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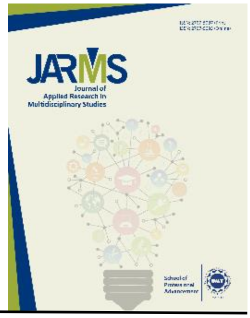

Title: **Impact of Contact Lens Wear on Female's Ophthalmic Health Adopting Logistic Regression Analysis**

Author (s): Kaniz Fatima[1],Humaira Ahmed[2] , Mahnoor[3], Basit Ali[1*], Amen Fatima[3], and Kinza Mazhar[3]

Affiliation (s): [1]Bahria University Karachi Campus, Pakistan,
[2]Sir Syed University of Engineering and Technology, Karachi, Pakistan
[3]Dow University of Health Sciences, Karachi, Pakistan

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*Corresponding Author: basitali.bukc@bahria.edu.pk

Analyzing the Impact of Contact Lenses on Women's Ophthalmic Health

Kaniz Fatima[1],Humaira Ahmed[2] , Mahnoor[3], Basit Ali[4*], Amen Fatima[3], and Kinza Mazhar[3]

[1]Department of Humanities and Social Sciences, Bahria University Karachi Campus, Pakistan
[2]Department of Mathematics and Sciences, Sir Syed University of Engineering and Technology, Karachi, Pakistan
[3]DOW College of Pharmacy, DOW University of Health Sciences, Karachi, Pakistan
[4]Department of Electrical Engineering, Bahria University Karachi Campus, Pakistan

Abstract

People wearing contact lenses, especially women, are more likely to get eye infections. The current study aimed to examine the relationship between contact lenses and eye infections including age, duration of wearing lenses, wearing time, any kind of pain or discomfort experienced after wearing them, and mainly the cleaning method of contact lenses. This study employed binary logistic regression analysis to analyze the data obtained from 120 women contact lens wearers between 15 and 35 years old with a diverse demographic background. The results depicted that females who cleaned their contact lenses with tap water were three times at a higher risk to get eye infections than those who used proper chemical solutions to clean their contact lenses. Women above 15 years of age who have been wearing lenses for more than three years, wear them for more than three hours each day, experience pain after using lenses. Moreover, they are also at a greater risk of having an eye infection due to cleaning the lenses with tap water. The current study also provided an understanding of the factors which drive ocular infections in women contact lens wearers as well as the study has significant public health implications.

Keywords**:** binary logistic regression, chemical solution, contact lenses, eye infections, tap water

Introduction

Eyes are the most sensitive organs of human body as they interact with the light to help people watch everything in their surroundings. Light proceeds through two layers within the eyes: the cornea and lens, focusing the incoming rays on the retina. However, when this lens deteriorates, the incoming light cannot adequately focus which causes a blurry vision. Eyeglasses and contact lenses are used to rectify this problem. Contact lenses are preferred over eyeglasses as they provide a more natural vision by directly contacting the eyes and significantly minimizing distortions. A thin silicon hydrogel-based layer on the cornea of eyes modifies refractive errors (Key, 2007). It improves visual clarity by letting the eye focusing light in the correct area of retina. These address visual issues, such as myopia, hyperopia, astigmatism, and presbyopia (Gulsen & Chauhan, 2004). Contact lenses are quite comfortable and can be worn safely for 14-16 hours daily. Wearing contact lenses for over 30 days would lead towards contact lens build-up. The first material used for the manufacturing of contact lenses was glass, followed by plastic. Later on, other types of contact lenses were introduced, such as soft lenses with hydrogel and silicon-hydrogel varieties and rigid gas permeable. The soft contact lens material must be durable, flexible, adaptable, biocompatible, thermally and chemically stable, and oxygen permeable (Hickson-Curran et al., 2011).

