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Distribution Analysis of Refraction Defects in Prescriptions in Terms of Opticians: The Case of Karaman Province

Optisyenlik Açısından Reçetelerdeki Refraksiyon Kusurlarının Dağılım Analizi: Karaman İli Örneği

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ÖZET
Amaç: Bu araştırmanın amacı Karaman ilindeki vakıf ve devlet hastanelerinde yazılan reçetelerdeki kırma kusurlarının analiz edilerek değerlendirilmesidir.
Materyal ve Metot: Araştırmaya Karaman ilinde göz doktoruna başvurarak adına reçete düzenlenen 213 kişi dâhil edilerek reçeteler retrospektif olarak incelendi. Araştırmaya dâhil edilen 213 kişiden; 126'sı (%59,15) kadın, 87'si (%40,85) ise erkektir. Reçetelerdeki yakın ve uzak gözlük verileri; basit miyop, basit hipermetropi, basit miyop astigmatizma, basit hipermetrop astigmatizma, kompoze miyop astigmatizma, kompoze hipermetrop astigmatizma, mikst astigmatizma olmak üzere 7 gruba ayrılarak analiz edildi**.**
Bulgular: Araştırmada yakın gözlük sağ cam refraksiyon kusurları analizinde; basit hipermetropi %22,06 ile en sık görülürken %0,94 ile en az görülen basit miyop astigmatizma tespit edilmiştir. Yakın gözlük sol cam refraksiyon kusurları analizinde; mikst astigmatizma %22,53 ile en sık görülürken, %0,47 ile en az görülen basit miyop astigmatizma olduğu tespit edilmiştir. Uzak gözlük sağ cam refraksiyon kusurları analizinde; bileşik miyop astigmatizma %30,98 ile en sık görülürken, en az görülen %2,35 ile basit hipermetrop astigmatizma tespit edilmiştir. Uzak gözlük sol cam refraksiyon kusurları analizinde; bileşik miyop astigmatizma %29,11 ile en sık görülürken en az görülen %2,35 ile basit hipermetrop astigmatizma tespit edilmiştir.
Sonuç: Araştırma sonucunda en sık rastlanan refraksiyon kusurunun %30,98 ile bileşik miyop astigmatizma, en az rastlananın ise %0,47 ile basit miyop astigmatizma olduğu tespit edilmiştir. Araştırma, Karaman ilindeki kırma kusuru dağılımını geniş çapta inceleyen ilk araştırma olması açısından önemlidir.

Anahtar Kelimeler: Optisyenlik, Reçete, Refraksiyon Kusurları, Yakın Gözlük, Uzak Gözlük.

ABSTRACT
Objective: The aim of this study is to analyze and evaluate refraction errors in prescriptions written in foundation and state hospitals in Karaman province.
Material and Method: The prescriptions were analyzed retrospectively by including 213 people who applied to an ophthalmologist in the province of Karaman and for whom a prescription was issued. Of the 213 people included in the study; 126 (59.15%) are women, 87 (40.85%) are men. Near and far eyeglasses data on prescriptions were divided into 7 groups as simple myopia, simple hyperopia, simple myopic astigmatism, simple hyperopia astigmatism, composite myopic astigmatism, compound hyperopia astigmatism, and mixed astigmatism.
Results: In the near-eyeglass right glass refraction defects analysis in the research; simple hypermetropia was the most common with 22.06%, while the least common simple myopic astigmatism was detected with 0.94%. In the near eyeglass left eyeglass refraction defects analysis; while mixed astigmatism was the most common with 22.53%, it was determined that it was the least seen simple myopic astigmatism with 0.47%. In the far eyeglass right glass refraction defects analysis; compound myopic astigmatism was the most common with 30.98%, and the least common was simple hypermetropic astigmatism with 2.35%. In the far eyeglass left eyeglass refraction defects analysis; compound myopic astigmatism was the most common with 29.11%, while the least common was simple hypermetropic astigmatism with 2.35%.
Conclusion: As a result of the research, it was determined that the most common refractive error was compound myopic astigmatism with 30.98%, and the least common one was simple myopic astigmatism with 0.47%. The research is important due to it is the first study to examine the refractive error distribution in Karaman.

