



DRY EYE DISEASE AMONG PREGNANT WOMEN AT A TERTIARY CARE HOSPITAL IN WESTERN U.P.

Ophthalmology

Dr. Prerna Jagdish 3rd year PG Junior Resident, MMC&H, Muzaffarnagar.

**Dr. Suman
Bhartiya**

Professor & Head, MMC&H, Muzaffarnagar.

Dr. Prachi Shukla Associate Professor, MMC&H, Muzaffarnagar.

ABSTRACT

Aim and objectives: To estimate the prevalence of dry eye disease among pregnant women and to find its association with the gestational period of women during pregnancy. **Materials and method:** This study was a hospital-based cross-sectional study among pregnant women attending antenatal care at a tertiary care center in Western U.P. 120 participants were enrolled for the study after taking written informed consent. The clinical examination comprised Tear Break up Time (TBUT) and Schirmer's test. **Results:** The majority (45%) of the subjects belonged to 26-35 years of age. As per the TBUT test, dry eye was found among 93 (77.5%), and as per Schirmer's test, dry eye was found among 81 (67.5%) subjects. There was no significant difference in the distribution of dry eye disease as per the gestational age. **Conclusion:** The prevalence of DED among the study's pregnant women was high, with the highest rate in the third trimester when most of the signs and symptoms occurred, whereas the lowest prevalence was found in the 1st trimester.

KEYWORDS

Dry eye disease, Tear Break up Time, Pregnancy, Schirmer's test

INTRODUCTION

Pregnancy is not a pathological condition, it involves anatomical, physiological, and biochemical changes in the woman's body.^[1] It is known that the quality of life decreases significantly over time during pregnancy.^[2] Pregnancy is associated with depression and other psychosomatic conditions.^[3] This implies that pregnancy places women in a vulnerable state of health. Every little effort to alleviate the challenges of pregnancy is very comforting to the individual. Pregnancy is associated with hormonal and metabolic changes, which alter the physiology of many body tissues.^[4,5]

During pregnancy, the changes in hormones, metabolism, hemodynamic, vascular, and immunological response can affect the eye, especially the ocular surface tissues.^[6-8] Earlier studies have looked at dry eye disease in pregnant women and reported increased symptomatology and decreased tear secretion in pregnant women.^[9,10] Nkiru et al. reported that dry eye symptoms and signs peak from the second to the third trimester and subside in the postpartum period. However, the study excluded first-trimester pregnant women, failing to give a clearer picture of the issue.^[11] It has also been shown that pregnant women have worse clinical signs of dry eye compared with age-matched non-pregnant women.^[10]

Dry eye disease is a prevalent ophthalmic disease and is one of the most common reasons for patients visiting ophthalmic practitioners.^[11,12] It is a disease characterized by symptoms of ocular discomfort, ocular surface damage, tear film instability, loss of homeostasis, and neurosensory abnormalities.^[11] The etiology of dry eye disease is multifactorial and often multiple instigators contribute to the clinical manifestation of the disease.^[12] Dry eye disease is frequently associated with psychosomatic symptoms further entrenching its role as a perpetrator of poor quality of life.^[13]

Dry eye disease (DED) is a disorder of the ocular surface that affects more than 35% of the population.^[14] It is characterized by qualitative and quantitative alterations in the tear film, which has the main functions of lubrication, optical transparency, and nutrition, and is the main defense against bacterial infection.^[1] DED is a common clinical problem and among the most frequently diagnosed and reported reasons for seeking medical care for the eyes. It represents a significant cost burden due to direct and indirect healthcare costs and reduced work productivity.^[15]

Dry eye disease need not compound the precarious situation pregnant women already face daily. This implies that treating and researching dry eye disease in pregnant women is worthwhile. This study aimed to estimate the prevalence of dry eye disease among pregnant women and to find its association with the gestational period of women during pregnancy.

MATERIAL AND METHODS

This study was a hospital-based cross-sectional study among pregnant women attending antenatal care at a tertiary care center in Western U.P. All pregnant women who met the inclusion criteria and were willing to provide written informed consent were recruited to the study.

Inclusion Criteria:

Pregnant women of any gestational age with no remarkable systemic disease or psychological condition and willing to give written; informed consent.

