Medical Science

pISSN 2321–7359; eISSN 2321–7367

Prevalence of dry eye disease symptoms among medical students in Al-Madinah

Hanan Makhdoum[1], **Mohammed Khoshhal**[2*], **Turki Algethami**[3], **Waleed Alshehri**[2], **Ahmed Albelowi**[4], **Husain AlHabuobi**[4], **Nasser Alsuhaymi**[5]

To Cite:
Makhdoum H, Khoshhal M, Algethami T, Alshehri W, Albelowi A, AlHabuobi H, Alsuhaymi N. Prevalence of dry eye disease symptoms among medical students in Al-Madinah. Medical Science 2022; 26:ms456e2476.
doi: https://doi.org/10.54905/disssi/v26i129/ms456e2476

Authors' Affiliation:
[1]Associate professor of Ophthalmology, College of medicine, Taibah University, Medina, Saudi Arabia
[2]Medical intern, College of medicine, Taibah University, Medina, Saudi Arabia
[3]Ophthalmology resident, King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia
[4]Medical student, College of medicine, Taibah University, Medina, Saudi Arabia
[5]Medical student, College of medicine, Al-Rayan Colleges, Medina, Saudi Arabia

***Corresponding author**
Medical intern, College of medicine, Taibah University, Medina, Saudi Arabia
Email: mohammed.khoshhal@hotmail.com

Peer-Review History
Received: 08 September 2022
Reviewed & Revised: 14/September/2022 to 20/October/2022
Accepted: 01 November 2022
Published: 08 November 2022

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

Introduction: Dry eye disease (DED) is a multi factorial disease of the ocular surface and tears that result in various symptoms. Although there are several studies on the prevalence of DED in general prevalence among medical students is still limited and sparse. Therefore, the aim of this study is to estimate the prevalence of DED among medical students in Al-Madinah, Saudi Arabia. *Methods:* This study was carried out among clinical and pre clinical medical students from March 2022 to May 2022 in two separate Universities in Al-Madinah, Saudi Arabia. The questionnaire was taken from previously published project and reviewed by two ophthalmologists. *Results:* A total of 680 medical students were included. Most of them (n = 462, 67.9%) were reported to have DED. About half of those with DED were considered to have severe disease (n = 219) the rest had mild and moderate disease. *Conclusion:* Dry eye disease symptoms among medical students were highly prevalent. Many factors were found to have a role in developing DED.

Keywords: Dry eye disease; OSDI; Medical students; Saudi Arabia

1. INTRODUCTION

Dry eye disease (DED) is defined according to International Dry Eye Workshop as a disease with several causes affecting orbital surface and tears that results in symptoms of discomfort, visual disruption, and fragility of the tear film with possible harm to the orbital surface associated with an increase in osmolarity of the tear film and inflammation of the orbital surface (Subcommittee of the International Dry Eye Work Shop 2007). A quarter of patients who seek ophthalmic clinics complain of symptoms of dry eye making it an evolving public health issue (Sjögren et al., 1933). The etiology of DED includes two primary elements either tear evaporation or insufficient tear production. Latest research has revealed that dry eye is an inflammatory disease that has many characteristics in common with autoimmune diseases. Distress to the orbital surface (infection, antigen, endogenous stress, environmental factors and genetic factors) is hypothesized as the mechanism of etiology. Pro inflammatory chemokines, cytokines, and matrix metalloproteinase lead to the proliferation of auto reactive T helper cells that

penetrate the lacrimal glands and orbital surface. A vicious cycle is the outcome of damage to the orbital surface and inflammation (Stern et al., 2013; Stevenson et al., 2013).

Risk factors include old age and female gender particularly postmenopausal women. This is influenced by the considerable decline of tear generation with in the sixth decade of life (Lamberts et al., 1979). Furthermore long term contact lens wear may precipitate or aggravate DED symptoms (Gayton et al., 2019). Anti depressants and antihistamines are known to have xerophthalmic side effects that can eventually lead to DED (Terry et al., 2001). Following refractive operation such as photo refractive keratectomy (PRK) or laser assisted in situ keratomileusis (LASIK) patients may encounter severe eye dryness because of the injuries to the nerves of cornea during surgery (Fox et al., 1984; Fair weather et al., 2008). Smoking can also contribute to DED (Market Scope, 2004). Dry eye symptoms are exacerbated by prolonged television viewing and reading also prolonged visual tasking while using a computer (Schlote et al., 2004). Additionally to the previously mentioned risk factors and etiologies, environmental and climate challenges for instance indoor environment, air travel, pollution, relative humidity, and hot temperatures, among others has a crucial a part in its occurrence of DED (Gayton, 2009). However there was no significant relationship between diabetes, age group, or hypertension and DED (Yasir et al., 2019).