The above mentioned material offers almost all the properties which a suitable contact lens requires. However, oxygen permeability was inadequate for extended lens wear (Musgrave & Fang,

*Corresponding Author: basitali.bukc@bahria.edu.pk

2019). Additionally, silicon rubber was also introduced as another material for soft contact lenses, although it had higher oxygen permeability but was inflexible (Bacon et al., 1994). Later on, silicone hydrogel contact lenses were introduced which are suitable for long-term wear due to their highest oxygen permeability (Guillon, 2013). Besides having several benefits of wearing contact lenses instead of glasses, it may also cause many severe complications in the eyes. These complications include corneal neovascularization, contact lens-related discomfort, microbial keratitis, dry eyes, corneal oedema, blepharitis, itching, tear turnover, burning sensation, grittiness, hyper keratinization, ulcers, corneal hypoxia, eye strain, blurred vision, pain, and astigmatism (Stapleton et al., 2006). Soft contact lens wearers, mainly in extended wear, showed a higher prevalence of corneal vascularization than hard contact lens wearers. The primary causes of this condition are oxygen transmissibility, herpes simplex stromal keratitis, and poor fitting of contact lenses (Alipour et al., 2016). Corneal hypoxia is a deficient oxygen supply to the corneal tissues. The oxygen permeability value is the capability of a contact lens to allow oxygen to reach the eye. Ideally, soft contact lenses daily wear Dk/t value is 24 Barrer/cm (Bruce, 2003). Microbial keratitis refers to a condition which originates from microbes. It causes severe injury which may lead towards visual loss due to corneal facets and punctures (Cardall, 2012). It is characterized by redness, pain, photophobia, lesions, and different types of infiltrates as the natural resistance of the eye is endangered due to microbial adherence to the lens, creating biofilm (Cheng et al., 1999). Dry eyes caused by contact lenses are typically accompanied by contact lens discomfort. The insertion of contact lenses into the eyes results in the separation of tear film into pre-lens tear film and post-lens tear film. This increased friction results in dry and uncomfortable eyes (Kojima, 2018). Temperature fluctuation causes dehydration due to increased evaporation, leading towards dryness and eye discomfort.

Robin L. Chalmers used a dry eye questionnaire and a contact lens dry eye questionnaire to determine the frequency of symptoms associated with dryness in an unselected sample with or without contact lens usage in 2006 (Chan et al., 2021). Richdale et al. (2007), reported through the survey which included 730 subjects selected from the university-based ophthalmic clinic. Among 730 subjects, 453 were contact lens wearers and most of them were women. Ocular symptoms, such as discomfort and dry eyes were reported by women (Chalmers & Begley, 2006). In 2007, a study reported that in tropical regions, contact lens-related keratitis and other conditions associated with contact lens wear were more severe than in other regions of Australia (Richdale et al., 2007). Sindt reported that people wearing lenses with low water content are more prone to contact lens-induced dry eyes (Stapleton et al., 2007). In 2008, a survey was conducted among medical students at the University of Malaya and 121 contact lens wearers were included in this study. Among them, 87.6% of lens wearers were women. Majority of the users experienced a gritty sensation, that is, 81.8%, followed by red eyes, 64.4% of students (Sindt & Longmuir, 2007).

Unnikrishnan and Hussain (2009) reported that a study was conducted among the students of coastal Karnataka, a hot and humid area. Amid allergy to lens solution, dry, red, watery eyes, as well as discomfort was reported by 47.7% of the subjects as the major problem faced by contact lens users (Khairi & Zain, 2022). Contact lens-induced dry eyes are familiar among 40%-50% of the population wearing hydrogel soft contact lenses, along with changes in eye surface reported by (Pult et al., 2009; Unnikrishnan & Hussain, 2009). In 2010, contact lens overwear was reported to be associated with different ophthalmic problems. Among 271 contact lens users, 65 were men and 206 were women; the common disorders reported included papillae (10%), neovascularization (39%), and giant papillary conjunctivitis (36%). Teo reported that there were 721 patients in public hospitals in Singapore, the majority of them were women using soft contact lenses of different varieties. Infective keratitis was reported in 25.6% of patients. Other complications, such as GPC, corneal neovascularization, and dry eyes were also reported (Yeung et al., 2010). In 2013, Khan reported that according to the cross-sectional analysis, only 24% of women knew washing practices for contact lenses. Thirty-three (33%) of wearers replaced lens solution regularly, 42% swapped solutions later more than two weeks, 2% adopted hand hygiene before insertion, and 18% did not take care of hygiene (Teo et al., 2011).