Exclusion Criteria:

Pregnant women with a history of ocular surgeries, lid margin abnormalities, history of contact lens wear, ocular surface abnormalities, systemic disease (diabetes, Sjogren syndrome, preeclampsia, etc.), and usage of local or systemic medications that can affect tear function.

Clinical assessment

The same clinician performed all clinical measurements. Study subjects completed the ocular surface disease index (OSDI) before the clinical examination of the ocular surface.^[16] The examining clinician was not aware of the symptom score. The clinical examination comprised the TBUT test and Schirmer's test. All clinical assessments were made for each eye.

Tear Breakup Time:

Fluorescein-impregnated paper strip (Optitech eye care, Allahabad, India) was moisturized using normal saline. The paper strip was gently applied to the temporal conjunctiva after being completely wetted. The cornea was examined with a slit lamp using cobalt blue light. The patient was asked to blink twice and then look straight ahead without blinking. The time from the last blink to the first appearance of a dry spot or dark spot was measured three times with the help of a stopwatch. The mean of three measurements was used as tear breakup time.^[17]

After the fluorescein tear breakup time was measured, the staining of the cornea was recorded. The dry paper strip impregnated with lissamine green (Optitech eye care, Allahabad, India) was completely wetted with normal saline and gently applied to the temporal conjunctiva after the corneal staining was graded with fluorescein. One to two minutes' time interval was permitted after instilling the lissamine green dye and grading of the conjunctiva was commenced.^[18]

TBUT was graded as follows:¹⁹

- > 10 seconds = Normal
- 6-10 seconds = mild to moderate dry eye
- < 5 seconds = severe dry eye

Schirmer's Test:

This test was performed at 10 min intervals after the TBUT to minimize reflex tearing and ocular surface changes due to that test. The eye was dried of excess tears and 5 mm by 35mm of Whatman's Filter Paper (Ophthalmic Technology Pvt. Ltd., India) was folded 5mm at one end and inserted at the junction of the middle and outer third of the lower lid into the conjunctival fornix taking care not to touch the cornea or lashes. The participant was asked to blink and keep her eyes open. After 5 min, the paper was removed and the amount of wetting from the fold was measured. This procedure was performed without anesthesia. A reading <10mm was considered abnormal.^[20] It was graded as follows:

≥ 15 mm after 5 min = normal
 14-9 mm after 5 min = mild dry eye
 8-4 mm after 5 min = moderate dry eye
 < 4 mm after 5 min = severe dry eye

RESULTS**Table 1: Age-wise Distribution Of The Study Population**

Age groups	Number	Percent
18-25 years	31	25.8%
26-35 years	54	45%
36 & above	35	29.2%

Of the study population, the majority (45%) of the subjects belonged to the 26-35 years followed by 36 years & above (29.2%) and 18-25 years (31%) age group.

Table 2: Frequency Of Dry Eyes In TBUT Test And Schirmer's Test

Dry eyes	Number	Percent
TBUT test	93	77.5%
Schirmer's test	81	67.5%

As per the TBUT test, Dry eye was found among 93 (77.5%), and as per Schirmer's test, Dry eye was found among 81 (67.5%) subjects.

Table 3: Frequency Of Dry Eyes As Per TBUT Test In Relation To Gestational Age

Gestational age	TBUT test	
	Normal eyes	Dry eyes
1 st trimester	7	28.0%
2 nd trimester	10	31.3%
3 rd trimester	10	15.9%
Total	27	22.5%
	93	77.5%

χ^2 value = 3.425, p-value = 0.180

There was no significant difference in the distribution of Dry eye disease as measured by the TBUT test among pregnant women as per the gestational age.

Table 4: Frequency Of Dry Eyes As Per Schirmer's Test In Relation To Gestational Age

Gestational age	Schirmer's test	
	Normal eyes	Dry eyes
1 st trimester	10	40.0%
2 nd trimester	14	43.8%
3 rd trimester	15	23.1%
	39	32.5%
	81	67.5%

χ^2 value = 4.656, p-value = 0.0974*

There was no significant difference in dry eye disease as measured by Schirmer's test among pregnant women as per gestational age.

