



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

International Journal of Development Research

Vol. 13, Issue, 09, pp. 63768-63771, September, 2023

<https://doi.org/10.37118/ijdr.26810.09.2023>



RESEARCH ARTICLE

OPEN ACCESS

CHARACTERIZATION OF DRY EYE SYNDROME IN POSTMENOPAUSAL PATIENTS TREATED AT A HELTHCARE SERVICE IN THE AMAZON REGION

*Ana Paula Lisboa, Izabela Queiroz, Paula Coelho and Gabriela Borborema

Centro Universitário do Estado do Pará (CESUPA)- Belém (PA), Brazil

ARTICLE INFO

Article History:

Received 20th June, 2023

Received in revised form

17th July, 2023

Accepted 26th August, 2023

Published online 30th September, 2023

KeyWords:

Dry eye syndrome, Menopause, Corneal disease, Women's Health.

*Corresponding author: Ana Paula Lisboa,

ABSTRACT

Dry Eye Syndrome (DES) is a complex condition affecting the ocular surface, characterized by an imbalance in the tear film, accompanied by symptoms such as stinging, burning, and discomfort in the eyes. It primarily affects adults over the age of 40, with women being more susceptible. The prevalence of DES increases with age. Perimenopause marks the period when a woman's body undergoes physiological changes leading to menopause, which is the cessation of menstruation. After menopause, the body produces fewer reproductive hormones, which can result in decreased tear production and visual difficulties. The objective of this study was to characterize dry eye syndrome in postmenopausal patients attending the climacteric or gynecology outpatient clinic localized in the Amazon region, named by Centro de Especialidades Médicas do Cesupa (CEMEC). A descriptive cross-sectional study was conducted, involving the selection of 30 postmenopausal women attending the Climacteric or Gynecology outpatient clinic at CEMEC. The participants completed questionnaires and underwent tear film breakup time (BUT) assessments. The majority of patients in this study were of brown race, experienced menopause between the ages of 41 and 50, had a duration of menopause ranging from 11 to 20 years, exhibited BUT values of less than 5 seconds, and were classified as having severe dry eye according to the Ocular Surface Disease Index (OSDI) questionnaire. The most prevalent complaint among the participants was discomfort with wind in the eyes, followed by sensitivity to light and a burning sensation. The study also observed an increase in the number of dry eye cases with advancing age. However, no statistically significant correlation was found between age and disease severity. Furthermore, the study did not establish a relationship between the use of hormone therapy and dry eye syndrome, nor did it find an association between the duration of menopause and the disease. The study concludes that there is a high prevalence of dry eye syndrome among postmenopausal patients attending the climacteric and gynecology outpatient clinic at CEMEC. Therefore, it is crucial for healthcare professionals to be aware of the symptoms of dry eye in order to facilitate early diagnosis and appropriate treatment, ultimately improving the quality of life for these individuals.

Copyright©2023, Ana Paula Lisboa et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Ana Paula Lisboa, Izabela Queiroz, Paula Coelho and Gabriela Borborema. 2023. "Characterization of dry eye syndrome in postmenopausal patients treated at a helthcare service in the amazon region". *International Journal of Development Research*, 13, (09), 63768-63771.

INTRODUCTION

Dry Eye Syndrome is a complex ocular surface disease characterized by an imbalance in tear film homeostasis, resulting in symptoms such as burning, ocular discomfort, tear disorders, and a foreign body sensation in the eyes. Various factors contribute to the development of Dry Eye Syndrome (DES), including tear film instability, hyperosmolarity, ocular surface inflammation, and neurosensory damage. These factors play crucial roles in the etiology of the condition. DES not only affects patients' quality of life but can also lead to corneal damage and conjunctivitis (Fonseca et al., 2010; Almeida Junior et al., 2021; Barabino, 2021 and Craig et al., 2017). Several risk factors have been identified for DES, including age over 50 years, female gender, Asian ethnicity, low humidity environments, exposure to smoke, autoimmune diseases, contact lens use, thyroid disorders, frequent use of cell phones, and allergies (Craig, 2017; Messmer, 2015 and Pereira, 2020).