Keywords: Optician, Prescription, Refraction Defects, Near Eyelasses, Distance Eyeglasses.

INTRODUCTION

Sight is one of the most important components of human perceptions that enable us to connect with the that we live in (Dandona and Dandona, 2001). The eye, which provides the visual function, is located in the orbits known as right and left eye sockets on the human face and allows us to integrate with the world by perceiving the environment we live in. The eye contains a visual layer called retina, which covers 70% of the receptors in the human body (Snell, 2012). Seeing begins with the light falling on the eye and focuses on the retina after the interaction of light with different parts in the eye. Optical and material interaction takes place during this focus. Optical interference, which is also called refractive error, occurs as a result of the inability of light that comes to the eye to focus on retina due to the differences in the structural properties of the eye. Another interaction is the material interactions of light with the optical systems in the eye. Considering that the eye is both an organic tissue and an optical system, it contains structural bonds with many different tissues. Structural defects that occur when the tissues and ligaments in the eye structure do not work in a perfect harmony cause the quality of image to deteriorate by scattering the light that comes to the eye (Tang et al., 2009). Unless the refractive errors that impair the image quality are corrected, the individual's quality of life will decrease, regardless of the age, gender and ethnicity of the individual (Rahi, 2010). Correction of these defects has a positive effect on general health, psychological state, academic achievement and career choice (Davidson and Quinn, 2011).

The methods used while correcting refractive errors are refractive surgery, contact lenses and eyeglasses. In this study, prescriptions for eyeglasses used in the solution of refractive errors are discussed. Eyelasses consist of two lenses (lens, glass) that help to solve refractive errors by means of frame and dioptric (refractive) power. Dioptric power is a measure of the extent to which the lenses recommended for correction of eye defects in prescriptions deflect incoming rays from their original direction. The eye that does not have any visual problems, in other words, the one that can focus the rays coming parallel to the eye on retina is called the "emmetropic eye". If the eye cannot focus the rays on the retina; in other words, if there is a refraction defect, it is called "ametropic eye". There are three different refractive errors depending on the inability of the rays coming parallel to the ametropic eye to focus on one point, and the place focused on being in front of or behind the retina (O'dwyer and Akova, 2011). Refractive errors are examined under three headings below:

1. Myopia: It is a refractive error in which rays come parallel to the eye focus in front of the retina (Yanoff and Duker, 2014). Individuals with myopic eye defect cannot see distant objects clearly, but they have no problems seeing near objects. Spherical concave lenses with negative dioptric power are used while correcting myopia.

2. Hypermetropia: It is a refractive error in which rays coming parallel to the eye focus behind the retina. Individuals with hypermetropic eye defect cannot see near objects clearly, but they have no problems seeing distant objects. Spherical concave lenses with positive dioptric power are used while correcting hypermetropia.

3. Astigmatism: It is the condition of rays coming to the eye refracting in different meridians; that is, not being able to focus on a single point (Donders, 1864). Astigmatism is corrected by using cylindrical lenses. In astigmatism, the image of the object is examined under three headings according whether it focuses in front of and behind the retina (Bengisu, 1998; Güler, 2001; Miller et al., 2008-2009).

a) Simple astigmatism: In an individual, while one meridian is emmetropic, the other is ametropic; that is, one of the images is focused on the retina, while the other is focused in front of it. If one meridian is emmetropic and the other is myopic, it is called "simple myopic astigmatism, and if one meridian is emmetropic and the other hypermetropic, it is called "simple hypermetropic astigmatism".

b) Compound astigmatism: All meridians are ametropic in the individual, that is, the images focus on in front of or behind the retina. In compound astigmatism, different diopter values show hypermetropia or myopia. If diopter values are different and both images focus behind the retina, it is called "compound hypermetropic astigmatism", and if diopter values are different and both images focus in front of the retina, it is called "compound myopic astigmatism".

c) Mixed astigmatism: All meridians in an individual are ametropic and one of the meridians is myopic and the other is hypermetropic.