DISCUSSION

Dry eye disease (DED) is a multifactorial disorder of the tear film and ocular surface due to tear deficiency or excessive tear evaporation causing damage to the interpalpebral ocular surface and associated with symptoms of foreign body sensation, dryness, blurring of vision, photophobia, and, tear film/ instability.^[21] Globally, the prevalence rate of DED is estimated to be between 7-37%.^[22,23]

Several reasons may account for the increase in dry eye disease in pregnancy. Many studies have demonstrated that dry eye disease during pregnancy may be due to damage to the lacrimal acinar cells through several mechanisms including but not limited to enhanced immune reactivity of prolactin and adverse effects of transforming growth factor-beta 1 and epidermal growth factor on the ductal cells.^[24]

Martins *et al.*^[25] stated that the most prevalent diseases were those

affecting the ocular surface and ametropia: dry eye (29.3%), conjunctivitis (16%), and ametropia (16%). During pregnancy, the cornea's sensitivity is reduced, and its thickness is increased. These physiological changes can worsen dry eye symptoms and increase contact lens intolerance. The cornea tends to retain more water during pregnancy, and this could increase the myopia shift.

The high prevalence of DED found in the present study was similar to that reported in a study by Skare *et al.*^[26] conducted with pregnant women. Skare *et al.* attributed the high prevalence of DED to lacrimal dysfunction. In contrast, two studies were conducted in Southern Nigeria.^[27, 28] reported lower DED prevalence rates. However, these studies were conducted with women who were not pregnant. The study by Onua and Chukwuka^[28] (27.4% prevalence) used a mixed (male and female) study population and its instruments consisted of only TBUT and Schirmer's test. A study by Onwubiko *et al.*^[27] (22% prevalence) used an OSDI cut-off ≥50. Thus, the different study designs and procedures might be responsible for the lower prevalence rates observed in these studies, whereas hormonal changes during pregnancy may be responsible for the higher prevalence of DED found in our study.

The prevalence of DED in the third trimester in this study (78.4%) corroborated the findings reported in a similar study by Schechter *et al.*^[29] that found DED in 80% of the study's population. Our results were, however, inconsistent with those of Ibraheem *et al.*^[30] who reported a decrease in the TBUT among pregnant women, but an increase in Schirmer's test values. This disparity might be due to the study's design and exclusion criteria; they used a cross-sectional case-controlled design in which values were measured early in the pregnancy when hormonal upregulation had not reached a significant peak to affect the lacrimal gland, whereas our study used a longitudinal design, in which the values were measured at three different points. Their exclusion criteria were not clearly defined, whereas our criteria excluded conditions that had the potential to interfere with tear production and evaporation.

Potential causes of dry eye may be due to elevated estrogens and progesterone which mitigates androgens' effects on the ocular surface through competitive antagonism.^[31,32,33] There is also the potential for the downregulation of androgen receptors on the ocular surface of pregnant women further entrenching the desiccating effect of estrogen on the ocular surface.^[33] Researchers have shown a moderate correlation between body fat and dry eye symptoms.^[34]

An association between adiposity measured by body fat percentage and symptoms of dry eye has been shown in the adult population.^[34] Overall, pregnant women exhibit gains in weight, fat, and body water content across pregnancy, and afterward, values decline during the postpartum period.^[35] It may be plausible that an increase in adipose tissue in pregnancy may instigate or contribute to dry eye in pregnancy as reported in the general population.^[34]

Due to the generally poor quality of life in pregnant women, treating dry eye disease will alleviate challenges with the quality of life. This is because dry eye symptoms impact the quality of life and the amelioration of dry eye symptoms is commensurate with an improved quality of life.^[36] Factors associated with dry eye disease in pregnant women have been elusive as key dry eye risk factors such as age and sex are not important in pregnant women and other unrecognized factors may be important in the pregnancy-associated dry eye.^[37]

CONCLUSION

The prevalence of DED among the study's pregnant women was high, with the highest rate in the third trimester when most of the signs and symptoms occurred, whereas the lowest prevalence was found in the 1st trimester. Thus, there is a need for counseling and the development of an effective eye-care management protocol that will reduce the symptoms and improve the quality of life of pregnant women in our environment.