The TFOS international workshop report stated that 12-51% of contact lens wearers' dropout cases occured due to discomfort caused by contact lenses. A survey conducted in Canada and the U.S. shows that 47% of contact lens discontinuation diminished their discomfort symptoms (Ali et al., 2022). A study about contact lens wearers demographics and risk behaviours for contact lens-related eye infection was conducted in the U.S. in 2015. It was conducted through an online survey which analyzed the frequency of contact lens hygiene-related behaviour. In this study, nearly 99% reported engaging in at least one hygiene-related risk behaviour and nearly one-third of contact lens wearers reported having experienced red and painful eyes requiring a doctor's visit (Nichols et al., 2013). Shin et al. (2016), reported the relationship of contact lenses with ocular microbiota using a 16S RNA gene-based sequencing technique. It was discovered that the conjunctiva microbiota of lens wearers was more similar to the microbiota of skin under the eye as compared to people who do not wear lenses (Cope et al., 2015).

In 2017, a study reported that the occurrence of symptomatic contact lens-induced infiltrates in cornea compasses was from 2.5-6% (Shin et al., 2016). Xu et al. (2018), reported that contact lenses for ophthalmic drug distribution have 50-70% corneal bioavailability, enabling penetration inside the vitreous chamber (Steele & Szczotka-flynn, 2017). Efron reported that positioning and removal of contact lenses cause impulsive blinking which leads towards contact lens dislodging (Xu et al., 2018). In 2018, a study reported that the complications related to contact lenses observed were 36.88% dry eyes, blepharitis, and meibomian gland dysfunction which was observed to be 31.91%. Fifteen (15) patients showed microbial keratitis with the inclusion of 7 cases of Acanthamoeba keratitis found in 141 patients (Erdinest, 2023). Sticca reported that the risk factors for Acanthamoeba keratitis are soft contact lens wear and saline solution for lens fitting (Li et al., 2018).

In 2018, a study reported that the main hazardous factors contributing to contact lens complications include its storage, handling, and rinsing with water, which leads towards limited efficacy (Sticca et al., 2018). Arshad et al. (2019), reported that the corneal sterile infiltrates are also related to water exposure to contact lenses (Lim et al., 2018). In 2019, a study reported that when contact lens-related blepharitic eye condition was treated with microblepharon exfoliation, this complication was significantly curtailed (Arshad et al., 2019). Stapleton (2021), reported that the complications related to contact lenses influence about one-third of wearers. Its interaction with the ophthalmic surface, lacrimal layer, environmental microbes, and contact lens solutions gave rise to different eye disorders (Siddireddy et al., 2019).

Contact lens disinfecting solutions are used to maintain safe lens hygiene. Rinsing contact lens cases with hot water and air-drying them are the productive ways to reduce microbial growth (Wu et al., 2010). Multipurpose solution (MPS) is an effective way to clean lenses as it helps remove deposits efficiently (Cho et al., 2008). The Opti-Free Express solution, which contains disodium EDTA, boric acid, sodium citrate, sodium chloride, sorbitol, aminomethyl propanol, and POLYQUAD, draws out more deposited protein in the Lotrafilcon B lens than any other solution (Zhao et al., 2009).

Method

Binary logistic regression analysis is a technique used to investigate the association between a binary dependent variable and one or more independent categorical variables. It provides valuable statistics, such as odds, odds ratio, and probability, effectively conveying the research purpose (Klieštik et al., 2015). This approach is efficient when analyzing dependent variables that are binary or dichotomous rather than continuous (Simmonds & Higgins, 2016).

In the current study, women facing eye infections due to wearing contact lenses was the dependent variable. Whereas, the independent variables included the age of women, duration of wearing lenses, wearing time, any kind of pain or discomfort experienced after wearing them, as well as the cleaning method. The dependent variable has binary outcome (facing an eye infection from wearing contact lenses vs. facing no eye infection from wearing contact lenses), this is the basic condition for using binary logistic regression. It is the most appropriate method to interpret the effect of contact lenses on the probability of facing an eye infection.

The assumptions of logistic regression in this study included the independence of observations, linearity of the log-odds, adequate sample size, and no outliers in the model. The individual observed was a female, and it is important to note that facing the eye infection is expected to be independent among all females. There was no repetition or redundancy in the data. It was also supposed that there was a linear relationship between the log-odds of the dependent variable (facing an eye infection from wearing contact lenses) and the independent variables (age, duration of wearing lenses, wearing time, any kind of pain or discomfort experienced after wearing them, and mainly the cleaning method of contact lenses).

