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Evaluate the effect of chemotherapy on tear film in breast cancer

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ABSTRACT

Objective*: The aim of study is to evaluate the effect of different sessions of chemotherapy in breast cancer females on tear film.*

Methods*: An observational longitudinal study was conducted at the oncology department of Madinah Teaching Hospital Faisalabad from September 2023 to December2023.A purposive non-probability sampling technique was used to select the data. 30 Females with 25-45years of age, diagnosed with breast cancer having chemotherapy as treatment plan were included. Exclusion criteria was contact lens users, seasonal allergies, lactating woman, menopausal woman and past history of dry eye. After taking verbal and written consent and complete history, Schirmer test and TBUT was performed at baseline and after 2, 4 and 6 sessions of chemotherapy. Then compared their results.*

Results*: Data was analyzed with Repeated Measure ANOVA test by using IBM SPSS softwareversion20.The mean difference of at baseline in breast cancer females was 14.3333±2.998 and 14.300±3.425 respectively. After 3 cycles of chemotherapy cycles the mean difference of TBUT and Schirmer was reduced with P=0.00.*

Conclusion: *The incidence of aqueous-deficient dry eye was significantly higher in patients who had undergone more than two sessions of chemotherapy. As number of sessions increases, lower the value of Schirmer I and TBUT were recorded.*

Keywords*: Dry Eye, Schirmer, Chemotherapy, Breast Cancer, aqueous-deficient dry eye.*

1. INTRODUCTION

Breast cancer is a type of cancer that forms in the cells of the breast, primarily affecting women. In which breast cells mutate and become cancerous cells that multiply and forms tumor (1). It is abnormal, uncontrollable growth of epithelial cells of lobules,ducts and the nipple in breast(2).Breast cancer is the most frequent type of cancer among female as it constitutes 24% of all female malignancies. Breast cancer affects nearly 2 million females worldwide(3). Approximately 0.6 million deaths and 2.1 million new cases were reported in 2018 in all Asian nations(4). Pakistan has the highest incidence of breast cancer; 1 in 9 women get breast cancer diagnoses (5).

Chemotherapy is the most common treatment given in breast cancer .Chemotherapy is a cytotoxic medication that uses powerful chemicals (drugs) to kill fast growing cells in your body. It is the therapy in which anti-neoplastic drugs are used to kill the tumor cell(6). It helps to control, stop or terminate the rapid growth of cells(7).

Chemotherapy used as breast cancer treatment cause some mechanical changes to ocular surface specially disturb tear film that cause dry eye disease(8).Tear film serves a variety of important purposes, first is to maintain the high-quality vision as the most anterior aspect of the visual system. Second, the tear film is the ocular defense. It nourishes the cornea and remove dust and wastage from epithelial layer of cornea(9).

Disturbance in tear film cause dry eye(10). DED is the multifactorial disease of the ocular surface in which the homeostasis of tear film loses(11). It is the dry, lusterless condition of conjunctiva due to unstable tear film or increase osmolarity of tear film (excessive tear evaporation)(12). That caused discomfort, visual disturbance, burning sensation and photophobia (13). Dry eye is classified as aqueous deficient dry eye and evaporative dry eye(14). Aqueous deficient dry eye occurs when lacrimal glands do not produce enough tears. As in advance age, blink irregularities, ocular surface diseases (chalazion, blepharitis), ocular inflammation (uveitis), systemic inflammatory disorders(rheumatoid arthritis, multiple sclerosis), disturbance in trigeminal (CN-V) and drugs that trigger tear production and cause dysfunction of tear film. Evaporative dry eye occurs when tears evaporate rapidly. It mostly caused by meibomian gland dysfunction. It linked to screen exposure, sun exposure, hot weather, smoking, menopause, sex hormones and windy conditions (15).

Dry Eye is a multifactorial condition; however, it is concerned with inflammation, cell apoptosis, medication, hormonal and environmental changes. Mostly antihistamine and decongestant affect mucus layer. Antidepressants and acne medications cause disturbance in lipid layer. Aqueous layer changes occur due to over use of antidepressants, antihistamines, beta-blockers, hormone medication and also due to chemotherapy (16).

2. METHODOLOGY

This Observational Longitudinal study included 30 diagnosed breast cancer females from Oncology Department of Madinah Teaching Hospital Faisalabad, Pakistan from September 2023 to December 2023 in a time period of 4 months.

The research included females with diagnosed breast cancer, age range of 25 to 45 years. Lactating, Pregnant, Menopause, Contact Lens users, Seasonal allergies, Ocular surgeries, Diabetic and Hypertensive females were excluded.

Verbal and Written consent from patients after explaining procedure was obtained. For collection of data tear film was assessed before starting therapy and then after 2,4,6 session of chemotherapy with the gap of one week between ach session.

Firstly, we begin with OSDI to score symptoms of dry eye. After patient seated comfortably, we used fluorescein strip to measure TBUT for tear stability by asking patient to look inferiorly and rubbed strip on conjunctiva. First break on cornea appearing as black spot or line after blink in seconds with the help of stop watch was observed by using burton lamp.

After obtaining results, self-designed proforma was filled to observe baseline findings and to check the effect of different sessions of chemotherapy on tear film for appropriate conclusion.

Data was analyzed with SPSS Software Version 20. Repeated Measure ANOVA Test was applied on data to evaluate the effect of chemotherapy on tear film at baseline and then after 2,4,6 sessions in breast cancer patients.