REFERENCES

- Morin M, Vayssiere C, Claris O, Irague F, Mallah S, Molinier L *et al.* Evaluation of the quality of life of pregnant women from 2005 to 2015. *Eur J Obstet Gynecol Reprod Biol.* 2017; 214:115-130.
- Morin M, Claris O, Dussart C, Frelat A, de Place A, Molinier L, *et al.* Health-related quality of life during pregnancy: A repeated measures study of changes from the first trimester to birth. *Acta Obstet Gynecol Scand.* 2019; 98(10):1282-1291. <https://doi.org/10.1111/aogs.13624> PMID: 30985917
- Cattane N, Ra'ikko'nen K, Anniverno R, Mencacci C, Riva MA, Pariente CM, *et al.*

- Depression, obesity and their comorbidity during pregnancy: effects on the offspring's mental and physical health. *Mol Psychiatry*. 2021; 26(2):462–481. <https://doi.org/10.1038/s41380-020-0813-6> PMID: 32632208
4. Kyei S, Ephraim RKD, Animful S, Adanusa M, Ali-Baya SK, Akorsah B et al. Impact of serum prolactin and testosterone levels on the clinical parameters of dry eye in pregnant women. *J Ophthalmol*. 2020;2020:1491602.
 5. Van Leusden HA. Hormonal changes in pathological pregnancy. *Vitam Horm*. 1972; 30:281–361.
 6. Gotovac M, Kas'telan S, Lukenda A: Eye and pregnancy. *Coll Antropol*. 2013; 37(1):189–193.
 7. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr*. 2016; 27(2):89–94.
 8. Duran M, Gu'ngo' r Í. The effect of pregnancy on tear osmolarity. *Cont Lens Anterior Eye*. 2019; 42(2):196–199. <https://doi.org/10.1016/j.clae.2018.10.007> PMID: 30482511
 9. Nkiru ZN, Stella O, Udeh N, Polycarp UA, Daniel CN, Ifeoma RE: Dry eye disease: A longitudinal study among pregnant women in Enugu, south east, Nigeria. *The Ocul. Surf*. 2019; 17(3):458–463.
 10. Ibraheem WA, Ibraheem AB, Tjani AM, Oladejo S, Adepoju S, Folohunso B. Tear film functions and intraocular pressure changes in pregnancy. *Afr J Reprod Health*. 2015; 19(4):118–122.
 11. 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):276–283.
 12. Asiedu K, Kyei S, Ayobi B, Agyemang FO, Abiordepey RK. Survey of eye practitioners' preference of diagnostic tests and treatment modalities for dry eye in Ghana. *Cont Lens Anterior Eye*. 2016; 39(6):411–415. <https://doi.org/10.1016/j.clae.2016.08.001> PMID: 27507732
 13. Asiedu K, Dzasimatu SK, Kyei S. Impact of Dry Eye on Psychosomatic symptoms and quality of life in a healthy youthful clinical sample. *Eye Contact Lens*. 2018; 44 Suppl 2:S404–s409.
 14. Nebbioso M, Regno PD, Gharbiya M, Sacchetti M, Plateroti R, Lambiase A. Analysis of the pathogenic factors and management of Dry eye in ocular surface disorders. *Int J Mol Sci* 2017;18:1764.
 15. Stapleton F, Alves M, Bunya VY, Jalbert I, Lekhanont K, Malet F, et al. TFOS DEWS II epidemiology report. *Ocul Surf* 2017;XX:334–68.
 16. Walt J. Ocular Surface Disease Index (OSDI) Administration and Scoring Manual. Irvine, CA Allergan, Inc 2004.
 17. Tomlinson A, Bron AJ, Korb DR, Amano S, Paugh JR, Pearce EI, et al. The international workshop on meibomian gland dysfunction: report of the diagnosis subcommittee. *Invest Ophthalmol Vis Sci*. 2011;52(4):2006–2049. <https://doi.org/10.1167/iov.10-6997> PMID: 21450918.
 18. Bron AJ, Evans VE, Smith JA. Grading of corneal and conjunctival staining in the context of other dry eye tests. *Cornea*. 2003; 22(7):640–650.