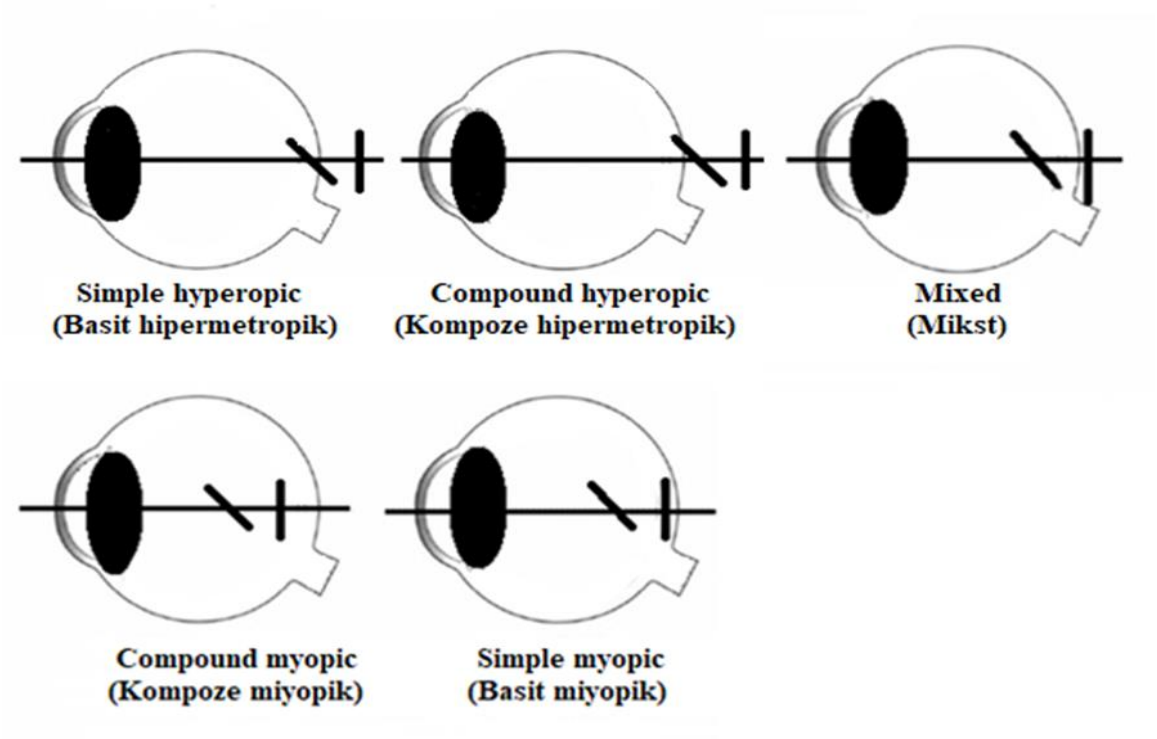

Figure 1. Position of focal lines relative to retina in astigmatism types

The purpose of this research; the aim of this study is to analyze and evaluate the refractive errors in the prescriptions written in foundation and state hospitals in Karaman. It is aimed to examine the prescriptions separately in the form of near and far glasses data. Near and far eyeglasses data on prescriptions are analyzed by dividing into 7 groups as simple myopia, simple hyperopia, simple myopic astigmatism, simple hyperopic astigmatism, composite myopic astigmatism, composite hyperopic astigmatism, mixed astigmatism, and as a result of the research, the percentages of the most common and least common refractive errors are analyzed. It was aimed to determine their distribution.

MATERIAL and METHODS

In the study, refraction errors of patients who applied to an optical store in Karaman province with a prescription written by an ophthalmologist between August and September 2021 were retrospectively examined. All patients were briefly informed about the details of the study and their consent was obtained. The study was approved by the ethics committee of Ondokuz Mayıs University on 27.08.2021 with the decision number 2021/676. The study was carried out taking into account international declarations.

