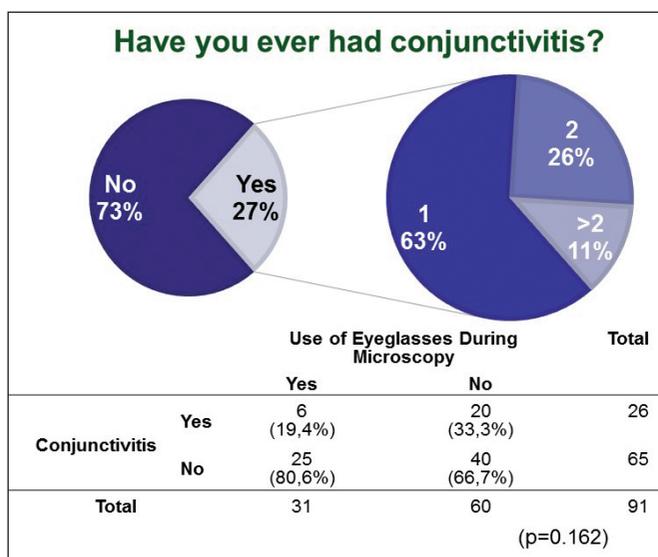


Figure 3: Presence of conjunctivitis attack among pathologists and its correlation with the use of eyeglasses.

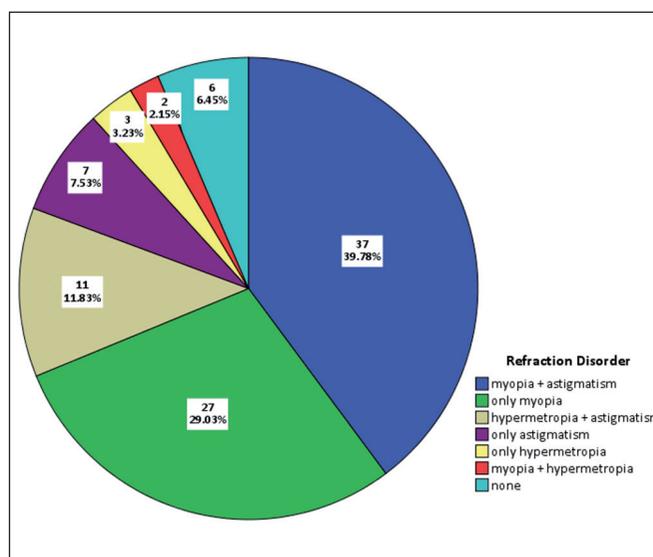


Figure 4: Distribution of refractive errors among pathologists.

in agreement with Adams et al. and Fritzsche et al. that over two thirds of the responders claimed an increase in refractive error of a median 1 D (15, 16). More investigations by McBrien and Adams elucidated the structural cause of adult-onset and adult-progression of myopia as vitreous chamber elongation (19), which may occur due to certain occupational tasks during the use of microscopy. Other proposed reasons for the high level of myopia among pathologists are long time spent on microscope or computer and selection bias of the ametropic medical students (16).

Conjunctivitis, particularly adenoviral conjunctivitis, is known as a dreadful disease among pathologists, as it results in loss of work and spreads quickly due to frequent use of the microscope. In our series, over one third of the participants had suffered at least one conjunctivitis attack. Interestingly, conjunctivitis among pathologists who do not use eyeglasses during microscopy was almost 2 times as common as that of pathologists who wear eyeglasses (19.4% vs. 33.3%), although the difference did not reach statistical level of significance. Further studies with larger groups are needed to prove the protective effect of eyeglasses on the prevention of conjunctivitis.