The prevalence of DED has been studied in many countries around the world. It can vary between 7% and 34% within the general populace (Gayton et al., 2009; Moss et al., 2000). In the United States DED affects approximately 4% of men (1.05 million) and 7% of women (3.2 million) over 50 years of age (Schaumberg et al., 2002; Schaumberg et al., 2003). Australia has an estimated prevalence of 7.4% of DED, with older patients' prevalence significantly higher, and tear production was significantly lower in women from 50 to 59 years old (Mc Carty et al., 1998). Approximately 27.5% of Indonesian Adults experience dry eyes along with increased prevalence correlated with aging, pterygium and cigarette smoking (Lee et al., 2002). There is also an estimated prevalence of 25% in Canada and in Japan of 33% (Shimmura et al., 1999). The prevalence of dry eyes in China was 17% (Liu et al., 2014) and Spain 11%, which is lower than the incidence in northern India of 32% (Viso et al., 2009; Titiyal et al., 2018). Looking at the literature locally a research done in Riyadh revealed that 35% of adults aged 40 years and older have dry eyes. However, many of these patients had mild dry eyes (Yasir et al., 2019). Another study was carried out in Saudi Arabia showed that 84.5% of contact lens wearers had some degree of DED symptoms (Almutairi et al., 2021). Although there are several studies on the DED prevalence in general data and prevalence of the same issue among a specific population such as medical students who usually read and study for long hours is still limited and sparse. Therefore the aim of the current research is to determine the prevalence of DED among medical students in Al-Madinah.

2. MATERIALS AND METHODS

This is a cross sectional study that was conducted among clinical and pre clinical students in medical colleges at two separate universities (Taibah University and Al-Rayan College) in Al-Madinah, Saudi Arabia. The study duration was from March 2022 to May 2022. A self administrated and structured electronic questionnaire (the questionnaire is considered valid since we took it from previously published research (Alkabbani et al., 2021). After obtaining permission from the corresponding author was distributed among the targeted population and data was collected using an online platform (Google Form). More over the questionnaire was reviewed by two independent board certified ophthalmologists for any conflicts or disagreements.

Study population and sampling

The sample size was 360. This was determined by using the following formula: $n = Z^2 P (1-P) / d^2$. Where n is the sample size Z is the statistic corresponding to level of confidence (1.96) P is expected prevalence (obtained from a similar study done on medical students in Dubai (Alkabbani et al., 2021) where in prevalence was 62.2% we took the prevalence from this study since we didn't find any studies done locally on medical students and we assume that Saudi Arabia will have similar prevalence to Dubai) and d is precision (5%). Since the number of students in each batch was not unified stratified random sampling was used so that all batches were appropriately represented. This included classifying the population into internally homogeneous subgroups or strata (each batch in the same gender was treated as a separate stratum, for example 2nd year male students were separated from 2nd year female students and so on), then a sample was drawn from each stratum by simple random sampling. Finally, we combined results of all strata. Female and male students in pre clinical and clinical phases of medical college were enrolled and included. Our exclusion criteria were as follows: Students in health specialties other than medicine, intern's and graduated medical students and those who refused to give the consent.

Measurements

The study used a structured, validated, self administrated questionnaire to collect the information. The questionnaire was comprised of three main divisions; the first division was socio-demographic characteristics. The second division was the Ocular Surface Disease Index (OSDI) which is a reliable and standardized method to assess the presence or absence of DED and its severity. The third section was risk factors related to DED.

Data management and analysis plan

The data was analyzed and coded by Statistical Package for Social Sciences (SPSS) software. A $p < 0.05$ was considered statistically significant.

Ethical consideration

The agreement of the participants to complete the survey was considered as consent to participate. The data are only accessible by the primary author and co-authors. The participation was voluntary and every participants were submitted their consent for participation. This study received the ethical approval from the Ethical Committee of Scientific Research division of Medical College at Taibah University, Al-Madinah, Saudi Arabia (TU-21-020).

