

The breastfeeding effect on the tear film of women: An observational study

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Abstract

Objective: To assess the tear film parameters in breastfeeding women.

Method: The observational study was conducted at the College of Applied Medical Sciences, Riyadh, Saudi Arabia, from December 15, 2021, to February 12, 2022, and comprised healthy women aged 18-40 years who had no ocular diseases. Breastfeeding women were in group A and non-breastfeeding women formed the control group B. Ocular surface disease index, phenol red thread, and tear ferning tests were used in that order to assess the tear film for all the subjects. A gap of 5 minutes was allowed between phenol red thread and tear ferning tests. Data was analysed using SPSS, version 22.

Results: Of the 50 subjects, 25(50%) were in group A with mean age 30.4 ± 5.9 years having a mean breastfeeding period of 5.4 ± 5.0 months. The remaining 25(50%) women were in group B with mean age 28.5 ± 2.1 years. Significant differences were found between the groups for ocular surface disease index, phenol red thread, and tear ferning ($p < 0.05$). Significant moderate correlation was found between tear ferning grades and breastfeeding duration ($p < 0.05$).

Conclusion: Breastfeeding was found to increase dry eye symptoms in women.

Keywords: Dry eye, Tear film, Tear ferning test, Breastfeeding, Risk factor. (JPMA 73: 2200; 2023)

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Introduction

Dry eye is common among adults and has a high prevalence (5-50%).¹ Dry eye results mainly from either increased evaporation or insufficient production of tears.² Dry eye has an impact on the quality of life. The vision of adults has a serious impact on both society and economy due to the high cost of medications, and the decrease in individuals' productivity due to visual disorders.³ It causes inflammation, redness, instability and hyperosmolarity in the tear film.⁴ Dry eye symptoms could vary based on the conditions of the weather, such as sunshine, humidity, winds and dust.⁵ Lacrimal gland dysfunction leads to changes in tear fluid composition and instability in the tear film.⁶ These changes cause an increase in the osmolarity of tears, along with inflammation and irritation of the ocular surface. Besides, dysfunction in the meibomian glands leads to a disturbance in the lipid layer, causing excessive evaporation of tears.⁶ The symptoms of dry eye include burning, itching, pain, a sandy feeling, increased blinking, and foreign body sensation.⁶

The methods used to define and diagnose dry eye involve questionnaires to detect the symptoms and a slit lamp to investigate the surface of the tear film.⁷ Various tests are used to assess eye dryness.⁸ The ocular surface disease

index (OSDI) is used as a subjective tool to evaluate common symptoms of dry eye over a certain period in clinical trials.⁹ The non-invasive breakup time test is a common method to diagnose dry eye which assesses tear film stability.¹⁰ The tear film integrity and abnormalities in the cornea and conjunctiva can be assessed using rose bengal and fluorescein.¹¹ The tear flow is measured using tear meniscus, Schirmer and phenol red thread (PRT) tests.¹² In addition, tear ferning (TF) test and others are used to detect the dryness of the eye.¹³ The TF test is repeatable and reliable in detecting dry eye.¹⁴

Women suffer hormonal changes during pregnancy;¹⁵ for example, the secretion of progesterone and oestrogen increases significantly. Therefore, pregnancy has been established as a risk factor for dry eye.¹⁶ In addition, the hormonal changes that occur during the menstrual cycle can cause symptoms of dry eye.¹⁷ After birth, these hormones decrease dramatically, leading to changes in tear film. The breastfeeding effect on the tear film of women has never been studied. The current study was planned to fill the gap by assessing the effect of breastfeeding on the tear film of lactating mothers.

Subjects and Methods

The observational study was conducted at the College of Applied Medical Sciences, Riyadh, Saudi Arabia, from December 15, 2021, to February 12, 2022. After approval from the ethics review board of King Saud University, Riyadh, the sample was raised from among those visiting

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the female clinics. Those included were healthy women aged 18-40 years who had no ocular diseases with OSDI score <13. Breastfeeding women were in group A and non-breastfeeding women formed the control group B. Those excluded were women wearing contact lens, diabetics, smokers and women with high cholesterol (>4mmol/L), high body mass index (BMI) (≥ 25 kg/m²), and high refractive power. In addition, pregnant women and those in their menstrual cycle, three days before and three days after the periods were denied participation since there is a change in hormonal level in that phase.¹⁵ A slit-lamp examination was used to check abnormalities. The tests used in that order were OSDI, PRT and TF in which 5 minutes were given between the tests. The same examiner assessed the right eye of the subjects after taking written informed consent.

