Original Article

Effect of Ramadan Fasting on Biometric Readings of Eye

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ABSTRACT

Purpose: To determine change in biometric values of eye after fasting and to elucidate whether this change is significant enough to delay the refractive and cataract surgeries during fasting.

Study Design: Cross sectional observational.

Place and Duration of Study: Eye department, DHQ-UTH, Gujranwala, from April 2021 to May 2021.

Methods: Thirty subjects of either gender between 20-40 years of age who participated in both phases were enrolled in this study. Phase 1 was conducted one week before Ramadan and 2nd phase in the last week of Ramadan. After routine ophthalmic examination, keratometric(K) values were obtained with Auto Ref-Keratometer (Canon), while Axial length (AL), Anterior chamber depth (ACD), and Intraocular lens power (IOL_p)were obtained from Master-Vu A-scan (Sonomed, Model # MV4500). Data was analyzed using SPSS version 25.

Results: Out of 30 participants, 66.6% were female and 33.3%were male with mean age of 29.8 years. Mean K_1 increased to 43.03 D during fasting from non-fasting reading of 42.24 D, while Mean K_2 increased to 43.87 D during fasting from non-fasting reading of 43.28 D with significant p-value (<0.05). Mean ACD was 3.15mm in non-fasting that also increased to 3.21D in fasting state. Mean AL in non-fasting state was 23.41mm that remains the same in fasting state as well. Mean IOL_p in non-fasting state was 21.18D that reduced to 20.42D in fasting state with significant p-value.

Conclusion: Fasting increased the keratometry and ACD values with no effect on AL but that reduced overall intraocular lens power.

Key Words: Anterior chamber depth, Axial length, Keratometry, Intraocular lens.

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INTRODUCTION

Fasting is observed all over the world by a lot of people irrespective of faith, race or religion. Muslims fast during holy month of Ramadan which is the 9th month of lunar calendar. Ramadan fasting affects body composition, biochemical profile and anti-oxidant status.[1] Each Islamic year starts 11 days earlier successively with respect to seasonal year so Ramadan may fall during any season. It is reported that fasting affects the disease course and management of the fasting individuals.[2,3] Muslims fast from sunrise to sunset and are restricted from any type of eating, drinking, smoking and sexual activities. Hypo hydrated state may have different effects on the health especially elderly and sick patients.[3,4] However children, menstruating and lactating women, critically ill patients and travelers are exempted from fasting on certain terms.

During fasting, most people tend to alter their eating and sleeping habits.[5] More portentous foods are consumed impacting different physiological processes in body like decreased insulin and raised glucagon production which in turn affects retinal

hyperperfusion.[6] Fluids and food restriction during fasting may lead to dehydration and weight loss compromising the electrolyte balance which takes part in ocular blood flow.[7] Effects of Ramadan fasting have also been studied on immune system, pregnancy, in cardiac, asthmatic and HIV patients and athletes.[8]

As Ramadan may fall during any season and climate, different studies have been done regarding its effects on eye parameters. Most researched parameter is intra ocular pressure. Kamal et al, showed that significant decrease in IOP occurs during fasting.[9] Some stated no effect on IOP at al.[10] Nowroozzadeh et al, studied the effect on ocular biometric and refractive parameters and stated significant changes.[11] As fasting starts at sunrise, ending at sunset and in between eating is not allowed, people tend to eat and drink in larger amounts during "sahur" and "iftaar". Kerimoglu et al. studied the effect of this overload diet on tears secretion and anterior chamber parameters and reported an increase in tear secretion after "sahur" and subsequent decrease at the end of fast.[12] Another group of researchers studied the changes in visual acuity and refractive state of eye and stated no significant effects.[13]

Ramadan may affect the individuals differently depending upon the climate, season and duration of fasting all over the globe. Moreover, the cultural habits might have add-on effect too. As different ocular parameters have been studied in regards to fasting, we are conducting this study to evaluate any changes in biometric readings of the fasting individuals in a specific population and compare them with non-fasting readings. Results may differ from other studies performed in different circumstances.

This study was conducted to determine any change in biometric values of eye during fasting and whether this change is significant enough to delay the refractive and cataract surgeries while the patient is fasting.

METHODS

After approval from institutional review board, a cross-sectional study was conducted at Eye department of DHQ-UTH, Gujranwala in two phases; one phase was conducted 1 week before Ramadan (April 2021) and the other phase during last week of Ramadan (May 2021) afternoon. Thirty fasting subjects of either gender between 20-40 years of age who participated in both phases were enrolled in this study. Patients with any ocular or systemic disease, using any topical or systemic drugs and previous intra-ocular surgery were excluded from this study. Study was conducted in accordance with Declaration of Helsinki.

After routine ophthalmological examination of visual acuity (VA) by Snellen's chart, best corrected visual acuity (BCVA), and detailed slit lamp examination, keratometric values were obtained with Auto Ref-Keratometer (Canon), while axial length (AL), anterior chamber depth (ACD), and intra-ocular lens power (IOL_p) were obtained from Master-Vu A-scan (Sonomed, Model # MV4500) at A-constant of 118.0 and keeping the standard deviation (SD) at minimum. This examination was carried out one week before Ramadan and same process was repeated in participants during last week of Ramadan, both readings taken at around 12:00 pm. All measurements were obtained by single competent ophthalmologist in both phases.

Data was analyzed using SPSS version 25. Categorical variables were recorded as frequency and percentage while numerical variables were recorded in the form of Mean and Sonomed sample t-test was used to determine the difference of biometric values between fasting and non-fasting state and p-value less than 0.05 was considered significant.