3. RESULTS

The study includes 680 participants 53.1% of them were females and 46.9% were males. 58.2% of our participants were aged between 20–24 years old, 34.1% aged between 19–21 years old and 6% aged over 24 years old. 95.4% were single, 3.8% were married and 0.7% was divorced. 55.9% were from Taibah University and 44.1% were from Al-Rayan Collage. 25.7% were in their 5th year, 23.5% were in their 6th year, 19.6% were in their 3rd year, 17% were in their 4th year and 14.1% were in their 2nd year. 39.6% had a GPA > 4.5, 24.1% of them were between 4.25–4.5, 15.4% of them were between 4.0–4.25, 11.6% of them were between 3.75–4.0, 6.6% of them were between 3.5–3.75 and 2.6% of them were below a 3.5 GPA.

Table 1 Socio-demographic characteristics of participants (n = 680)

Parameter		No	Percent
Gender	Male	319	46.9
	Female	361	53.1
Age	19–21 years old	232	34.1
	22–24 years old	396	58.2
	> 24 years old	52	7.6
Marital status	Divorced	5	0.7
	Married	26	3.8
	Single	649	95.4
University	Taibah University	380	55.9
	Al-Rayan Collage	299	44.1
Academic year	2nd	96	14.1
	3rd	133	19.6
	4th	116	17.1
	5th	175	25.7
	6th	160	23.5
GPA	> 3.5	18	2.6
	> 4.5	269	39.6
	3.5–3.75	45	6.6
	3.75–4.0	79	11.6
	4.0–4.25	105	15.4
	4.25–4.5	164	24.1

Table 2 Ocular Surface Disease Index (OSDI) (n = 680)

		No	Percent
OSDI	No dry eye	218	32.1
	Dry eye	462	67.9
Severity	Mild	124	18.2
	Moderate	119	17.5
	Severe	219	32.2
	No dry eye	218	32.1

Our study shows that 67.9% of the participants were having dry eye disease and 32.1% were not. 32.2% of them were severe cases 18.2% of them were mild cases and 17.5% were moderate cases. 76.7% of participants didn't find it difficult to open their eyes in the morning due to the dryness and 23.3% of them found it hard to open their eyes. 86.2% have no previous history of injury or ophthalmic surgery (including chemical injury) and 13.8% of them have a history of injury or ophthalmic surgery. 92.6% of them are not on medication and 7.4% of them are on some medications. 67.5% of them are not exposed to smoking or Shish and 32.5% are exposed. 79.6% are not exposed to walking outdoors and 20.4% are exposed. 61.6% of them had more than 6 hours screen time per day, 32.8% of them had 3–6 hours per day and 6% of them had less than 3 hours daily. 97.4% of them did not have any rheumatologic disease and 2.6% of them are affected by rheumatologic disease.