For OSDI, the degree of dryness was categorised as normal (0-12), mild (13-22), moderate (23-32), and severe (33-100).⁹

The PRT test involved the use of a cotton thread that contained a potential of hydrogen (pH) indicator. The thread (3mm bent end) was placed and left for 15 seconds in the lower fornix. The thread changed colour when wetted with tears. The PRT thread was removed, and the length of the red portion was measured. Dry eye was diagnosed if the length of the red thread was <10mm.¹²

A glass capillary tube (10 μ L) was used to collect a tear sample (1 μ L) from the lower meniscus of the subjects' right eyes. The tears were dropped on a microscopic slide and left for 10 minutes to dry at a temperature of 23°C and with a humidity of 15%. The ferns produced were inspected using a digital microscope with a magnification power of 10 \times . The TF patterns of dried tears were graded.¹⁸

Data was analysed using SPSS, version 22. Normality of data was checked using Kolmogorov-Smirnov test, and Mann-Whitney U test was used to compare data between the groups. The associations between parameters were tested using Spearman's rank correlation coefficient (*r*).¹⁹ $P < 0.05$ was considered significant.

The sample size was determined as 25 with a confidence level of 80% and a significance of 0.05.²⁰

Results

Of the 50 subjects, 25(50%) were in group A with mean age 30.4 ± 5.9 years having a mean breastfeeding period of 5.4 ± 5.0 months. The remaining 25(50%) women were in group B with mean age 28.5 ± 2.1 years. Significant differences were found between the groups for OSDI, PRT and TF ($p < 0.05$) (Table).

The duration of breastfeeding and age affected the tear

film parameters. The median scores of OSDI, PRT and TF were 10.0(interquartile range [IQR]: 7.5), 17.5(IQR: 8.0), and 1.3(IQR: 0.5), respectively, when the breastfeeding duration was 1 month (14[56%] subjects aged 30.9 ± 6.0 years). When the breastfeeding duration was 10 months (6[24%]

Table-2: Mean age and median OSDI, PRT and TF values in study and control groups.

Parameter	Study group (n=25)	Control group (n=25)	p-value*
Mean Age (years)	30.4 ± 5.9	28.5 ± 2.1	0.675
OSDI	11.0 (14.0)	6.0 (2.0)	0.010
PRT (mm)	23.0 (9.0)	29.0 (4.5)	< 0.001
TF Grade	1.4 (1.1)	0.8 (0.4)	< 0.001

* Significant difference (Mann-Whitney U test; $p < 0.001$); OSDI: Ocular surface disease index, PRT: Phenol red thread, TF: Tear ferning.