RESULTS

Thirty persons were included in this study (20 were females and 10 were males). Age range was 25 to 36

Table 1: *Mean Keratometry, Anterior chamber depth, Axial Length and Intraocular Lens Power Readings in Fasting and Non-Fasting States*

Mean±SD Values of Variables	Eye	Fasting	Non-Fasting
K_1(diopters)	Right	43.01±1.06	42.42±1.24
	Left	43.04±0.98	42.05±1.14
	Average	43.03±1.34	42.24±1.68
K_2(diopters)	Right	43.90±0.76	43.41±0.89
	Left	43.83±1.14	43.15±1.23
	Average	43.87±1.42	43.28±1.78
ACD (mm)	Right	3.18±0.76	3.13±1.24
	Left	3.23±0.96	3.17±1.14
	Average	3.21±1.86	3.15±1.23
AL (mm)	Right	23.36±0.72	23.34±0.68
	Left	23.47±0.96	23.48±0.76
	Average	23.41±0.86	23.41±0.86
IOL (p)(diopters)	Right	20.60±1.23	21.29±1.46
	Left	20.23±0.45	21.06±0.56
	Average	20.42±1.82	21.18±1.54

years with mean age of 29.8±1.23 years. They were divided into two age groups, Group I consisted of 23 (76.6%) persons ranging from 25 to 30 years and Group II had 7 (23.3%) persons from 31 to 36 years of age.

Mean values of different biometric readings of eyes in fasting and non-fasting states are described in Table 1. The average keratometry and anterior chamber depth reading increased from non-fasting reading. However, average axial length remained unchanged. Mean IOL power was reduced during fasting that shows a myopic shift with significant p-value of ≤0.05(p-value=0.0024).

DISCUSSION

Fasting in the holy month of Ramadan has been made compulsory for all Muslims and is observed by millions of Muslims present around the globe.[14] Fasting has multiple spiritual, mental and health benefits. In fact, researchers have described vastly positive impacts of Ramadan fasting on all organ systems of body as well as different health parameters such as body mass index, serum lipid profiles, inflammatory markers, insulin and HOMA index.[15]

Effect of fasting on different ocular tissues from pre-corneal tear film to choroidal thickness have all been individually and collectively described in literature with most studies focusing exclusively on tear film parameters and intraocular pressure measurements.[16]

In our study, we found out that fasting during Ramadan affects the corneal keratometry readings. The average horizontal keratometry reading (K_1) increased to 43.03 During fasting from non-fasting reading of 42.24 D, with a significant difference of 0.79 D. Similarly, average vertical keratometry reading (K_2) increased to 43.87 D during fasting from non-fasting reading of 43.28 D, with a significant difference of 0.59 D. These differences were more pronounced in left eyes as compared to right eyes. These observations are contradicted by Nowroozzadeh et al. who reported no such differences in keratometric readings during fasting and non-fasting states although he stated very small hyperopic shifts in spherical equivalents.[11]Nowroozzadeh's results were endorsed by Kerimoglu et al. in their study.[12]

We found out that anterior chamber depth (ACD) increased during fasting state to an average reading of 3.21 mm from non-fasting reading of 3.15 mm with difference of 0.06 mm. This was similar to Nowroozzadeh et al, but he reported a very huge difference of 0.84 mm which was more pronounced in early morning. Heravian et al. also had results very similar to our study.[16]

In our study, we observed that Ramadan fasting had no change on axial length (AL) measurements. Average axial length readings remained at 23.41 mm in fasting as well as non-fasting states. This verifies the theory of Uyar et al, of no-difference.[17] However, Heravian et al, stated that axial length decreased significantly during fasting and attributed this change to vitreous shrinkage due to relative state of dehydration during fasting. Baser et al, also declared decreased axial length during fasting.[18]

Our final parameter was intraocular lens (IOL) power calculation (using SRK-II formula)which actually reduced to an average reading of 20.42 D as compared to non-fasting value of 21.18 D with a difference of 0.76 diopters. The difference in IOL power of both eyes was not very dissimilar. This reduction in IOL power during fasting state is contradicted by various studies. Nowroozzadeh et al, stated increase in IOL power in fasting state by almost 0.9 D difference and verified the study of Alameen et al who reported one diopter increase in IOL power.[19] Heravian et al, also reported an increase in IOL power by 0.8 diopter in fasting state.

There are multiple other ocular parameters that have been studied vastly worldwide but not included in our study. Incidence of tear film instability increases while the intraocular pressure (IOP), vitreous volume and choroidal thickness decrease significantly during fasting.[20]

The difference in the results of our study and other studies can be attributed to small sample size and study duration. We performed these calculations in summer and since the month of Ramadan rotates in all seasons and weathers according to Islamic calendar, the readings might be different in different (especially colder) seasons and climate. However, this study provides a great deal of ideas how fasting in Ramadan can affect different ocular especially biometric parameters of eye. These biometric differences might give significant postoperative surprises in patients undergoing cataract surgeries during Ramadan. All these factors have important role in counselling and subsequent management of such patients.

CONCLUSION

Ramadan fasting affects ocular biometry readings to a great extent. Generally speaking, horizontal and vertical keratometry readings and anterior chamber depth increases during fasting. While managing the patients for cataract surgery in Ramadan, all these factors must be considered before undertaking any further steps and patients must be thoroughly counselled about these effects.

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Patient's Consent: All participants provided written informed consent, and researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board **(335/GMC).**

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