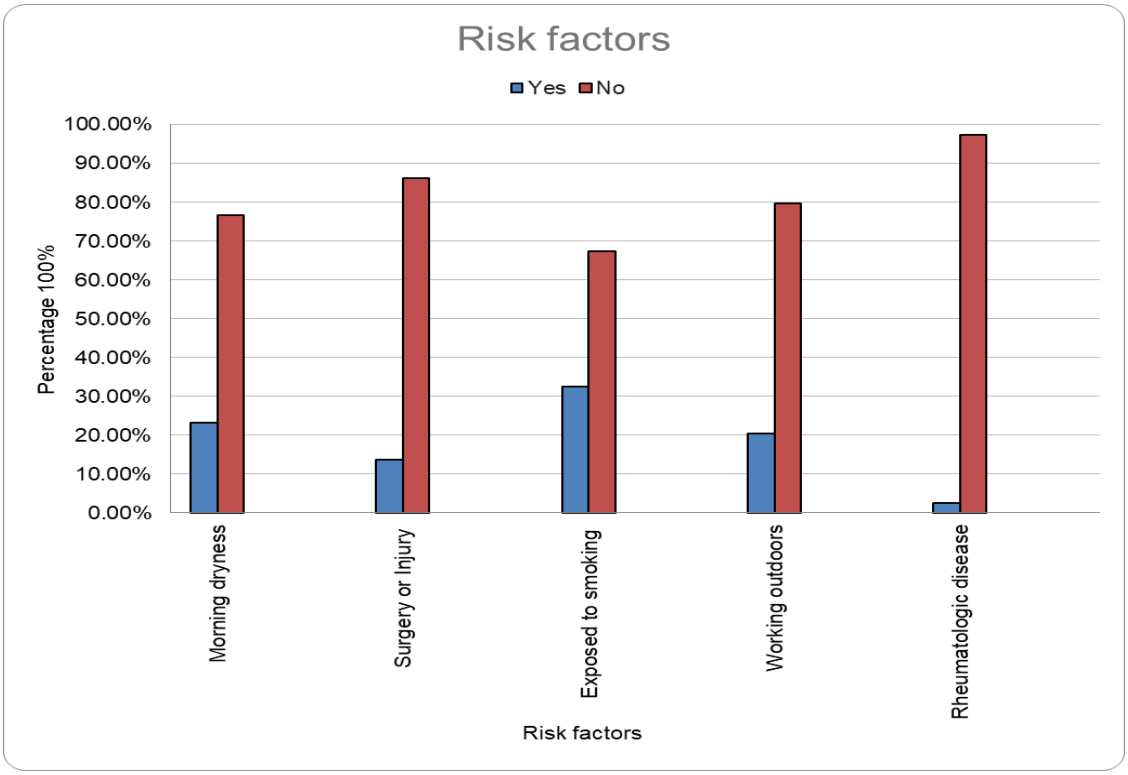

Figure 1 Risk factors

4. DISCUSSION

This study is aimed to investigate the prevalence and severity of DED and to assess the possible risk factors among medical student in Al-Madinah, Saudi Arabia. As far as we are concerned this is the first research which addresses DED among medical students in Al-Madinah, Saudi Arabia.

Reference to relevant literature

According to the results of the survey, 67.9% of students were reported to have DED. This may be attributed to the hot dry climate of Al-Madinah. Also the use of air conditioners and fans in buildings and cars may have a corresponding relation. As a comparison between our findings and a study conducted in Gujarat, India among medical students in tertiary care hospital prevalence was

estimated to be 56.81% (Sethia et al., 2021). Another study at Chiang Mai University in Thailand had a prevalence of 70.8% (Tang monkongvoragul et al., 2022). Another study conducted at University of Fallujah in Iraq had a prevalence of 20.1% (Fayyadh et al., 2021). A study conducted at Shanghai University in China assessing ocular surface health had a prevalence of only 10% (Li et al., 2018). This wide variation in prevalence may be attributed to different factors such as the corresponding environment study population, demographic factors and different modalities of diagnosis.

A major aspect to investigate and estimate was the significance of risk factors to better understand the results. According to the results of the survey eye injury and ophthalmic surgery were crucial risk factors for developing DED ($p = 0.008$). In fact DED is known to manifest as a complication of eye surgery especially LASIK surgeries (Mayo clinic org et al., 2022). Ironically smoking was an insignificant risk factor for DED ($p = 0.881$). In comparison to other studies smoking is proven to be a significant risk factor for DED as seen in a study in Jeddah, Saudi Arabia (Bukhari et al., 2009). This might be attributed by the difference in the sample size and population. Working outdoors and being exposed to the outer environment were significant risk factors ($p = 0.002$). This is sensible because the weather in Al-Madinah is dry, hot and dusty most of the year. Most of the participants had more than 6 hours daily screen time fewer had 3–6 hours screen time and a very small portion of participants had < 3 hours screen time. Surprisingly the screen time was an insignificant risk factor ($p = 0.310$). Contrary to expectations rheumatological diseases and medication use were insignificant factors ($p = 0.156$ and $p = 0.058$ respectively). Despite that it is a matter of fact that rheumatological conditions are very important risk factors for DED but as elaborated previously this unanticipated finding might be because of the sample size. These are the risk factors that were investigated in the study. More research and investigation are required to expand the sample for better understanding of the desired objectives.

Strength and limitations

This study has important and valuable strengths. This is the first study to investigate DED in Al-Madinah, Saud Arabia which gives a baseline to all upcoming studies in this corresponding region. The population of the study was exclusively medical students who have better understanding of the questions on the survey and its terminology which positively affects outcomes (i.e., minimizing understanding errors and bias that could occur from the general population due to educational backgrounds). It uses a certified scale to assess the magnitude of DED OSDI. This study has some limitations that were challenging and inevitable. The sample size was not considerable. It would be fruitful to establish new research addressing larger samples. In addition providing an online questionnaire to evaluate DED instead of clinical evaluation is an issue. However online questionnaires are especially convenient amidst COVID-19 pandemic physical contact and social distancing obstacles occurring globally. Moreover some essential data were not collected (i.e., additional risk factors) due to lack of similar studies regarding DED. There are no similar studies in Al-Madinah to compare the survey findings. There is very little research regarding DED prevalence both locally and globally.