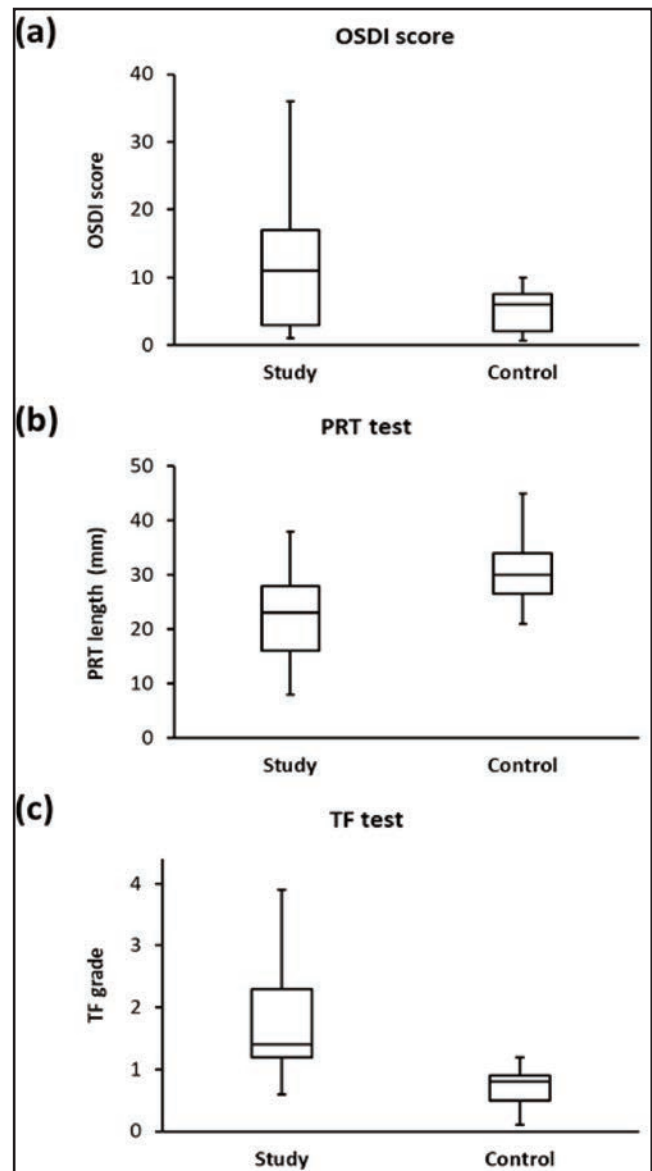


Figure-1: Boxplots (a) for OSDI scores, (b) PRT scores and (c) TF grades in the study and control groups.

OSDI: Ocular surface disease index, PRT: Phenol red thread, TF: Tear ferning.