The result of each independent variable on the log-odds was additive and proportional. Another asumption was that there should be an enough number of samples to predict the probability of having an eye infection. The current study used binary logistic regression analysis to analyze the data obtained from 120 female contact lens wearers. It was also assumed that there were no outliers in the study which impact the results inappropriately. All the observations were carefully examined to measure their influence on the model results.

Statistical Model and Investigation

The main objective of this study was to analyze the relationship between eye infection after wearing contact lenses and several explanatory variables, such as age, duration of wearing lenses, daily wear time, any pain or itching experienced after wearing contact lenses, and especially the cleaning methods adopted by women. The data obtained from a survey of 120 women between 15 and 35 years of ages using contact lenses was examined using IBM SPSS software.

Wearing contact lenses varied from less than three years to more than three years. The everyday wear time of contact lenses was categorized as less than 3 hours and more than 3 hours. Women were also asked about experiencing any pain after wearing the lenses. The answers were categorized as "painful" or "not painful." Additionally, the cleaning method used was recorded, and the option was tap water or chemical solution. The collected data was then analyzed using binary logistic regression analysis. This convenient statistical technique examines the association between a binary dependent variable and one or more independent categorical variables. The analysis provided odds, ratios, and probability statistics that helped in understanding the relationship between variables.

Model Analysis

The binary logistic regression analysis, as shown in Table 1, is evaluated by the model diagnosis. The performance of the model known as the "goodness of fit test" is shown in this table. By contrasting the anticipated frequencies with the actual frequencies, the model's predictions' accuracy is determined. The results of the Omnibus Test revealed a significant discrepancy between the expected and observed frequencies, and the model is statistically significant (chi-square statistic: 50.506). Another statistical method to evaluate the goodness of fit of the logistic regression model is

Test	Chi-square	Degrees of freedom	Significance level
Omnibus	50.506	5	0.000
Hosmer and Lemeshow	3.288	8	0.915

the Hosmer and Lemeshow test. This test provides a chi-square value of 3.288 and a significance level of 0.915. A high p-value means there is no reason to reject the null hypothesis that the model fits the data well. Based on this result, it can be concluded that the model's fit is relatively maintained.

Table 1
Omnibus and Hosmer Tests

Various goodness of fit metrics are used to estimate the model's validity. One such metric is the -2 log-likelihood, which for this model is 110.171. This value indicates the model's ability to fit the data. Cox and Snell *R*-squared and Nagelkerke *R*-squared are additional metrics, demonstrating how well the model predicts the outcome variable. The Cox and Snell *R*-squared value for this model is 0.344, indicating that the independent variables in the model may explain 34.4% of the variance in the dependent variable. Similarly, the Nagelkerke *R*-squared value is 0.466, indicating that the independent variables in the model may account for 46.6% of the variance in the dependent variable as shown in Table 2. These measurements show a moderate to good fit for the model.

Table 2
Model Summary

-2 Log-likelihood	Cox & Snell R^2	Nagelkerke R^2
110.171	0.344	0.466

Model Characteristics

Table 3 shows the accuracy of the model. This indicates that the model correctly classified 75% of the cases. Table also shows that the model correctly identified 80.8% of the cases in which women did not experience any eye infection after wearing contact lenses as compared to the cases in which women did experience an eye infection after wearing contact lenses. It also shows that the model correctly identified 66.0% of the cases. Overall, classification in Table 3 provides valuable information about the model's predictive ability to define whether a person would develop an eye infection after wearing contact lenses based on the variables included in the model.

Table 3
Classification Table

Observed		Do you suffer any eye infections after wearing contact lenses?		Percentage Correct
		no	yes	
Do you suffer any eye infections after wearing contact lenses?	no	59	14	80.8
	yes	16	31	66.0
Overall Percentage				75.0

Results

The findings of a logistic regression analysis that determined the relationship between various factors and the likelihood of eye infections after using contact lenses are shown in Table 4. The current study used "Do you experience an eye infection after wearing contact lenses?" as the dependent variable. The age of the female respondents, hours of contact lens wear, hours of contact lens wear per day, whether the respondent experienced pain after wearing the contact lenses, and how the contact lenses were cleaned were independent variables included in the analysis.