Recommendations

We highly recommend starting new research that estimates the severity and prevalence of DED and its risk factors within the entire population of Al-Madinah, Saudi Arabia.

5. CONCLUSION

DED symptoms among medical students in Al-Madinah, Saudi Arabia were highly prevalent. Many factors were found to have a role in developing DED (i.e., hot, dry climate, eye injury, ophthalmic surgery, working outdoors and exposure to the outer environment). The findings of the research will aid in raising awareness about the magnitude and burden of DED in the corresponding population. Thus we strongly recommend establishing a new study which addresses larger populations to obtain better data and to provide better management and care for affected persons.

Acknowledgement

We would like to extend our thanks to the data collectors for helping us gathering data for this study. This work was supported by Taibah Medical Club, Taibah University and Medina, Saudi Arabia.

Author contribution

HM: concept, design, definition of intellectual content, literature search, clinical studies, data analysis, statistical analysis, manuscript editing and manuscript review.

MK: concept, design, definition of intellectual content, literature search, manuscript writing, editing and manuscript review.

TA: definition of intellectual content, literature search, data analysis, statistical analysis, manuscript preparation, manuscript editing and manuscript review.
WA, MA, HA & NA: concept, design, definition of intellectual content, literature search, manuscript writing, editing and manuscript review.

Ethical approval
The study was approved by the Medical Ethics Committee of Taibah University College of Medicine (TU-21-020).

Funding
This study has not received any external funding.

Conflict of interest
The authors declare that there is no conflict of interests

Data and materials availability
All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Alkabbani S, Jeyaseelan L, Rao A, Thakur S, Warhekar P. The prevalence severity and risk factors for dry eye disease in Dubai: A cross sectional study. BMC Ophthalmology 2021; 21. doi: 10.1186/s12886-021-01978-4
2. Almutairi AH, Alalawi BS, Badr GH, Alawaz RH, Albarry M, Elbadawy HM. Prevalence of dry eye syndrome in association with the use of contact lenses in Saudi Arabia. BMC Ophthalmol 2021; 21:147. doi; 10.1186/s12886-021-01912-8
3. Bukhari A, Ajlan R, Alsaggaf H. Prevalence of dry eye in the normal population in Jeddah, Saudi Arabia. Orbit 2009; 28:392–7. doi: 10.3109/01676830903074095
4. Fair weather D, Frisancho-Kiss S, Rose NR. Sex differences in autoimmune disease from a pathological perspective. Am J Pathol 2008; 173:600–9? doi: 10.2353/ajpath.2008.071008
5. Fayyadh RA, Mohammed MA, Abady NH, Tahseen AW, Taleb EN. Dry eye disease among medical students at the University of Fallujah, Iraq. Annals of Tropical Medicine Public Health 2021; 23:1023–38. doi: 10.36295/asro.2020.231038
6. Fox RI, Howell FV, Bone RC, Michelson P. Primary Sjogren syndrome: Clinical and immune pathologic features. Semin Arthritis Rheum 1984; 77-105. doi: 10.1016/0049-0172(84)90001-5
7. Gayton JL. Etiology, prevalence and treatment of dry eye disease. Clinical ophthalmology (Auckland, NZ) 2009; 3, 405–12. doi: 10.2147/opth.s5555
8. Lambert DW, Foster CS, Perry HD. Schirmer test after topical anesthesia and the tear meniscus height in normal eyes. Arch Ophthalmol 1979; 97:1082–5. doi: 10.1001/archopht.1979.01020010536004
9. Lee AJ, Lee J, Saw SM, Gazzard G, Koh D, Widjaja D, Tan DT. Prevalence and risk factors associated with dry eye symptoms: A population based study in Indonesia. Br J Ophthalmol 2002; 86:1347-51. doi: 10.1136/bjo.86.12.1347
10. Li S, He J, Chen Q, Zhu J, Zou H, Xu X. Ocular surface health in Shanghai University students: A cross sectional study. BMC ophthalmology 2018; 18,245. doi: 10.1186/s12886-018-0825-z
11. Liu N, Liu L, Li J, Sun Y. Prevalence of and risk factors for dry eye symptom in main land china: A systematic review and meta- analysis. J Ophthalmol 2014; 1–8. doi: 10.1155/2014/748654
12. Market Scope. Report on the global dry eye market 2004; St Louis MO. https://www.market-scope.com/pages/reports/dry-eye?page=1
13. Mayo clinic org LASIK eye surgery Mayo Clinic [Internet] 2022; Available from: https://www.mayoclinic.org/tests-procedures/lasik-eye-surgery/about/pac-20384774
14. Mc Carty CA, Bansal AK, Livingston PM, Stanislavsky YL, Taylor HR. The epidemiology of dry eye in Melbourne, Australia. Ophthalmology 1998; 105:1114-9. doi: 10.1016/S0161-6420(98)96016-X
15. Moss SE, Klein R, Klein BE. Prevalence of and risk factors for dry eye syndrome. Arch Ophthalmol 2000; 118:1264–8. doi: 10.1001/archopht.118.9.1264
16. Schaumberg DA, Sullivan DA, Buring JE, Dana MR. Prevalence of dry eye syndrome among US women. Am J Ophthalmol 2003; 136:318-26. doi: 10.1016/s0002-9394(03)00218-6
17. Schaumberg DA, Sullivan DA, Dana MR. Epidemiology of dry eye syndrome. Adv Exp Biol Med 2002; 506:989–98. doi: 10.1007/978-1-4615-0717-8_140