The American Academy of Ophthalmology (AAO) recommends a comprehensive clinical assessment for diagnosing DES, including a thorough patient history to investigate symptoms and a physical examination of the face, eyelids, conjunctiva, cornea, and tear film. While there is no gold standard diagnostic test, various examinations can be conducted to assess the ocular surface, tear film stability, tear production, and evaporation. These tests include fluorescein staining (tear breakup time - BUT), Schirmer test, staining with Lissamine Green or Rose Bengal, evaluation of the meibomian glands, among others (Bron, 2007 and Kojima, 2020). The climacteric phase, defined by the World Health Organization (WHO), represents the biological transition from the reproductive to non-reproductive period in women. Perimenopause refers to the physiological changes that occur in a woman's body leading to menopause (Selbac, 2018). Menopause is typically diagnosed retrospectively after 12 consecutive months of amenorrhea, once other potential causes have been ruled out (Brasil, 2016). The correlation between DES and menopause/post-menopause can be attributed to hormonal changes during this period. Androgen

and estrogen hormones play a direct role in tear film synthesis and composition (Peck, 2017). Receptors for these hormones are present in the Meibomian gland and are activated via the autonomic nervous system (Peck, 2017 and Junior, 2019). Estrogen, in particular, contributes to corneal elasticity and influences the cornea's shape as light passes through the eye. After menopause, the body produces lower levels of these reproductive hormones, leading to decreased tear production, blurred vision, and difficulties in wearing contact lenses (Gupta, 2020 and Matossian, 2019). Based on the aforementioned information, the objective of this study was to characterize dry eye syndrome in postmenopausal patients attending the climacteric or gynecology outpatient clinic at CEMEC.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted at the Centro de Especialidades Médicas do Cesupa (CEMEC) between February and August 2022. The study included 30 postmenopausal women who were being followed up at the gynecology and climacteric outpatient clinic of CEMEC and met the defined inclusion and exclusion criteria. The study consisted of three stages. In the first stage, a questionnaire was administered to gather information on participants' personal characteristics and identify risk factors. The second stage involved the administration of the ocular surface disease index (OSDI) questionnaire, which consisted of 12 questions assessing DES symptoms. Each question was graded on a scale from 0 to 4, with a total score ranging from 0 to 100. A higher score indicated more severe symptoms. The final OSDI score was calculated as (sum of all scores) x 25/number of questions answered. The third stage involved the application of the tear film rupture test or Break Up Time (BUT) in the ophthalmology office, with the assistance of an advisor, to diagnose DES. A lower BUT value indicated lower tear film quality and greater severity of dry eye. Additionally, during the ophthalmological examination, the researchers completed a questionnaire that included the patient's BUT value, presence or absence of conjunctival hyperemia, corneal changes, and blepharitis. Inclusion criteria encompassed women who were postmenopausal and aged between 40 and 70 years. Exclusion criteria included a diagnosis of autoimmune disease or thyroid disease, use of medications that could cause dry eye syndrome, routine use of contact lenses, a history of frequent allergies, or active ocular inflammatory conditions such as viral, bacterial, or allergic conjunctivitis, uveitis, scleritis, episcleritis, and hordeola.

Statistical analysis was performed using Bioestat 5.5 software. The Fisher's exact test was used to test the independence or association between two categorical variables, and significant associations were further examined using standardized residue analysis to identify the categories that contributed most to the result. Results with $p \leq 0.05$ (two-tailed) were considered statistically significant. The study was conducted with the approval of the Ethics Committee of CESUPA.

RESULTS

The study sample consisted of 30 patients. Table 1 presents the most prevalent symptoms based on the responses obtained from the OSDI questionnaire. The scores assigned to each symptom were summed for each patient. For example, if a patient reported sensitivity to light for 1 to 2 days a week, they received a score of 1. If the symptom occurred for 3 to 4 days a week, the score was 2. For 5 to 6 days a week, the score was 3. If the symptom was experienced every day of the week, the score was 4. If a question did not apply to a patient's situation, no points were assigned. This was the case for the variable "difficulty driving at night" as none of the patients engaged in this activity. Therefore, they did not receive any points for that variable. The scores for all patients were summed, resulting in the table below.

Table 1. Scores received on the OSDI questionnaire by patients seen at the CEMEC ophthalmology Outpatient Clinic (CESUPA), evaluated from May to August 2022, Belém-Pará

Variable	Score in the OSDI questionnaire
Clarity	60
Feeling of sand	29
Burning	56
Blurry vision	47
Bad vision	49
Uncomfortable with wind	61
Uncomfortable with dry places	2
Annoyance with places with air conditioning	47
Difficulty to read	38
Difficulty driving at night	0
Difficulty using computer	23
Difficulty watching television	5

Source: Research protocol.