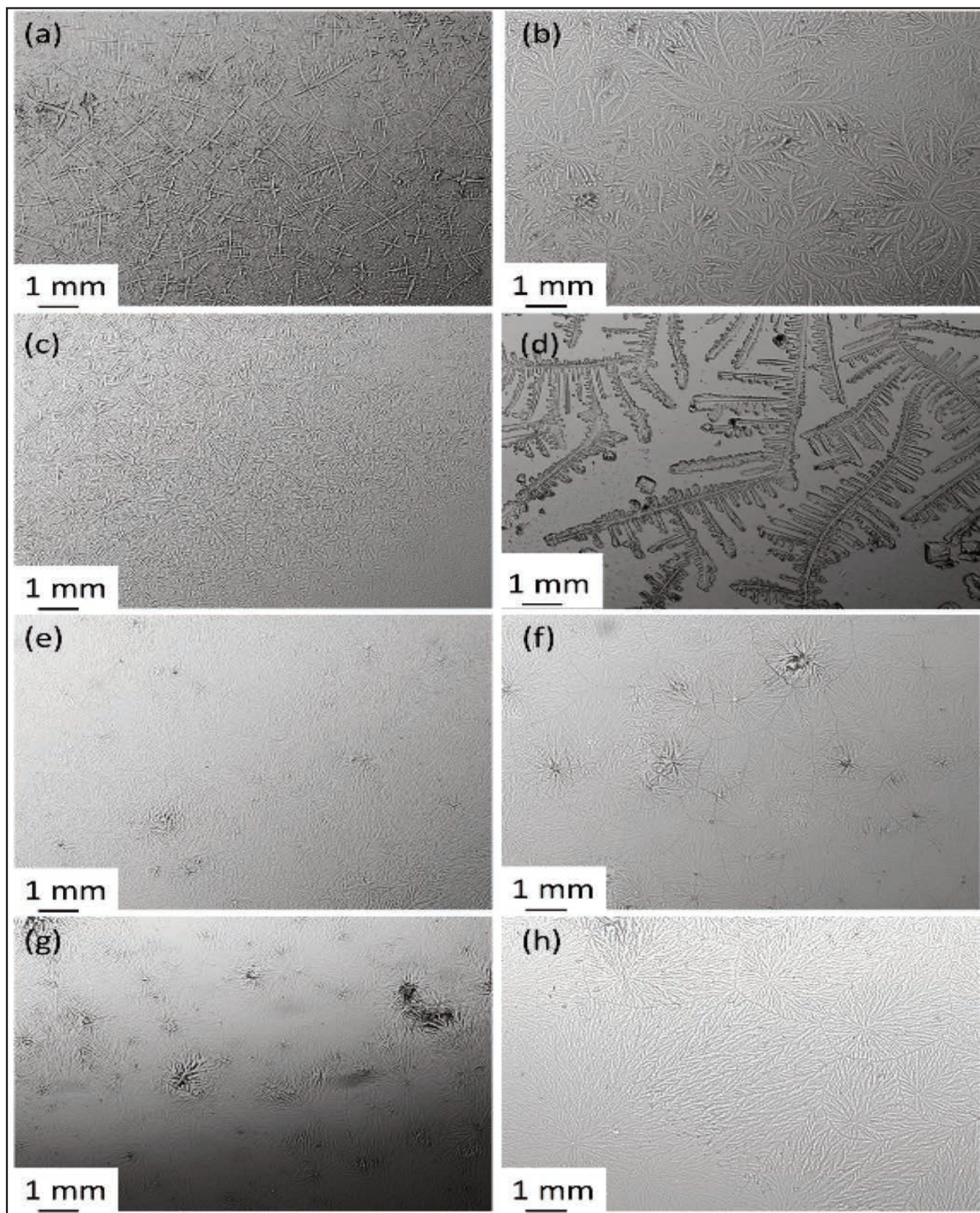


Figure-1: Representative TF patterns of tears collected from 4 breastfeeding women (a, b, c and d) and 4 non-breastfeeding women (e, f, g and h).

subjects aged 27.5 ± 2.5 years), the median scores of OSDI, PRT and TF were 17.0 (IQR: 26.4), 17.5 (IQR: 11.0) and 2.4 (IQR: 0.8), respectively. The differences were significant between median OSDI and TF scores when the breastfeeding duration varied from 1 month to 10 months ($p < 0.03$).

Side-by-side boxplots for OSDI, PRT and TF scores in the two groups showed significant differences ($p < 0.05$) (Figure 1). The spaces between the tear ferns were very small in the control group compared to the study group (Figure 2).

OSDI score showed that 8(32%) breastfeeding women had dry eyes and none of them had severe symptoms, while 3(12%) women experienced mild, 2(8%) moderate and 3(12%) showed severe dry eye symptoms. TF grades suggested 10(40%) breastfeeding women had dry eyes (TF grade ≥ 2). Only 3(12%) subjects in group A had dry eyes based on the PRT measurements. The volume of tears was at the normal level (≥ 15 mm) in 22(88%) breastfeeding women. In the control group, none of the subjects showed dry eye symptoms based on OSDI, PRT and TF scores. A moderate correlation was observed between TF grades and breastfeeding duration ($r = 0.510$, $p < 0.001$).

Discussion

The findings suggested an association between breastfeeding and symptoms of dry eye. Hormonal changes during pregnancy can lead to various physiological changes and affect the eyes.^{21,22} Various ocular changes take place during pregnancy because of increased hormones, which include alterations in tear film composition and thickness, cornea sensation and refractive power.²² Dry eye has been reported to be common in pregnant women.²³ However, these changes are temporary, not severe, and require no treatment. The response of the intraocular pressure during pregnancy is hypotensive, but changes in lacrimal gland function lead to dry eye.^{23,24} A previous study showed no significant difference in pre- and post-partum intraocular pressure and increased tear production.²² In addition, the change in hormone concentration causes water retention, leading to an increase in cornea curvature and thickness. However, such a condition is temporary and clears itself after the breastfeeding period.

A balance among hormones, such as testosterone and oestrogen, leads to normal meibomian gland function. Testosterone increases the development of the meibomian gland. While oestrogen causes a decrease in the size and secretion of the meibomian gland. During pregnancy and breastfeeding, the secretion of testosterone and oestrogen becomes irregular.²⁵

Routine ocular check-up for breastfeeding women is

recommended. Eye drops are safe during the breastfeeding period to relieve the symptoms of dry eye.²⁰ However, some medications could cross the placenta, causing a risk to the foetus. The exact mechanism by which eye drops cause problems in breastfeeding women is complex and not fully understood.²⁶ The lowest effective dose of ophthalmic medications should be given to breastfeeding and pregnant women, and closing the eyes for a short period (one to two minutes) after administration may help in reducing systemic adsorption and drainage.²⁷

The limitations of the current study include a small sample size, limited number of tests to detect dry eye, and the fact that no hormones were measured. Also, the breastfeeding period varied. Demographic variables and effect modifiers were not addressed as the subjects were recruited from a single location in a single city.

Future studies should target larger samples, and should also assess tear film stability among breastfeeding women using a combination of objective and subjective tests.

Conclusion

Breastfeeding led to a change in the volume and quality of tears. A high prevalence of dry eyes was seen in breastfeeding women. The tear volume and quality were significantly lower in the breastfeeding group in comparison with the control group. However, normal tear secretion was observed in breastfeeding women.

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Conflict of Interest: None.

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