18. Schlote T, Kadner G, Frudenthaler N. Marked reduction and distinct pattern of eye blinking in patients with moderately dry eyes during video display terminal use. Graefes Arch Clin Exp Ophthalmol 2004; 242:306–12. doi: 10.1007/s00417-003-0845-z
19. Sethia R, Modi S, Shah A, Mehta J. Prevalence of dry eye disease in medical students in a tertiary care hospital: A cross sectional Study. J Clin of Diagn Res 2021; 15:NC05−NC08. doi: 10.7860/JCDR/2021/47647.14610
20. Shimmura S, Shimazaki J, Tsubota K. Results of a population based questionnaire on the symptoms and lifestyles associated with dry eye. Cornea 1999; 18:408–11. doi: 10.1097/00003226-199907000-00003
21. Sjögren HSC. Zur Kenntnisder Kerato conjunctivitissicca (Keratitisfiliformisbei Hypofunktionder Tränendrüsen). Acta Ophthalmol 1933; Supp II: 1–151. Copenhagen.
22. Stern ME, Schaumburg CS, Pflugfelder SC. Dry eye as a mucosal autoimmune disease. Int Rev Immunol 2013; 32:19–41. doi: 10.3109/08830185.2012.748052
23. Stevenson W, Chauhan SK, Dana R. Dry eye disease an immune mediated ocular surface disorder. Arch Ophthalmol 2012; 130:90–100. doi: 10.1001/archophthalmol.2011.364
24. Tang monkongvoragul C, Chokesuwattanaskul S, Khankaeo C, Punyasevee R, Nakkara L, Moolsan S, Unruan O. Prevalence of symptomatic dry eye disease with associated risk factors among medical students at Chiang Mai University due to increased screen time and stress during COVID-19 pandemic. PLOS ONE 2022; 17:e0265733. doi : 10.1371/journal.pone.0265733
25. Terry MA. Dry eye in the elderly. Drugs Aging 2001; 18:101–7. doi: 10.2165/00002512-200118020-00003
26. The definition and classification of dry eye disease: Report of the Definition and Classification Subcommittee of the International Dry Eye Work Shop. Ocul Surf 2007; 75-92. doi: 10.1016/s1542-0124(12)70081-2
27. Titiyal JS, Falera RC, Kaur M, Sharma V, Sharma N. Prevalence and risk factors of dry eye disease in North India: Ocular surface disease index based cross sectional hospital study. Indian J Ophthalmol 2018; 66:207–11. doi: 10.4103/ijo.IJO_698_17
28. Viso E, Rodriguez-Ares MT, Gude F. Prevalence of and associated factors for dry eye in a Spanish adult population (the Salnes Eye Study). Ophthalmic Epidemiol 2009; 16:15-21. doi: 10.1080/09286580802228509
29. Yasir ZH, Chauhan D, Khandekar R, Souru C, Varghese S. Prevalence and determinants of dry eye disease among 40 years and older population of Riyadh (except capital), Saudi Arabia. Middle East Afr J Ophthalmol 2019; 26:27−32. doi: 10.4103/meajo.MEAJO_194_18