Color blindness is relatively common with a worldwide prevalence of 5-8% among males and 0.4-1.0% among females (20). The prevalences reported from Turkey are slightly lower than these figures: 3.7-5.5% for men and 0-0.8% for women (21, 22). Color vision deficiency may be either inherited (mostly deutan) or acquired (mostly tritan) as a result of aging or other diseases such as diabetes, high myopia and multiple sclerosis. While the prevalence of inherited color vision deficiency is greater in males than in females, the prevalence of acquired deficiencies will be expected to be the same in both sexes. Moreover, the prevalence of acquired defects is also expected to increase with age (23, 24). In our group composed of 93 pathologists or pathology residents, none claimed to suffer from color blindness. The absence of neither inherited nor acquired color vision deficiency in our group could be explained by predominance of young pathologists, in whom an acquired color vision defect is not expected. Absence of color vision deficiency might also be due to the so-called mutually exclusive nature of pathology practice and color blindness. As an indicative of this, nearly two thirds of the pathologists took the view that color blind people should not perform pathology practice. Common sense and some vivid examples may suggest that color vision deficiency may have an impact on doctors' medical skills, including those in ophthalmology, ear nose and throat, pediatrics, gastroenterology, and pathology (11). In pathology

practice, this belief could be justified by misevaluation of special stains, such as Ziehl-Neelsen, periodic acid Schiff, crystal violet, and even routine hematoxylin and eosin stain. Indeed, there is some evidence that color blind pathologists may experience some difficulties in evaluating several special stains such as Ziehl-Neelsen (12). However, it is also suggested that these complications can be easily overcome by self-awareness of the color blindness and its diagnostic limits; therefore, color blindness should not be a ground for concern in the selection and training of histopathologists (25, 26). The essence of pattern analysis, knowledge and judgment rather than color perception in order to reach the correct pathological diagnosis, and the presence of journals and textbooks printed with black and white images also supports the latter statement. Moreover, it is reported that there are some skillful pathologists who are color blind and work without inconvenience (13, 26). Lastly showing the prejudice towards color blindness, none of the pathologists having any degree of visual disturbances other than color vision defect claimed that this had an influence on the selection of pathology subspecialty.

Recently, the statement "*the candidates should fulfill medical conditions requested by specialties. For example ... not to have color blindness for pathology, biochemistry and microbiology...*" in the application form of examination for specialty in medicine (TUS) have been removed after the Fall Examination in 2009. In the light of evidence-based medicine, specialties such as pathology or microbiology should not be forbidden for medical students with color blindness. However, it is highly recommended that medical students and doctors be checked for color vision deficiency before they decide on their subspecialty (12). Only 70% of our study group were being checked for color vision deficiency. Also, 1 of the 2 female pathologists complained of having difficulty in the evaluation of special stains but had not undergone a color blindness test before. This finding indicates that there may be potential color blind subjects among the pathologists not tested for the condition.

## REFERENCES

1. Birch J, Chisholm CM. Occupational colour vision requirements for police officers. *Ophthalmic Physiol Opt.* 2008;28:524-31.
2. Cumberland P, Rahi JS, Peckham CS. Impact of congenital colour vision defects on occupation. *Arch Dis Child.* 2005;90:906-8.
3. Harris RW, Cole BL. Abnormal colour vision is a handicap to playing cricket but not an insurmountable one. *Clin Exp Optom.* 2007;90:451-6.
4. Hyman L. Myopic and hyperopic refractive error in adults: An overview. *Ophthalmic Epidemiol.* 2007;14:192-7.