 19. Versura P, Profazio V, Campos EC. Performance of tear osmolarity compared to previous diagnostic tests for dry eye disease. *Curr Eye Res*. 2010;35:553–64.
 20. Wolffsohn JS, Arita R, Chalmers R, et al. TFOS DEWS II diagnostic methodology report. *Ocul Surf* 2017;15:539–74.
 21. The definition and classification of dry eye disease: report of the definition and classification subcommittee of the International dry eye workshop (2007). *Ocul Surf* 2007; 5: 75–92.
 22. Lin PY, Tsai SY, Cheng CY, Liu JH, Hsu WM. Prevalence of dry eye among elderly Chinese population in Taiwan. *The Shihpat Eye Study*. *Ophthalmol* 2003; 110: 1096–101.
 23. McCarty CA, Bansal AK, Livingston PM, Stanislavsky YL, Taylor HR. The epidemiology of dry eye in Melbourne, Australia. *Ophthalmol* 1998; 105: 1114–9.
 24. Asiedu K, Kyei S, Adanusa M, Ephraim RKD, Animful S, Ali-Baya SK, Akorsah B, Sekyere MA. Dry eye, its clinical subtypes and associated factors in healthy pregnancy: A cross-sectional study. *PLoS One*. 2021 Oct 7;16(10):e0258233. doi: 10.1371/journal.pone.0258233. Erratum in: *PLoS One*. 2022 Jan 27;17(1):e0263426.
 25. Martins TG, Schor P, Mendes LG, Anschütz A, Silva R. Eye diseases during pregnancy: a study with the medical data warehouse in the eye clinic of the Ludwig-Maximilians-Universität München in Munich in Germany. *einstein (São Paulo)*. 2022;20:eAO6613.
 26. Skare TL, Gehlen ML, Silveira DMG, Uma MMDS. Pregnancy and lacrimal dysfunction. *Rev Bras Ginecol Obstet* 2012; 34: 170–4.
 27. Onwubiko SN, Eze BI, Udeh NN, Arinze OC, Onwasigwe EN, Umeh RE. Dry eye disease: prevalence, distribution and determinants in a hospital-based population. *Contact Lens Anterior Eye* 2014;37:157–61.
 28. Onua AA, Chukwuka IO. Prevalence of dry eye disease in a rural Niger delta community, southern Nigeria. *Open J Ophthalmol* 2017;7:95–102.
 29. Schechter JE, Pidgeon M, Chang D, Fong YC, Trousdale MD, Chang N. Potential role of disrupted lacrimal acinar cells in dry eye during pregnancy. *Adv Exp Med Biol*. 2002;506:153–7.
 30. Garg P, Aggarwal P. Ocular changes in pregnancy. *Nepal J Ophthalmol* 2012;4(7):150–61.
 31. Yenerel NM, Ku'c,u'men RB. Pregnancy and the eye. *Turk. J. Ophthalmol*. 2015; 45(5):213.
 32. Golebiowski B, Badarudin N, Eden J, You J, Hampel U, Stapleton F. Does endogenous serum oestrogen play a role in meibomian gland dysfunction in postmenopausal women with dry eye? *Br J Ophthalmol*. 2017; 101(2):218–22. <https://doi.org/10.1136/bjophthalmol-2016-308473> PMID: 27075716
 33. Truong S, Cole N, Stapleton F, Golebiowski B. Sex hormones and the dry eye. *Clin Exp Optom*. 2014;97(4):324–336. <https://doi.org/10.1111/cxo.12147> PMID: 24689906
 34. Ho KC, Jalbert I, Watt K, Golebiowski B. A possible association between dry eye symptoms and body fat: a prospective, cross-sectional preliminary study. *Eye Contact Lens*. 2017; 43(4):245–252.
 35. Dwyer V, Hogan J, Farah N, Kennelly MM, Stuart B, Turner MJ. Changes in maternal body composition during pregnancy. *Arch Dis Child Fetal Neonatal Ed*. 2012; 97(Suppl 1):A47.
 36. Friedman NJ. Impact of dry eye disease and treatment on quality of life. *Curr Opin Ophthalmol*. 2010;21(4):310–316.
 37. Asiedu K, Kyei S, Boampong F, Ocansey S. Symptomatic Dry eye and its associated factors: a study of university undergraduate students in Ghana. *Eye Contact Lens* 2017; 43(4):262–6.