This study aims to collect data on a certain population and to find out the characteristics of this population at a specific time. For this reason, it was decided to use cross sectional survey model in this

study (Büyüköztürk et al., 2012). While forming the study group, easily accessible sampling method, one of the non-random methods, was used since they were considered to be easily accessible. The scope of the study is eyeglass wearers who referred to ophthalmologist in the province of Karaman with vision problems and who were prescribed prescriptions to correct their vision defects. The study was carried out with the analysis of the prescriptions of 213 individuals who referred to opticians with prescriptions taken from both state and private hospitals in the province of Karaman between 2020 and 2021. Of the 213 individuals included in the study, 59.15% (126) were female, while 40.85% (87) were male. Coding the prescriptions included in the study is also an important stage. In order to minimize the possibility of error in the study, the data to be analyzed must be correctly coded. Among the individuals who were included in coding, those who had refractive error in at least one of their eyes were taken as "having refractive error". Refractive errors were grouped in and analyzed as simple myopia (Simple Myo), simple hypermetropia (Simple Hyp), simple myopia astigmatism (Simple Myo Ast.), simple hypermetropia astigmatism (Simple Hyp Ast.), compound myopia astigmatism (Compound Myo Ast.), compound hypermetropia astigmatism (Compound Hyp. Ast.), mixed astigmatism (Mix. Ast). While coding, the data were entered independently by two different researchers. One of these researchers is a lecturer in the field of opticianry, the other researcher is an optician in the related field. After the researchers finished coding the data independently, percentage of agreement was found by using Miles and Huberman's formula (Miles and Huberman, 1994). The level of consistency in the coding of the researchers was found as 92%. For inconsistent coding, the researchers came together, analyzed the data and ensured coding reliability by providing consensus.

RESULTS

This section includes the results obtained from the analysis of refractive errors in prescriptions of the participants, prepared in both state and private hospitals of the province of Karaman. Of the 213 individuals included in the study, it was found that 121 (56.81%) preferred state hospital, while 92 (43.19%) preferred private hospitals. In the interpretation of the data in prescriptions issued in these hospitals, the results of refractive errors in right and left eye were presented below respectively by considering diopter values in near glasses and distance eyeglasses prescribed.

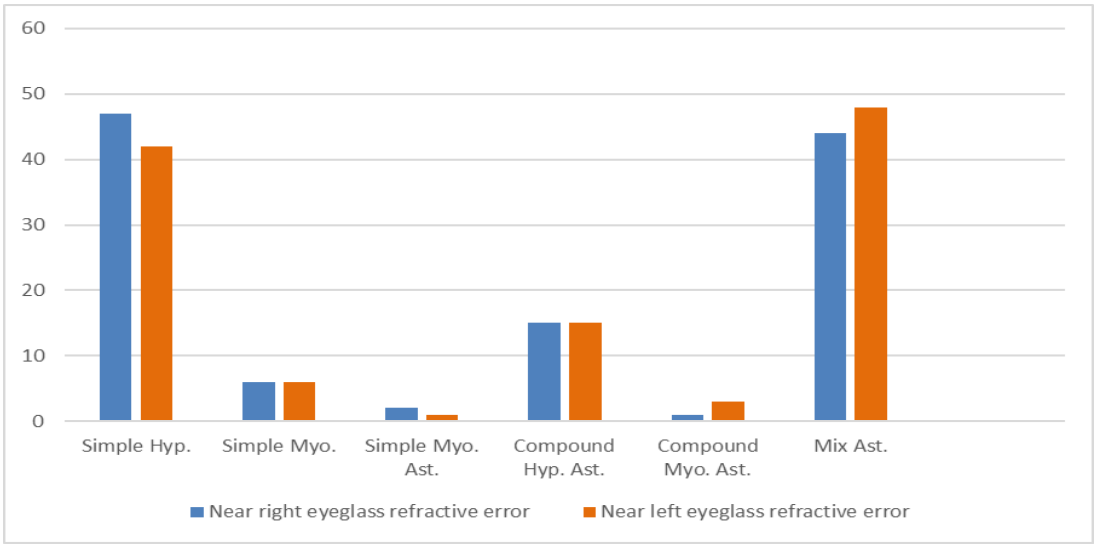

Figure 2. Distribution of refractive errors in near right and left eyeglasses of the participants in the study.

