# Correlation Between Use of Contact Lens Cleaning Liquid and Subjective Complaints of the Eyes of Contact Lens Users


## Abstract

The correlation between the use of contact lens cleaning solutions with subjective complaints of the contact lens users in the medical student Batch 2018 Christian University of Indonesia. The research aims to determine the correlation between duration of use, knowledge, and obedience to contact lens cleaning solutions with subjective complaints of contact lens users. Samples were taken from 40 students of contact lens users by filling out a questionnaire containing duration of use, knowledge, and obedience use of contact lens cleaning solution. The result of the study is that the correlation between the duration of use of contact lens cleaning solution and knowledge of use of contact lens cleaning solution with subjective complaints of the contact lens users is not significant. The correlation between obedience use of contact lens cleaning solutions with subjective complaints of contact lens users is significant.



***Keywords****: Contact lens cleaning solution, duration of using contact lens cleaning solution, knowledge of using contact lens cleaning solution, the obedience of using contact lens cleaning solution, subjective complaint.*




## Introduction

Eyes as the five senses that are very important in human life to see. With seeing eyes, humans can enjoy the beauty of nature and interact well with the surrounding environment. If the eyes experience interference or eye disease, it will be fatal for human life. So the eye should be a body member that needs to be maintained in daily health. Many young people today like to live a modern lifestyle, follow fashion, and don't want to be out of date. Of the many teenagers whose original eye lenses are very concerning, they flock to contact lens optical shops just to buy instead of going to the hospital for routine eye checks.

In the past, contact lenses have been widely used to help overcome refractive errors, but most of the use of contact lenses has a function not only to correct existing refractive errors but is used as a means to improve or add value to appearance and for therapeutic purposes. Because of the use of contact lenses with broad indications, sufficient knowledge is needed. Data from the World Health Organization (WHO) states that there are 39 million people experiencing blindness. Corneal blindness ranks fifth as the cause of blindness in the world's population after cataracts, glaucoma, macular degeneration, and refractive errors [1]. Whereas in developing countries with tropical climates, corneal blindness is second only to cataracts as a cause of blindness and decreased visual acuity [2].

The use of contact lenses globally reaches 140 million people, both for correction purposes and cosmetics. The most users are in Asia and America, where 38 million users come from North America, then 24 million from Europe [3]. For the duration of use, about 60% of contact lens users use extended-wear contact lenses, and 40% of contact lens users use daily-wear contact lenses [4]. Meanwhile, contact lens users among medical students at the Faculty of Medicine, University of North Sumatra 2009 showed around 115 contact lens users out of 1306 students [5]. From this data, it can be

said that contact lenses are people's choice in treating eye disorders, especially in terms of refractive errors, but more modern contact lens users do not prevent their use from side effects. According to Stanler, around 80,000 contact lens users suffer from eye diseases, particularly disorders of the conjunctiva, cornea, and tear glands [6].

According to the American Optometric Association, the reason for choosing to use contact lenses over glasses is that contact lenses follow the movement of the eyeball and do not reduce the field of view of the eye in the slightest, so they do not interfere with vision, beautify the appearance, comfortable, brighter, no frames that interfere with the eye's view, reduces distortion, does not fog up, is not easily exposed to rain, and does not hinder activities. However, contact lens users have many negative impacts that need to be watched out for, especially if they do not follow the usage rules, such as eye metabolic disorders (hypoxia), stromal damage, endothelial trauma, toxic and allergic occurrences, sterile keratitis, microbial keratitis, impaired tear flow, and corneal distortion.

Caring for contact lenses is very important; one way is to clean them regularly. There are various ways to clean, one of which is by washing contact lenses using a special liquid (anti-infection liquid). This method protects contact lenses from bacterial microorganisms that can grow on the surface of contact lenses, such as fungi, bacteria, and amoebae. It should be noted that many variations of contact lens fluid can be obtained to treat contact lenses. However, on the other hand, many also use intravenous fluids because they are thought to be able to clean and are cheaper, or try to make their fluids that are unclean and contaminated with bacteria or use ordinary eye drops instead of those specifically for contact lenses. As a result, an infection occurs, which causes the cornea to be damaged so that it must be transplanted or discarded so as not to become a more serious eye disease [7].

Research conducted by Finera Winda [8] shows that most contact lens user respondents' knowledge level of the negative effects of their use is at the moderate category level. Furthermore, Fatin Amirah Kamaruddin's research [8] showed that 90% of contact lens user respondents had a low risk of developing keratitis, and as many as 10% of students had a moderate risk of keratitis. The results of Khaerunnisa's research [10] show no significant relationship between knowledge variables and the behavior of contact lens users. Research conducted by Ratna Sitompul [11] suggests that poor hygiene and compliance are also contraindications to contact lenses, proper and correct introduction to contact lens cleaning fluids is very important to prevent eye complications. Furthermore, liquids have an expiration date of 2-6 months after the bottle is opened.