Table 4
Assessed Coefficients of Logistic Regression Model for Different Eye Infection Parameters

	B	*S.E.*	Wald	*df*	Sig.	Exp(*B*)	95% C.I.for	
							Lower	Upper
Age	-0.06	0.05	1.24	1	0.27	0.94	0.85	1.04
Since how long have you been wearing contact lenses?	1.88	0.54	12.00	1	0.001	6.52	2.26	18.83
	B	*S.E.*	Wald	*df*	Sig.	Exp(*B*)	95% C.I.for	
							Lower	Upper
For how many hours do you wear contact lenses in a day?	1.44	0.49	8.73	1	0.003	4.24	1.63	11.05
Do you experience any kind of pain after wearing contact lenses?	1.11	0.52	4.60	1	0.032	3.05	1.10	8.44
How do you clean your contact lenses?	-1.62	0.49	11.07	1	0.001	0.20	0.08	0.51
Constant	-0.07	1.18	0.003	1	0.96	0.94		

The correlations for each independent variable with a one-unit increase (column *B*) show the change in the log-odds of getting an eye infection, while holding all other variables constant. For instance, a coefficient of 1.875 for the duration of contact lens wear indicates that, when all other factors are held constant, the log-odds of developing an eye infection increased by 1.875 for each unit increase in the duration of contact lens wear. In the logistic regression model, the coefficient for the cleaning procedure variable was negative (-1.620), indicating a negative association between using chemical solutions to clean lenses and the probability of developing an eye infection. Furthermore, the coefficient's statistical significance (p = 0.001) suggests that the relationship between cleaning procedure and the probability of eye infections was not coincidental. The negative association was high enough to be regarded as significant. As a result of logistic regression analysis, it can be inferred that using chemical solutions to clean lenses is an actual means of decreasing the risk of getting eye infections. According to the model, the B value for women is negative, indicating that as the age of a woman increases, the likelihood of experiencing eyesight problems decreases. According to the model, the coefficient value '*B*' for women's age is negative which means that as a woman's age increases, so does her risk of developing vision issues. Younger girls in the model are more likely to acquire eye infections than older females. Women had a negative coefficient for age (-0.058). However, it was insignificant, p = 0.266, indicating no relationship between age and the probability of getting an eye infection.

The coefficients for the remaining variables were all positive, indicating that they were related to an increased risk of eye infection. Longer duration of contact lens wear (B = 1.875, p = 0.001), more hours of contact lens wear per day (B = 1.444, p = 0.003), and pain after wearing contact lenses (B = 1.114, p = 0.032) were all related with a higher risk of eye infections. These coefficient '*B*' values can be used in an equation to find the probability of eye infection after wearing contact lenses in women. These values are in log-odds units, which can be converted to probabilities. The following is the expression for the binary logistic regression model considering the variables mentioned above:

$$\log\left(\frac{p}{1-p}\right) = b_0 + b_1\, x_{age} + b_2\, x_{duration} + b_3\, x_{daily\ wear\ time} + b_4\, x_{pain} + b_5\, x_{Cleaning\ method} \quad (1)$$

where, p is the probability of having an eye infection after wearing contact lenses in women. $\log\left(\frac{p}{1-p}\right)$ in Equation (1) is considered a log of odds or link logit function, while $\frac{p}{1-p}$ is the odds ratio. The logistic regression in Equation (2) in variables form is:

$$\log\left(\frac{p}{1-p}\right) = -0.067 - 0.058x_{age} + 1.875\ x_{duration} + 1.444x_{daily\ wear\ time} + 1.114x_{pain} - 1.620\ _{cleaning\ method} \quad (2)$$

The probability of having an eye infection after wearing contact lenses in women with different covariates can be easily depicted. Equation (3) represents the probability equation generated from the model.

$$p = \frac{e^{-0.067-0.058x_{age}+1.875\ x_{duration}+1.444x_{daily\ wear\ time}+1.114x_{pain}-1.620\ x_{Cleaning\ method}}}{1+e^{-0.067-0.058x_{age}+1.875\ x_{duration}+1.444x_{daily\ wear\ time}+1.114x_{pain}-1.620\ x_{Cleaning\ method}}} \quad (3)$$

The odds ratios (Exp(B)) show the increase or decrease in the probability of developing an eye infection related to a one-unit increase in each independent variable while holding all other factors constant. The variable, that is, "age of women" has an exp(B) value of 0.944. This means that for every single unit that rises in age (in years), the odds of experiencing an eye infection after wearing contact lenses decrease by a factor of 0.944. It implies that as women get older, the probability of experiencing an eye infection after wearing contact lenses decreases slightly. However, this effect is not statistically significant ($p = 0.266$). The odds ratios (Exp(B)) show the increase or decrease in the probability of developing an eye infection related to a single unit increase in each independent variable while holding all other factors constant. According to the model, every unit increase in the duration of time a woman uses contact lenses raises the probability of an eye infection by a factor of 6.519, with a confidence interval of 95% extending from 2.257-18.827. This means that women who have used contact lenses for an elongated time have a considerably higher risk of having an eye infection than those who have worn them for a shorter time.