When Figure 2 is examined, it can be seen that refractive errors of the right glass in near eyeglasses were included. In 213 individuals who participated in the study, it was found that the most frequent refractive error was simple hypermetropia in 47 individuals with a rate of 22.06%, while the least frequent was compound myopia astigmatism in 1 individual with a rate of 0.47%. While no simple hypermetropia astigmatism was seen, there were also no individuals who were prescribed 0 power glasses (Vp). While a prescription was prepared for 98 (46.01%) of the participants, there was no need for prescribing near eyeglasses. In refractive errors of the left glass in near eyeglasses, it was found that the most frequent refractive error in 213 individuals included in the study was mixed astigmatism in 48 individuals with a rate of 22.53%, while the least frequent was simple myopia astigmatism in 1 individual with a rate of 0.47%. While no simple hypermetropia astigmatism was seen, there were also no individuals who were prescribed 0 power eyeglasses (Vp). While a prescription was prepared for 98 (46.01%) of the participants, there was no need for prescribing near eyeglasses. Figure 3 shows the comparison of refractive errors of the right and left eyeglass in near eyeglasses in terms of gender.

Figure 3. Gender distribution of refractive errors in near right and left glasses of the participants

When the near eyeglasses right eyeglass data of women were examined, it was found that the most frequent refractive error was simple hypermetropia in 27 individuals with a rate of 21.43%, while the least frequent was compound myopia astigmatism in 1 individual with a rate of 0.79%. Distance eyeglasses right glass data of women showed that the most frequent refractive error was simple hypermetropia in 26 individuals with a rate of 20.63%, while the least frequent was simple myopia astigmatism in 1 individual with a rate of 0.79%. While no simple hypermetropia astigmatism was found in refractive errors of right and left eyeglasses in women, no 0 power eyeglass (Vp) was prescribed. While prescription was prepared for 59 (46.83%) of the female participants, no 0 power eyeglass (Vp) was prescribed. When the near eyeglasses right glass data of women were examined, it was found that the most frequent refractive errors were mixed astigmatism in 20 individuals with a rate of 22.99% and simple hypermetropia in 20 individuals with a rate of 22.99%, while

the least frequent was compound hypermetropia astigmatism in 1 individual with a rate of 9.19%. In near eyeglasses left eyeglass data of men, it was found that the most frequent refractive error was mixed astigmatism in 24 individuals with a rate of 27.59%, while the least frequent was compound myopia astigmatism in 1 individual with 1.15%. Of the refractive errors of right and left eyeglass in men, while no simple myopia, simple hypermetropia astigmatism and simple myopia astigmatism were found, there were also no individuals who were prescribed 0 power glass. While a prescription was prepared for 39 (44.83%) of the participants, there was no need for prescribing near eyeglasses.