The eye is a complex sensory organ that is sensitive to light. Each eye has a layer of receptor cells within its protective shell, an optical system (cornea, lens, aqueous humor, corpus vitreum) to focus light on receptors, and a nervous system to transmit impulses from receptors to the brain [12]. The foremost part of the eye is the cornea, a transparent layer that lets light rays enter the eye. Inner to the sclera is the choroid, a pigmented layer containing many blood vessels that nourish the internal structures of the eyeball. The lens is a transparent structure that is round and slightly flattened at its equator, which is linked by the zonula zine fibers which hang the lens on the ciliary body. The lens of the eye automatically becomes more bulging due to the constriction of the ciliary muscle, which results in the relaxation of the zonula zine.

In front of the lens is a pigmented iris with a pupil hole in the center. The iris contains circular muscle fibers that constrict the pupil and longitudinal (radial) fibers

that dilate it. Changes in the diameter of the pupil of the eye are useful for adjusting the amount of light that enters the eye. The space between the lens and retina is filled with a viscous fluid mass, namely the corpus vitreum and aqueous humor. The aqueous humor produced by the ciliary body fills mainly the eye's anterior chamber. If all the refractive surfaces of the eye are added together algebraically and imagined as a lens, the optical structure of the normal eye will be seen simply, and the scheme is often referred to as the reduced eye [13]. In a reduced eye, it is imagined that there is only one lens with an optical center point of 17mm in front of the retina and has a total refractive power of 59 diopters when looking at a distance[14].

The greater part of the eye's refractive power is produced not by the lens but by the anterior surface of the cornea. The main reason for this thought is that the refractive index of the cornea is much different from that of air. The formation of an image on the retina occurs by focusing an image of an object on the retina. This image is reversed from the original object. However, the brain's perception of objects remains upright, not upside down, like the image on the retina. It happens because the brain has been trained to perceive the inverted image as a normal state [15]. The eye is said to be normal or called emmetrope when in a state of rest (without accommodation). Parallel light entering the eye is focused exactly on the retina. It means that the emmetropic eye can see all distant objects clearly when the eye is at rest, but for close objects, the ciliary muscle must contract so that the eye can accommodate. If there is an abnormality of refraction that results in parallel rays not being focused on the retina, then this condition is called ametropia. Refractive errors or ametropia can be in the form of myopia, hypermetropia, presbyopia, and astigmatism. The eye is said to be myopic when parallel rays are focused in front of the retina. Hypermetropia occurs when parallel rays are focused behind the retina. Presbyopia occurs because the power of accommodation decreases in old age. Meanwhile, astigmatism is a refractive error in which the image's focal point is not at one point.

Contact lenses are thin plastic lenses attached to the eye's cornea, which have the same function as glasses, namely correcting refractive errors, accommodation disorders, therapy, and cosmetics. Contact lenses can be made of glass or plastic material to cover the cornea and part of the sclera. The space between the contact lens and the cornea is filled with saline. This system can eliminate corneal astigmatism and correct ametropia. Contact lenses began to be used in the 1930s, when the lenses were large and made of glass. In 1947, contact lenses were made of plastic that was smaller and thinner than before [16].

In people who are just learning to use contact lenses, usually the lenses are replaced within four months because the lenses become damaged. At a later time, change the lens only once a year. A lost lens, damaged lens, or deposits on the lens surface usually cause lens replacement. Contact lenses must be used according to the rules of use. Lenses for vision correction should not be used 24 hours continuously on daily wear lenses. It also requires regular checks so that the cornea remains in good condition. With the development of knowledge about contact lens manufacturing, it is now possible to recognize various types of contact lenses where some can be used for a longer period so that contact lens users are not much bothered by the frequent insertion and removal of contact lenses. Types of contact lenses according to the time of use: a) Daily wear lenses, the lenses must be opened every day at night; b) Weekly wear lenses, which can be used for one week continuously and opened every week to be cleaned and eyes to rest. To prevent dry eyes, you have to drip lubricating lens fluid "comfort drops"

every day; c) Extended wear lens, this lens can be used continuously for a maximum of 3 months, but it is recommended that it should be opened once a month [17]. Every day you have to drip "comfort drops." Because the extended-wear lens is very thin, it cannot cover astigmatism, so astigmatism cannot wear an extended-wear lens unless glasses are added to correct astigmatism. For high astigmatism, toric contact lenses are now known, which can also be made as Daily wear lenses, Weekly wear lenses, and Extended wear lenses.

Contact lens cleaning fluid is used to clean, rinse and store contact lenses. Contact lens cleaning fluid is an absolute necessity for contact lens users. The user, structure, and materials of contact lenses require more care than eyeglass lenses. As a cleaning medium, rinse, and contact lens storage. Clean contact lenses using cleaning fluid. More than one liquid is used because each has a different function, from cleaning, killing germs, rinsing, and enzymes to cleaning the protein accumulated from tears. Each liquid has its active ingredient, which can irritate the eyes if not used according to the specified steps. The latest cleaning systems combine old fluids into two types of liquids, namely peroxide and multi-function liquid [18]. Both liquids contain cleaning agents such as bisphosphate compounds to clean proteins and polymeric structures to prevent the sticking of lenses and proteins. These liquids generally contain moisturizing ingredients such as cellulose, propylene glycol, or polyvinyl. In addition, there are also acidity regulators and preservatives.