Similarly, for every unit increase in hours per day a woman wears contact lenses, the odds of facing an eye infection increase by a factor of 4.238, extending from 1.626-11.047 with a 95% confidence interval. Thus, women who wear contact lenses for a longer duration each day have significantly higher odds of experiencing an eye infection than those who wear them for a shorter period. Similarly, women who experience pain after wearing contact lenses have 3.047 times higher odds of developing an eye infection as compared to those who did not experience pain.

The odd ratio for the cleaning method of contact lenses is 0.198, extending from 0.076-0.514 with a 95% confidence interval. This means that women who clean their contact lenses with chemical solutions have significantly lower odds of experiencing an eye infection than those who use tap water. The logistic regression results indicate the duration period of wearing contact lenses, the number of hours per day, and whether the respondent experienced pain after wearing contact lenses. The cleaning methods used for contact lenses significantly predict the likelihood of experiencing an eye infection after wearing contact lenses. The age of women, however, was not found to be a significant predictor. These results may inform interventions and educational programs to reduce the risk of eye infections in women.

Using the probability equation obtained in Equation (3), Table 5 shows that all probabilities of having an eye infection after wearing contact lenses were measured with the impact of all independent variables. Since age is the continuous variable, the maximum, minimum, and average ages were taken to estimate the probabilities. The lowest probability is 0.0237, which occurs for women in age group 26-35 using chemical solutions to clean their contact lenses, have been using contact lenses for less than three years, wear them for less than 3 hours a day, experience no pain after wearing them, and use a chemical solution to clean them. This means that there is a less chance of thesewomen developing an eye infection from wearing contact lenses. Conversely, the highest probability is 0.9706, which occurs for a 15 year old woman who has been wearing contact lenses for over three years, wears them for more than 3 hours a day, experiences pain after wearing them, and uses tap water to clean them. This means that there is a high chance of this woman developing an eye infection from wearing contact lenses. Individuals need to take appropriate precautions and follow recommended cleaning methods to minimize the risk of eye infection.

Table 5

Probability Table of having Eye Infection after Wearing Contact Lenses with the Covariates

	Duration	Less than three years				More than three years			
	Daily wear time	Less than 3 hours		More than 3 hours		Less than 3 hours		More than 3 hours	
	Pain after wearing contact lenses	No Pain	pain	No Pain	pain	No Pain	pain	No Pain	pain
Tap water	≤15 year	0.2815067	0.5441348	0.6241029	0.834933	0.7186955	0.8861496	0.9154444	0.9705737
	16-25 year	0.1799037	0.4005918	0.4817581	0.7390429	0.5885562	0.8133612	0.8583922	0.9486317
	26-35 year	0.1093887	0.2722969	0.3423138	0.6132514	0.4447268	0.7093027	0.7724153	0.911815
chemical solutions	≤15 year	0.0719576	0.1910812	0.247312	0.50025	0.3358151	0.6063511	0.6817878	0.867151
	16-25 year	0.0416066	0.1168091	0.1553817	0.3591627	0.2206298	0.4630674	0.5453748	0.785161
	26-35 year	0.02373	0.0689456	0.0933839	0.238849	0.1368149	0.3256338	0.401793	0.6717256

From the logistic regression model, the theoretical estimations proposed that women who clean their contact lenses with tap water are at a higher risk of getting eye infection along with other variables. The emperical estimation supported this fact and showed that there is a significant positive relationship between the risk of getting an eye infection and the cleaning method of contact lenses. The contact lenses should be cleaned using proper chemical solutions recommended by the ophthalmologists. The consistency between the predictions of the model and the observed data strengthens the validity of the conclusions.