In the study, it was found that 13 subjects were aged between 61 and 70 years old, 11 participants were between 51 and 60 years old, and only 6 were under 50 years old. A majority of the participants (17 or 56.7%) experienced menopause between the ages of 41 and 50, while 30% of the individuals reached menopause before the age of 40. The majority of participants (23 or 76.7%) did not use hormone replacement therapy, and 16.7% had used it in the past but had stopped for several years. None of the patients had an autoimmune disease. Most participants (25 or 83.3%) did not have any pre-existing eye diseases, and only one patient (3.3%) had undergone eye surgery. None of the participants used contact lenses (Table 2).

Table 2. Clinical characteristics of postmenopausal patients treated at the CEMEC ophthalmology Outpatient Clinic (CESUPA), evaluated from May to August 2022, Belém-Pará

Variable	Frequency	Percentage
Age at menopause		
Up to 40 years	9	30,0
From 41 to 50 years	17	56,7
From 51 to 60 years	4	13,3
Duration of menopause		
From 2 to 10 years	10	33,3
From 11 to 20 years	16	53,3
From 21 to 26 years	4	13,3
Use of Hormone Replacement		
Never used	23	76,7
Currently doing	1	3,3
Used and stopped more than 2 years ago	5	16,7
Have any eye disease		
No	25	83,3
Yes	5	16,7
Have you had eye surgery		
No	29	96,7
Yes	1	3,3

Source: Research protocol. Legend: The percentages are relative to the total number of participants (n=30).

More than half of the participants (17 or 56.7%) had severe dry eye (scores of 33-100) according to the ocular surface disease index (ISDO). The majority of participants (18 or 60%) had a tear film break-up time (BUT) of less than 5 seconds in the right eye, and 36.7% had a BUT of less than 10 seconds. Similarly, most participants (19 or 63.3%) had a BUT of less than 5 seconds in the left eye, while 36.7% had a BUT of less than 10 seconds. To assess generalizability, 95% confidence intervals were calculated for the proportions, indicating the level of certainty of the proportions in the population represented by the sample (Table 3).

Table 3. Severity of dry eye according to the ODSI result and the BUT test result in postmenopausal patients treated at cemec ophthalmology outpatient clinic (CESUPA), evaluated from May to August 2022, Belém-Pará

Variable	Frequency	Percentage	CI 95%
Ocular Surface Disease Index (ODSI) Score			
Mild dry eye (13-22)	5	16,7	6,3 - 35,5
Moderate dry eye (23-32)	8	26,7	13,0 - 46,2
Severe dry eye (33-100)	17	56,7	37,7 - 74,0
BUT Right eye			
<10 Seconds	11	36,7	20,5 - 56,1
<5 Seconds	18	60,0	40,8 - 76,8
Immediate	1	3,3	0,2 - 19,1
BUT Left eye			
<10 Seconds	11	36,7	20,5 - 56,1
<5 Seconds	19	63,3	43,9 - 79,5
Immediate	0	0,0	0,0 - 14,1

Source: Research protocol. Legent: The percentages are relative to the total number of participants (n=30). 95%CI: 95% confidence interval for prevalence.

None of the patients used lubricant daily. The majority (80%) did not have corneal changes in either eye. Of the participants, 13.3% had corneal changes in a single eye, which were characterized as a discrete punctate pattern, while only 6.6% had corneal changes in both eyes. The majority (90%) did not have any eyelid dysfunction in either eye, and 3 subjects (10%) had mild blepharitis. The association between the severity of dry eye indicated by the ocular surface disease index (ODSI) score and age range. In the group classified as having mild dry eye, the majority (3 or 60%) were aged between 61 and 70 years. Among subjects with moderate dry eye, 4 (50%) were aged between 61 and 70 years, and 3 subjects (37.5%) were aged between 51 and 60 years. For subjects with severe dry eye, 7 (41.2%) were aged between 51 and 60 years, and 6 individuals (35.3%) were aged between 61 and 70 years. However, these observed differences did not reach statistical significance ($p=0.833$). The association between the severity of dry eye indicated by the ocular surface disease index (ODSI) score and age range. In the group classified as having mild dry eye, the majority (3 or 60%) were aged between 61 and 70 years. Among subjects with moderate dry eye, 4 (50%) were aged between 61 and 70 years, and 3 subjects (37.5%) were aged between 51 and 60 years. For subjects with severe dry eye, 7 (41.2%) were aged between 51 and 60 years, and 6 individuals (35.3%) were aged between 61 and 70 years. However, these observed differences did not reach statistical significance ($p=0.833$).