3. RESULTS

Sixty eyes of thirty diagnosed breast cancer female shaving chemo therapy with age 25-45 years were evaluated in this study. Mean±SD of age was 36.8 ± 6. Tear film production and stability were checked at baseline before starting chemotherapy and thenotherreadingsweretakenafter2,4and6sessionsof chemotherapy.Results of this study were calculated using the Repeated Measure ANOVA test.

The descriptive statistics of Repeated Measure ANOVA test results shows that not only lipid layer effected but aqueous layer is also disturbed with administration of chemotherapy (Taxane). Chemotherapy inhibits the cell proliferation in eye which leads to dysfunctioning of stem cells and causes dry eye (evaporative and aqueous deficient). Most frequent type of dry eye disease caused by chemotherapy is Aqueous deficient dry eye.

Table1:Descriptive Statistics of Tear Film Production of Breast Cancer Female Having Chemotherapy Sessions

	Mean	**Std. Deviation**	**Sig. P value**
Tear film production at baseline	14.3000	3.42556	0.00
Tear film production after 2sessions	12.0000	3.32182	
Tear film production after 4sessions	9.3667	3.28511	
Tear film production after 6sessions	6.6333	3.33718	

The result demonstrated the tear film production reduced as the chemotherapy sessions increases.

Table 2: Descriptive Statistics of Tear Film Stability (TBUT)of Breast Cancer Female having Chemotherapy Sessions.

	Mean	**Sig. P value**	**Greenhouse Geisser**
Tear film stability at baseline	14.333±2.99808	0.00	0.388
Tear film stability after 2sessions	12.8000±3.04450		
Tear film stability after 4sessions	10.6333±2.9303		
Tear film stability after 6sessions	7.8333±2.90164		

4. DISCUSSION

The purpose of the study was to evaluate the effect of different sessions of chemotherapy on tear film in breast cancer patients. In this current study, sixty eyes of thirty diagnosed breast

cancer females having chemotherapy with age 25-45 years were evaluated from Madinah Teaching Hospital Faisalabad, Pakistan. Tear film production and stability were examined at baseline and then other readings were taken after 2,4 and 6 sessions of chemotherapy.

Results of this study were calculated using Repeated Measure ANOVA Test. The results of study showed that there was a significant reduction in mean values of TBUT and Schirmer test 1 value after every session, tear film stability and production was reduced as the chemotherapy sessions increased. Oncologists should refer to Ophthalmology Department for early screening of eyes thus to prevent from dry eye asthenopic symptoms which can lead towards blindness (Keratoconjuctivitis Sicca).

In 2013, Karamitsos A, et al. had conducted a study to describe the effect of chemotherapy on ocular surface tear film production, stability and drainage system changes. Study including 61 females of age range between 28 to 54 years with breast cancer treated with chemotherapy. Tear film production and stability was assessed with TBUT and Schirmer test 1 (without anesthesia) before the initiation of treatment and after third session of therapy cycle. The mean value of TBUT before initiating the chemotherapy was 14.00 secand theme an value of Schirmertest 1 was18.00 mm in 5 minutes. After third therapeutic period,the mean value of TBUT was <10.00 sec and the mean value of Schirmer test 1 in 5minutes was < 10.00 mm. These assessments of TBUT and Schirmer test 1 showed a marked reduction in tear film stability and production(18).

Jinhwan Park, et al. had conducted another study in May 2019 to assess the effect of chemotherapy on meibomian gland thickness and ocular surface diseases(19). This study included 17 females age range between 33 to 80 years. The chemotherapy duration was 27 months with follow-up of 9.6months and 3 follow-ups were taken. TBUT measured before chemotherapy initiation was > 10 seconds and when measured after 2 sessions of chemotherapy was < 10 seconds on slit lamp. Before chemotherapy the lipid layer thickness value was 98nm (normal>75nm) and again measured after chemotherapy session the value of LLT was 34.5nm which was lower than normal value. The mean value of meiboscore in lower and upper eyelids was represented as mean ± standard deviation was (2.14±0.86) and (2.6±0.8) respectively. Kruskal one-way statistical analysis was applied using SPSS 17 version and results showed that there was a significant difference (P<0.001). It was concluded that the chemotherapy was harmful for the production of lipid and aqueous layers(20).

The findings of this current study were consistent with both of studies explained above. There was a significant reduction in values of TBUT and Schirmer test 1 by analyzing before the initiation of chemotherapy and after cycles of chemotherapy.

Multidisciplinary approaches should be considered among Oncologist and Optometrist/ Ophthalmologist for comprehensive eye examination in patient having history of chemotherapy. Lipid base Artificial tears (Refresh Optive Mega-3 and TheraTears)should be used by breast cancer patients having multiple sessions of chemotherapy. Early screening can prevent them from aqueous deficient and evaporative dry eye associated ocular complications like Keratoconjuctivitis Sicca, Keratoconnus, Keratitis, Blepharitis which can lead to blindness.

This study was limited to age group of 25 to 45 years. According to severity of breast cancer there are many sessions (11,12…) of chemotherapy but due to limited time duration, this study observed patients till 6^{th} sessions.

5. CONCLUSION

The study showed chemotherapy has highly effect on tear film and concluded that with increase in sessions of chemotherapy, the severity of Aqueous deficient dry eye increases which effects the quality of life. But early ocular screening in breast cancer patient can prevent them from eye conditions which leads to blindness.

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