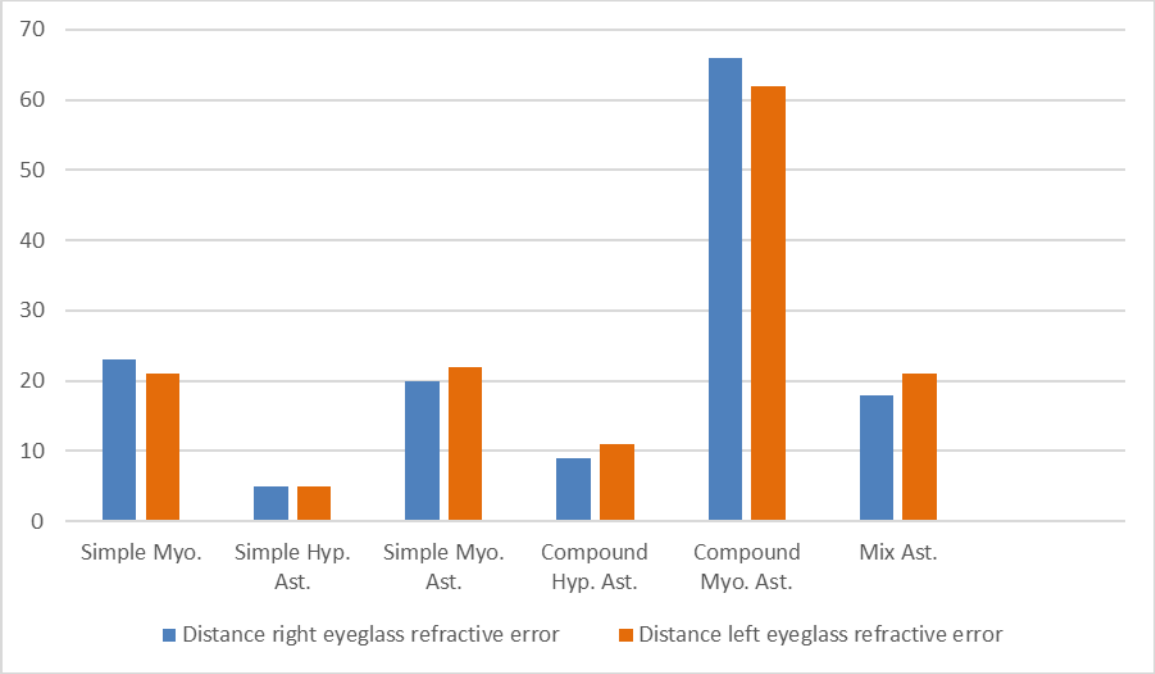

Figure 4. Distribution of refractive errors in distance right and left eyeglasses of the participants

When Figure 4 is examined, it can be seen to include refractive errors of distance eyeglasses right eyeglass. It was found that the most frequent refractive error in 213 individuals who participated in the study was compound myopia astigmatism in 66 individuals with a rate of 30.98%, while the least frequent was simple hypermetropia astigmatism in 5 individuals with a rate of 2.35%. While a prescription was prepared for 53 (24.88%) of the participants, there was no need for prescribing distance eyeglasses and 0 power eyeglasses were prescribed to 4 (1.88%). In terms of refractive errors of the left glass in distance eyeglasses, the most frequent refractive error was found as compound myopia astigmatism in 62 individuals with a rate of 29.11%, while the least frequent was simple hypermetropia astigmatism in 5 individuals with a rate of 2.35%. While a prescription was prepared for 53 (24.88%) of the participants, there was no need for prescribing distance glasses and 0 power eyeglasses were prescribed to 3 (1.41%).