Table 4. Association between the BUT result and the age group of postmenopausal patients treated at the CEMEC ophthalmology outpatients Clinic (CEMEC), evaluated from May to August 2022, Belém-Pará

Variable	Up to 50 years (n=6)	From 51 to 60 years (n=11)	From 61 to 70 years (n=13)	p-value
BUT Right eye				
<10 Seconds	4 (66,7)	5 (45,5)	2 (15,4)	0,199
<5 Seconds	2 (33,3)	6 (54,5)	10 (76,9)	
Immediate	0 (0,0)	0 (0,0)	1 (7,7)	
BUT Left eye				
<10 Seconds	4 (66,7)	5 (45,5)	2 (15,4)	0,073
<5 Seconds	2 (33,3)	6 (54,5)	11 (84,6)	
Immediate	0 (0,0)	0 (0,0)	0 (0,0)	

Source: Research protocol.

The results of the study did not show any significant associations between the ocular surface disease index (ODSI) scores, which indicate the severity of dry eye, and corneal changes or eyelid changes in either the right or left eye. The p-values for these associations were 0.171, 0.912, 0.715, and 0.715, respectively, indicating that there were no statistically significant relationships between ODSI scores and these specific ocular manifestations. The results of the study did not show any significant associations between the ocular surface disease index (ODSI) scores, which indicate the

severity of dry eye, and corneal changes or eyelid changes in either the right or left eye. The p-values for these associations were 0.171, 0.912, 0.715, and 0.715, respectively, indicating that there were no statistically significant relationships between ODSI scores and these specific ocular manifestations. The results of the study did not show any significant associations between the ocular surface disease index (ODSI) scores, which indicate the severity of dry eye, and corneal changes or eyelid changes in either the right or left eye. The p-values for these associations were 0.171, 0.912, 0.715, and 0.715, respectively, indicating that there were no statistically significant relationships between ODSI scores and these specific ocular manifestations. Further research with larger sample sizes and more comprehensive evaluations may be necessary to explore the potential relationships between ODSI scores and specific ocular manifestations in postmenopausal patients with dry eye.

CONCLUSION

In conclusion, the study found that Tear Film Breakup Time (BUT) is an important diagnostic procedure for evaluating clinical dry eye. All patients in the study were diagnosed with dry eye, and a significant percentage of them exhibited reduced BUT values. Specifically, 36% of patients had BUT less than 10 seconds, 60% had BUT less than 5 seconds, and 3.3% had immediate BUT. The severity of dry eye was categorized based on BUT values, with severity 2 defined as BUT less than 10 seconds, severity 3 as BUT less than 5 seconds, and severity 4 as immediate BUT. The majority of patients in this study were classified as severity 3 (60%), indicating a higher prevalence of more severe dry eye in menopausal patients. Additionally, a correlation was observed between BUT results of less than 5 seconds and severe dry eye according to the ODSI questionnaire, although this correlation was not statistically significant. The study also found that most patients in the sample had severe dry eye according to the ODSI questionnaire (56.7%), which differed from another study with a larger sample that reported a higher prevalence of moderate dry eye. This discrepancy may be attributed to the smaller sample size in the current study. Age was identified as a significant factor in the development of dry eye, with the highest number of cases observed in the age group of 61 to 70 years. This finding is consistent with previous studies that have shown a progressive increase in dry eye prevalence with age, particularly in postmenopausal women. Hormonal changes after menopause may contribute to this age-related increase in dry eye. The use of hormone therapy in postmenopausal women did not show a statistically significant relationship with lower dry eye severity in this study. The literature on this topic presents conflicting results, with some studies suggesting a higher prevalence of dry eye in women using hormone therapy and others indicating potential benefits in tear production and improvement of dry eye symptoms. Further research is needed to clarify the impact of hormone therapy on dry eye in postmenopausal women.