The data clearly shows that cleaning contact lenses with chemical solutions reduces the risk of getting eye infections in comparison with tap water, as shown in Figure 1 and Figure 2. Chemical solutions consistently show lower probabilities of eye infections, irrespective of daily wear time or duration of wearing. Conversely, tap water exhibits higher probabilities of eye infections throughout the graph. Additionally, the graph in Figure 3 depicts an increase in the probabilities of eye infection for both cleaning methods as daily wear time and duration of wearing contact lenses increase. However, the probabilities remain significantly lower for chemical solutions. Based on these findings, chemical solutions for cleaning contact lenses are highly recommended to minimize the risk of eye infections.

As age is the continuous variable, maximum, minimum, and average ages were taken to estimate the probabilities. The lowest probability is 0.0237, which occurs for women in age group 26-35 using chemical solutions to clean their contact lenses, have been wearing contact lenses for less than three years, wear them for less than 3 hours a day, experience no pain after wearing them, and use a chemical solution to clean them. This means that there is a significantly less chance of this woman facing an eye infection from wearing contact lenses. On the contrary, the highest probability is 0.9706, which occurs for a 15 year old woman who has been wearing lenses for over three years, also wears them for more than 3 hours every day, experiences pain after wearing lenses as well, and uses tap water to clean the contact lenses. This means that there is a high chance of this woman getting an eye infection using contact lenses. To decrease the risk of eye infection, people should follow the recommended cleaning methods for contact lenses and take appropriate precautions.

Figure 1

Probability of Having an Eye Infection When Cleaning the Contact Lenses with Tap Water

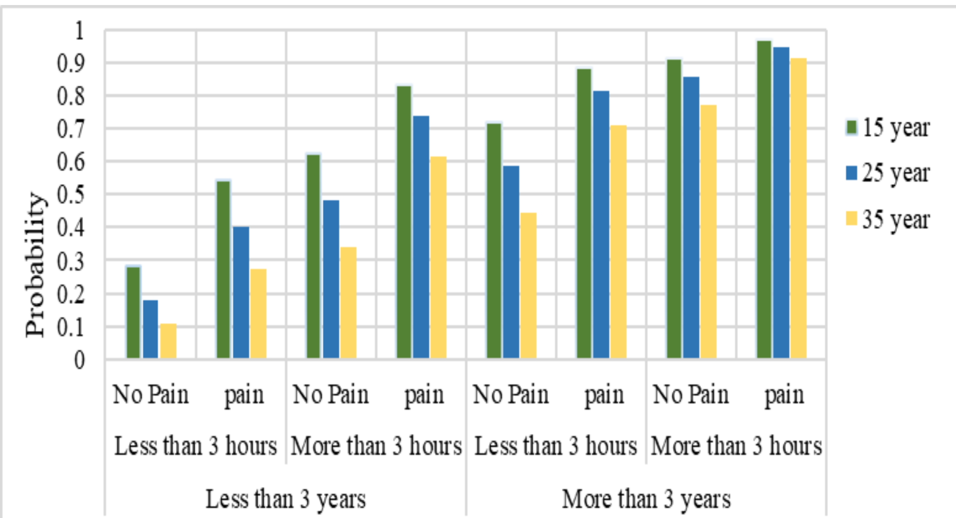


Figure 2
Probability of Having an Eye Infection When Cleaning the Contact Lenses with a Chemical Solution