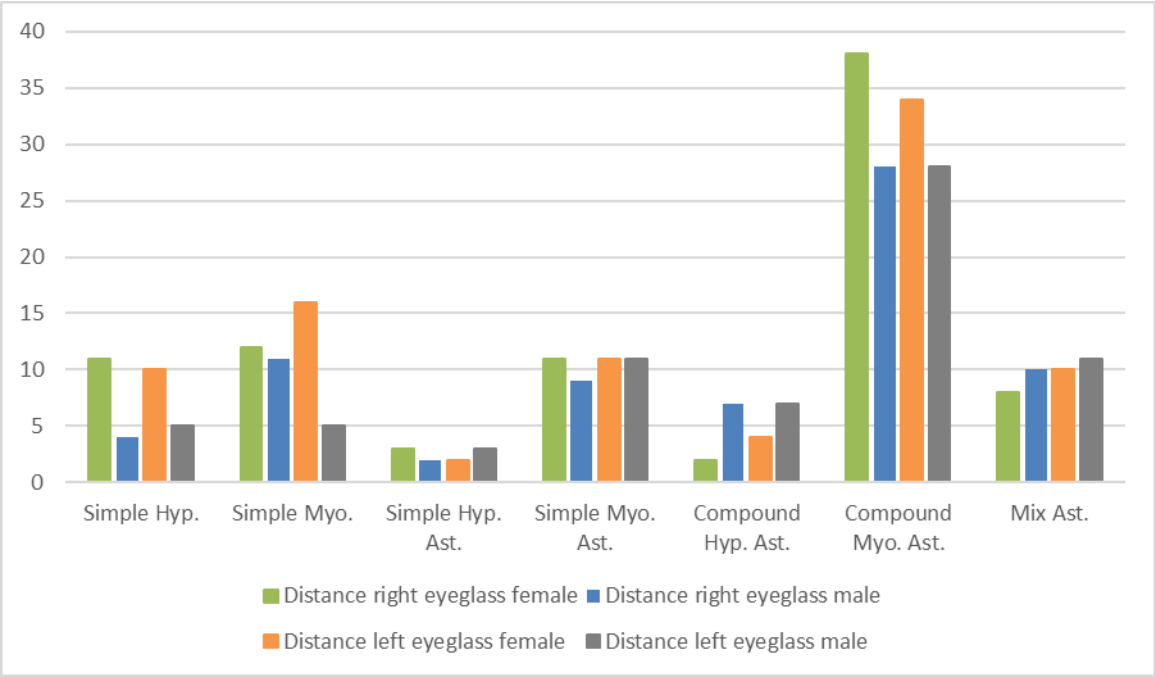

Figure 5. Distribution of refractive errors in distance right and left eyeglasses of the participants in terms of gender

Figure 5 shows the comparison of refractive errors of the right and left eyeglass in distance eyeglasses in terms of gender. When the distance glasses right eyeglass data in women are examined, it was found that the most frequent refractive error was compound myopia astigmatism in 38 individuals with a rate of 30.16%, while the least frequent was compound hypermetropia astigmatism in 2 individuals with a rate of 1.59%. 0 power eyeglass (Vp) was prescribed to 3 (2.38%) of the women in the study, 38 (30.16%) were given prescription, but they were not given distance eyeglasses. When the distance glasses left eyeglass data in women are examined, it was found that the most frequent refractive error was compound myopia astigmatism in 34 individuals with a rate of 26.98%, while the least frequent was simple hypermetropia astigmatism in 2 individuals with a rate of 1.59%. 0 power eyeglass (Vp) was prescribed to 1 (0.79%) of the women in the study, 38 (30.16%) were given prescription, but they were not given distance eyeglasses. When the distance glasses right glass data in men are examined, it was found that the most frequent refractive error was compound myopia astigmatism in 28 individuals with a rate of 32.18%, while the least frequent was simple hypermetropia astigmatism in 2 individuals with a rate of 2.30%. 0 power glass (Vp) was prescribed to 1 (0.79%) of the men in the study, 15 (17.24%) were given prescription, but they were not given distance eyeglasses. When the distance eyeglasses left glass data in men are examined, it was found that the most frequent refractive error was compound myopia astigmatism in 28 individuals with a rate of 32.18%, while the least frequent was simple hypermetropia astigmatism in 3 individuals with a rate of 3.45%. 0 power eyeglass (Vp) was prescribed to 2 (2.30%) of the men in the study, 15 (17.24%) were given prescription, but they were not given distance eyeglasses

DISCUSSION

Refractive errors vary in terms different societies, races, heredity, diet, culture level and similar factors (Chang et al., 2008). There are results showing that the rates of refractive errors vary between 17.47% and 36.7% in Turkiye (Ergin, 2001; Tezcan and Aslan, 2000). It can be seen that a great majority of studies

conducted on refractive errors in Turkiye have been conducted on primary education students and that the results of eye screening in schools have been evaluated. When the literature was reviewed, it was found that there was limited number of studies which included adults and a great majority of them did not examine types of astigmatism by grouping in sub-categories. In this context, Karaman was chosen since no studies were found conducted in this city on this subject and it was easy to reach data. In this study, prescriptions which were written in different hospitals in Karaman and which came to the chosen institution were grouped in subcategories of refractive errors of right and left glass in both distance and near eyeglasses were analyzed.

In the analysis of right eyeglass refractive errors of near eyeglasses, the most frequent refractive error was simple hypermetropia with 22.06%, while the least frequent was simple myopia astigmatism with 0.94%. In a study conducted with 150 participants in the province of Eskişehir by Mutlu (2017), similar results were found and in the analysis of right eyeglass refractive errors of near eyeglasses, the most frequent refractive error was simple hypermetropia with 27.3%, while compound myopia astigmatism was the least frequent with 0.7% (Mutlu, 2017).