Based on the findings, the study highlights the importance of raising awareness among gynecologists and the broader medical community about dry eye symptoms in postmenopausal patients. The IDSO questionnaire can serve as a useful screening tool during gynecology consultations, and referral to ophthalmology outpatient clinics can ensure a comprehensive evaluation of dry eye syndrome. Early diagnosis and appropriate treatment can significantly improve the quality of life for these women. Regarding the patient profile, the majority of participants in the study were of brown race, had a menopause diagnosis between 41 and 50 years, and had a duration of menopause ranging from 11 to 20 years. Most patients had a BUT result of less than 5 seconds and were classified as having severe dry eye according to the ODSI questionnaire. The most common complaints reported by the patients were discomfort with wind in the eyes, sensitivity to light, and a burning sensation in the eyes. The recommended treatment approaches for the participants included increased water intake, environmental exposure control, and the use of artificial tears. The study also revealed an increasing number of dry eye cases with age, emphasizing the need for attention to this multifactorial disease by gynecologists and society as a whole, considering the numerous symptoms it causes in patients.

REFERENCES

- Adhlakha N, Tirkey ER, Lakhtakia S. To assess the prevalence of dry eye disease in postmenopausal females in a tertiary care centre in Central India. *JMSCR* 2017; 05(10): 29012-29017.
- Almeida Junior TR, Carvalho TD, Norberto AR, Figueiredo FWS, Martinelli PM, Abreu LC, et al. Autonomic cardiac modulation in postmenopausal women with dry eye syndrome: a cross-sectional analytical study. *Rev Assoc Med Bras* 2021; 67(8): 1143-1149.
- Barabino S. A Narrative Review of Current Understanding and Classification of Dry Eye Disease with New Insights on the Impact of Dry Eye during the COVID-19 Pandemic. *Ophthalmol Ther* 2021; 10(1): 495-507.
- Bernardi FR, Almeida RCMC, Brock CM, Vargas JAA. Dry eye: diagnosis and management. *Mayo Clinic* 2018; 2(1): 1-3.
- Bowling BB. *Oftalmologia Clínica: Uma abordagem sistêmica 8ªed.* Guanabara Koogan, Oxford; 2016, 928p.
- Brasil. Ministério da Saúde. Protocolos da Atenção Básica: Saúde das Mulheres / Ministério da Saúde, Instituto Sírio-Libanês de Ensino e Pesquisa [Online]. Brasília, DF, 2016 [acessado em: 10 abr. 2022]. Disponível em: http://bvsmms.saude.gov.br/bvs/publicacoes/protocolos_atencao_basica_saude_mulheres.pdf.
- Bron AJ. Methodologies to diagnose and monitor dry eye disease: report of the diagnostic methodology subcommittee of the international Dry Eye Workshop (2007). *Ocul Surf* 2007; 5(2): 108-52.
- Carvalho ACD. *Aconselhamento Farmacêutico Especializado em Saúde Ocular: Olho Seco [Dissertação]*. Instituto Egas Moniz, Portugal; 2017.
- Chatterjee S, Agrawal D. Short tear film breakup time-type of dry eye in India. *Indian J Ophthalmol* 2021; 69(12): 3463-3468.
- Craig JP, Nichols KK, Akpek EK, Caffery B, Dua HS, Joo CK, et al. TFOS DEWS II Definition and Classification Report *Ocul Surf* 2017; 15(3): 276-83.
- Din NM, Sa'aid SHB, Shen LC, Shu YS, Rahman MBA, Azmi ABM, et al. Hormone replacement therapy an dry eye in post menopausal women: Study in a tertiary centre in Malaysia. *IJMS* 2013; 1(1): 12-15.
- Fonseca EC, Arruda GV, Rocha EM. Olho seco: etiopatogenia e tratamento. *Arq Bras Oftalmol* 2010; 73(2): 197-203.
- Gerstenblith AT. *Manual de Doenças Oculares do Wills Eye Hospital.* 6ed. Porto Alegre- RS: Artmed; 2014. 492 p.