5. Gwiazda J, Deng L, Dias L, Marsh-Tootle W; COMET Study Group. Association of education and occupation with myopia in COMET parents. *Optom Vis Sci.* 2011;88:1045-53.
6. Wensor M, McCarty CA, Taylor HR. Prevalence and risk factors of myopia in Victoria, Australia. *Arch Ophthalmol.* 1999;117:658-63.
7. Cortinez MF, Chiappe JP, Iribarren R. Prevalence of refractive errors in a population of office-workers in Buenos Aires, Argentina. *Ophthalmic Epidemiol.* 2008;15:10-6.
8. Campbell JL, Spalding AJ, Mir FA, Birch J. Doctors and the assessment of clinical photographs-does colour blindness matter? *Br J Gen Pract.* 1999;49:459-61.
9. Campbell JL, Spalding JA, Mir FA, Birch J. Doctors and the assessment of blood glucose testing sticks: Does colour blindness matter? *Br J Gen Pract.* 2000;50:393-5.
10. Cole BL. Assessment of inherited colour vision defects in clinical practice. *Clin Exp Optom.* 2007;90:157-75.
11. Spalding JA. Colour vision deficiency in the medical profession. *Br J Gen Pract.* 1999;49:469-75.
12. Poole CJ, Hill DJ, Christie JL, Birch J. Deficient colour vision and interpretation of histopathology slides: Cross sectional study. *BMJ.* 1997;315:1279-81.
13. Rigby HS, Warren BF, Diamond J, Carter C, Bradfield JW. Colour perception in pathologists: The Farnsworth-Munsell 100-hue test. *J Clin Pathol.* 1991;44:745-8.
14. Ting PW, Lam CS, Edwards MH, Schmid KL. Prevalence of myopia in a group of Hong Kong microscopists. *Optom Vis Sci.* 2004;81:88-93.
15. Adams DW, McBrien NA. Prevalence of myopia and myopic progression in a population of clinical microscopists. *Optom Vis Sci.* 1992;69:467-73.
16. Fritzsche FR, Ramach C, Soldini D, Caduff R, Tinguely M, Cassoly E, Moch H, Stewart A. Occupational health risks of pathologists-results from a nationwide online questionnaire in Switzerland. *BMC Public Health.* 2012;12:1054
17. TC Sağlık Bakanlığı Halk Sağlığı Kurumu. Çocuklarda Görme Tarama Programı, 2012 Access date: 21/7/2015. Available from: [afyonhsm.gov.tr/gorme.pptx](http://afyonhsm.gov.tr/gorme.pptx)
18. T.C Sağlık Bakanlığı Sağlık Araştırmaları Genel Müdürlüğü: Ankara İli'nde İlkokul 1. Sınıf Öğrencilerinde Gözde Kıırma Kusurları Sıklığının Tespit Edilmesi Araştırması, 2013 Access date: 21/7/2015. Available from: [http://www.sagem.gov.tr/Gozde\\_Kirma\\_Kusurlari\\_Raporu\\_04\\_03\\_2014.pdf](http://www.sagem.gov.tr/Gozde_Kirma_Kusurlari_Raporu_04_03_2014.pdf)
19. McBrien NA, Adams DW. A longitudinal investigation of adult-onset and adult-progression of myopia in an occupational group. Refractive and biometric findings. *Invest Ophthalmol Vis Sci.* 1997;38:321-33.
20. Birch J. Worldwide prevalence of red-green color deficiency. *J Opt Soc Am A Opt Image Sci Vis.* 2012;29:313-20.
21. Aydemir O, Can Bilir N. The Prevalence of congenital colour blindness in our university students. *Firat Medical Journal* 2012;17:144-7.
22. Işıklı B, Kalyoncu C, Metintaş S, Arslantaş D, Ünsal A: Refractive errors and color-blindness in school children between the ages of 6 and 17. *Turkish Medical Journal* 1999;6:29-32.
23. Jafarzadehpur E, Hashemi H, Emamian MH, Khabazkhoob M, Mehravaran S, Shariati M, Fotouhi A. Color vision deficiency in a middle-aged population: The Shahroud Eye Study. *Int Ophthalmol.* 2014;34:1067-74.
24. Shin YJ, Park KH, Hwang JM, Wee WR, Lee JH. A new color vision test to differentiate congenital and acquired color vision defects. *Ophthalmology.* 2007;114:1341-7.
25. Colour prejudice among pathologists. *Lancet.* 1991;338:1302-3.
26. Goudie RB. Colour deficient vision should not prevent a career in histopathology. *BMJ.* 1998;316:1750.