In the analysis of left glass refractive errors of near eyeglasses, the most frequent refractive error was mixed astigmatism with 22.53%, while the least frequent was simple myopia astigmatism with 0.47%. Similar to the results of this study, Mutlu (2017) found in the analysis of left eyeglass refractive errors of near eyeglasses that the most frequent refractive error was simple hypermetropia with 28.0%, while unlike this study it was found that the least frequent refractive error was mixed astigmatism.

In this study, in the analysis of right eyeeglass refractive errors of distance eyeglasses, the most frequent refractive error was compound myopia astigmatism with 30.98%, while the least frequent was simple hypermetropia astigmatism with 2.35%. Mutlu (2017) found similar results in his study and showed in right eyeglass refractive errors of distance eyeglasses that the most frequent refractive error was compound myopia astigmatism with 18.7%, while the least frequent was simple hypermetropia astigmatism with 2.7%. In the analysis of left eyeglass refractive errors of distance eyeglasses in this study, the most frequent refractive error was compound myopia astigmatism with 29.11%, while the least frequent was simple hypermetropia astigmatism with 2.35%. Similar to the results of this study, Mutlu (2017) found in the analysis of left eyeglass refractive errors of distance eyeglasses that the most frequent refractive error was compound myopia astigmatism with 20.7%, while unlike this study it was found that the least frequent refractive error was mixed astigmatism with 3.3%.

In a study conducted by Acer (2021) with 826 participants in Kırşehir province, near and far eyeglass prescriptions were not handled separately, and refractive errors in the right and left eyes were examined in general. As a result, in the analysis of refractive errors of the right glasses, the most common refractive error was 20.5% myopia, while the least common 3.2% was mixed astigmatism. When the left glass data were examined, it was determined that the most common refractive error was myopia with 23.0%, while the least common was mixed astigmatism with 4.2% (Acer, 2021).

When studies conducted abroad were examined, it was found that refractive errors were not grouped in sub-categories and instead examined as myopia, hypermetropia and astigmatism. Although there are not many adult studies in Turkiye, it can be seen that there are more studies on adults and that differences between regions were evaluated in studies conducted abroad. In their study, Bourne et al. (2014) examined refractive errors in adults aged 30 and older in Bangladesh to find out the prevalence of refractive errors and to examine the related factors. In the study which included 11.624 subjects, there were 5489 male participants and 5700 female participants. When the distribution of refractive errors was examined in the study, it was found that 4079 of the participants had

myopia, while 3625 had astigmatism and 2308 had hypermetropia (Bourne et al, 2004). When the distribution of refractive errors was examined in a study examining the prevalence of refractive errors and risk factors in Chinese adults in Singapore by Wong et al. (2000), it was found that 778 individuals had myopia, 489 individuals had astigmatism and 400 individuals had hypermetropia (Wong et al., 2000). In Turkiye, Cumurcu et al. (2011) examined the prevalence and distribution of refractive errors in a total of 661 children, 327 female and 334 male, studying in primary schools of Malatya. Refractive errors obtained as a result of their study were myopia with 5.59%, hypermetropia with 2.87%, myopia astigmatism with 16.33%, hypermetropia astigmatism with 15.8% and mixed astigmatism with 9.37% (Cumurcu et al, 2011). When all these data are taken into consideration, they support the result that refractive errors vary according to different factors such as societies, race, genetic factors and age.

CONCLUSION

During the literature review for the study, it was found that a great majority of the studies reviewed were conducted through eye screening applied to primary education students. In this context, considering the lack of studies conducted on populations with a larger age range, this study was conducted on 213 individuals including both children and adults. Considering that refractive errors vary according to factors such as different societies, races, genetic factors, diet, cultural level and similar factors, it can be recommended for researchers to conduct future studies to choose regions which were not previously chosen. In this study, refractive errors were analyzed from near and distance eyeglasses diopter values in prescriptions and analyses were also conducted in terms of the variable of gender. Other variables such as the participants' age, level of education and type of eyeglass were not included in the study. It can be recommended to examine refractive errors in terms of different variables (participants' age, level of education and type of eyeglass) in addition to gender.

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Conflicts of Interest

The authors declare no conflict of interest.

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