- Gupta PD. Hormonal Regulation of the Dry Eye. *JSM Ophthalmol* 2020; 7(1): 1069.
- Jeena G, Saurav P, Anadi K. Prevalence of Dry Eye in Postmenopausal Women: A Study from Nepal. *Ophthalmology Journal* 2019; 1(1): 1-5.
- Junior ADA. *Modulação autonômica cardíaca em mulheres na pós-menopausa com síndrome do olho seco [Dissertação]*. Faculdade de Medicina da Universidade de São Paulo. São Paulo; 2019.
- Kojima T, Dogru M, Kawashima M, Nakamura S, Tsubota K. Advances in the diagnosis and treatment of dry eye. *Progress in Retinal and Eye Research* 2020; 78(1): 100842.
- Kumar GV. A study on prevalence of dry eyes among menopausal women attending a tertiary care centre in Hyderabad, Telangana. *Int J Community Med Public Health* 2019; 6(1): 423-427.
- Lima CGMG, Sigueira GB, Cardoso IH, Sant'Anna AEB, Osaki MH. Avaliação do olho seco no pré e pós-operatório da blefaroplastia. *Arq Bras Oftalmol* 2006; 69(3): 377-82.
- Matossian CMD, McDonald MC, Gupta PK. Dry Eye Disease: Consideration for Women's Health. *Journal of women's health* 2019; 28(4): 502-514.
- Maurya RP. Prevalence of severe dry eye disease in postmenopausal women in North India: A teaching hospital study. *Indian Journal of Obstetrics and Gynecology Research* 2019; 6(1): 94-96.
- Messmer EM. The Pathophysiology, Diagnosis, and Threatment of Dry Eye Disease. *Dtsch Arztebl Int* 2015; 112(5): 71-82.
- Nuzzi R, Caselgrandi, P. Sex Hormones and Their Effects on Ocular Disorders and Pathophysiology: Current Aspects and Our Experience. *Int J Mol Sci* 2022; 23(6): 3269.
- OMS - Relatório mundial sobre a visão da Organização Mundial da Saúde; 2021. Disponível em: <https://apps.who.int/iris/bitstream/handle/10665/328717/9789241516570-por.pdf>
- Peck T. Dry Eye Syndrome in Menopause and Perimenopausal Age Group. *Journal of Mid-life Health.* Virginia 2017; 8(1): 51-4.
- Pereira LA. Epidemiologia da doença do olho seco: estudo de campo utilizando um questionário de sintomas [Tese]. Faculdade de Medicina De ribeirão Preto da Universidade de São Paulo. Ribeirão Preto; 2020.
- Piwkumsribonruang N, Luanratanakorn P, Tharnprisan P. Effectiveness of Hormone Therapy for Treating Dry Eye Syndrome in Postmenopausal Women: A Randomized Trial. *J Med Assoc Thai* 2010;93(6):647-652.
- Pujari MR, Salagar K, Bagare SN. Prevalence of Dry Eye in Post-Menopausal Women. *Journal of Evolution of Medical and Dental Sciences* 2015; 4(75): 13005-13010.
- Schaumberg DA, Buring JE, Sullivan DA. Hormone replacement therapy and dry eye syndrome. *JAMA* 2001; 286(17): 2114-2119.
- Schellini AS, Sakamoto RH, Ishii LA, Hoyama E, Nahas EAP, Padovani CR. Influência da terapia hormonal sobre o filme lacrimal em mulheres na pós-menopausa. *Revista de Ciências Médicas* 2012; 13(4):347-353.
- Selbac MT, Fernandes CGC, Marrone LCP, Vieira AG, Silveira EF, Martins MIM. Mudanças Comportamentais e Fisiológicas Determinadas pelo Ciclo Biológico Feminino- Climatério à Menopausa. *Aletheia* 2018; 51(1-2): 177-190.
- Tsubota K. Short Tear Film Breakup Time-Type Dry Eye. *Invest Ophthalmol Vis Sci* 2018; 59(14): 64-70.
- Vargas B, Santos AMPVS, Martins MIM. A terapia de reposição hormonal: fitoestrogênio e/ou sintético diminui os sintomas do climatério?. *RECIMA* 2022; 3(1): 1-13.
- Verma JP, Mishrikotkar ST. Comparative study of occurrence of dry eye in post menopausal women. *MedPulse - International Medical Journal* 2016; 3(10): 893-896.
- Yamoto Y, Yokoi N, Higashihara H, Inagaki K, Sonomura Y, Komuro A, et al. Clinical characteristics of short tear film breakup time (BUT) -type dry eye. *Nippon Ganka Gakkai Zasshi*