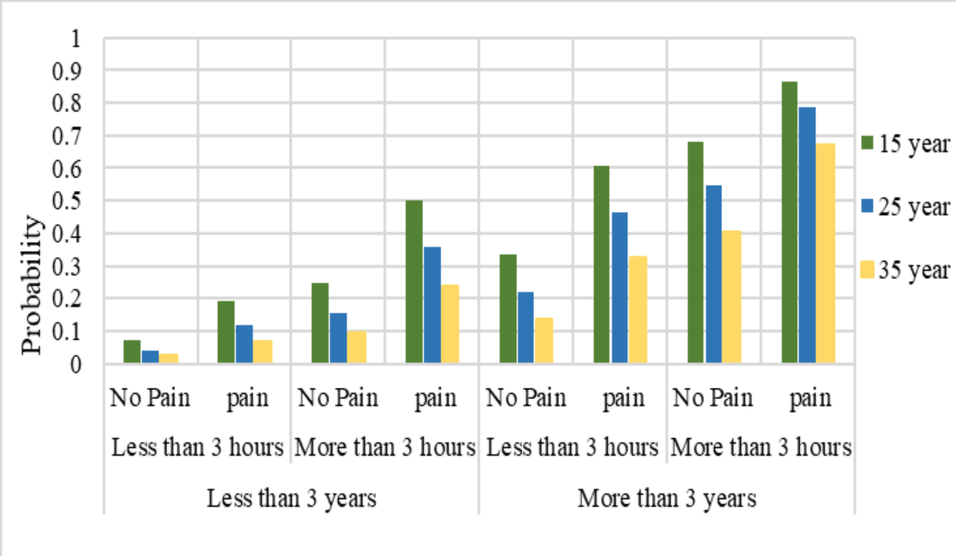
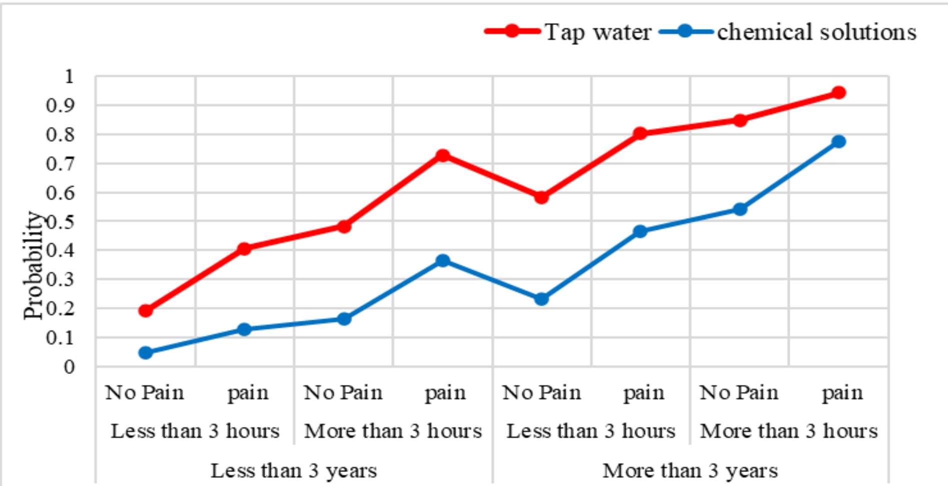


Figure 3
Probability of Eye Infection with Contact Lens Cleaning Method: Tap Water vs. Chemical Solution



Discussion

According to different literature reviewed contact lens disinfecting solutions are used to maintain safe lens hygiene. Rinsing contact lens cases with hot water and air-drying them are the productive ways to reduce microbial growth (Wu et al., 2010). A study reported that the occurrence of symptomatic contact lens-induced infiltrates in cornea compasses was from 2.5-6% (Shin et al., 2016). Contact lenses for ophthalmic drug distribution have 50-70% corneal bioavailability, enabling penetration inside the vitreous chamber that damages the structure of eye (Siddireddy et al., 2019). Positioning and removal of contact lenses can also cause impulsive blinking which leads towards contact lens dislodging (Xu et al., 2018).Complications related to contact lenses observed were 36.88% dry eyes, blepharitis, and meibomian gland dysfunction which was observed to be 31.91%. Fifteen (15) patients showed microbial keratitis with the inclusion of 7 cases of Acanthamoeba keratitis found in 141 patients (Erdinest, 2023). Multipurpose solution (MPS) is an effective way to clean lenses as it helps remove deposits efficiently (Cho et al., 2009).

The findings showed that the daily duration of contact lens wear and the occurrence of discomfort in women after wearing contact lenses are the two critical factors in determining the probability of developing an eye infection. The current study suggested that using tap water to cleanse the contact lenses increases the probability of contracting an eye infection. The demographic group comprised 26-35 year old women who utilize chemical solutions to disinfect their contact lenses, wear the lenses for less than three hours daily and use them for less than three years, facing the slightest possibility of having an eye infection. The age group showing the highest probability was women above 15 years who have continually used contact lenses for more than three years, used over three hours per day, and used tap water to clean their contact lenses. The results have significant ramifications for contact lens wearers which may help to lower the rate of eye infections associated with the usage of contact lenses.

Conflict of Interest

The author of the manuscript has no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability Statement

The data associated with this study will be provided by the corresponding author upon request.

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