Peroxide liquid itself is a liquid that is chemically harmful to eye tissue but has superior bacteria-killing properties compared to multi-functional liquids. So the peroxide liquid used for contact lenses also contains a peroxide neutralizer to prevent damage to eye tissue. Multi-functional liquids use polymers as disinfectants, but other preferred functions are sterile storage media when contact lenses are not used. Because contact lenses immersed in this liquid can be applied directly to the eye, the polymer agent is made to not irritate the eye by reducing its disinfecting power. Protein-cleaning enzymes can be used, but not as often as lens-cleaning fluids. This enzyme is generally in the form of tablets and is used every few days by putting it in a lens storage container with contact lenses [19].

Allergy is a change in the body's reaction power to contact with a substance (allergen), which forms the reaction of antigens and antibodies. However, most experts prefer to use the term allergy concerning excessive immune responses that cause disease or so-called hypersensitivity reactions. It depends on various circumstances, including antigen exposure, genetic predisposition, predisposition to form IgE, and other factors. Allergic symptoms arise when IgE attached to the surface of mast cells or basophils reacts with the appropriate allergen. The interaction between allergens and IgE results in cell degranulation and the release of certain substances. For example, histamine, vasoactive amine, prostaglandin, thromboxane, and bradykinin. Degranulation can occur when cross-links are formed due to the reaction between IgE on the cell surface and anti-IgE. Then histamine will dilate and increase vascular permeability and stimulate smooth muscle contractions and exocrine glands so that it will cause or cause symptoms such as red bumps (urticaria) (erythema) and itching due to increased vascular permeability and dilation of blood vessels, which then give manifestations of inflammation ( inflammation) [20].

Inflammation is a complex reaction of vascularized tissue to infection, exposure to toxins, or cell damage, which involves extravascular accumulation of plasma proteins and leukocytes. Acute inflammation is a common result of the innate immune response,

whereas locally acquired immune system responses can also increase inflammation. During the immune response, effector cells and molecules involved in immunological mechanisms can also damage body cells. Therefore from this point of view, inflammation can be called an immunopathological response. In inflammation, there is an increase in blood flow due to vasodilation at the scene or damage to the capillary network, which becomes more permeable so that fluids, large molecules, and leukocytes can exit the blood vessels and then enter the tissues. Due to chemotaxis, leukocytes move toward the target, especially neutrophils and monocytes. It also occurs with the release of proteases and free radicals. As a result of the above process, the physical characteristics of inflammation are redness (rubor), heat (calor), swelling (tumor), and pain (dolor) [21].

Knowledge results from knowing, which occurs after someone senses a certain object. This sensing occurs through the five human senses: sight, hearing, smell, taste, and touch. Most human knowledge is obtained through the eyes and ears [22]. According to Notoatmodjo [23] knowledge results from knowing, which occurs after people sense a particular object. Sensing occurs through the five human senses, namely the senses of sight, hearing, smell, taste, and touch. Most of human knowledge is obtained through the eyes and ears. Therefore knowledge is a very important domain for forming one's behavior. Based on the definition above, in this research, UKI Faculty of Medicine students Batch 2018 must have good knowledge to understand, analyze, and evaluate how to use contact lenses and contact lens cleaning fluid, starting from how to care for, clean, and how to store, so that complaints can be prevented as much as possible.

According to the Big Indonesian Dictionary [24] obedience is like following and obeying orders, while obedience is behavior according to rules and discipline. Meanwhile, according to Ali and Slamet [25] obedience comes from the basic word obey, which means discipline and obedience. Obedience is like obeying orders, obeying orders or rules. Meanwhile, obedience is behavior according to rules and discipline. Compliance with professional staff (nurses) is the extent to which a nurse's behavior follows the provisions given by the nurse leader or the hospital. Based on the definition of compliance above, UKI Medical Faculty students Batch 2018 must have a good level of compliance because if the knowledge possessed is not matched by compliance, the risk of negative impacts from using contact lenses and cleaning fluids is greater than the knowledge offset by compliance. Therefore, a good level of compliance is needed in the use of contact lenses and their cleaning fluid. For example, adherence to cleaning contact lenses using a special cleaning fluid instead of eye drops and soaking contact lenses in a sterile container using a new liquid or solution for 4-6 hours before reuse.

Based on the problems underlying the use of contact lenses and subjective complaints about the use of contact lens cleaning fluid, the research problem can be formulated as follows: Is there a relationship between compliance with contact lens cleaning fluid users and subjective complaints among contact lens users? Relationship between the use of contact lens cleaning fluid and subjective complaints about the eyes of contact lens users.

**Method**

The method used in this research is a correlational study with a cross-sectional study approach which aims to determine the relationship between the length of use, knowledge, and compliance with subjective complaints of using contact lens fluid on

the eyes of contact lens users [26]. The research was conducted at the Faculty of Medicine at the Indonesian Christian University, East Jakarta. The population of this study was contact lens-wearing students in the UKI Faculty of Medicine Batch 2018. The type of sample used in this research was purposive sampling with 40 people based on inclusion criteria. Primary data collection was obtained; the researcher obtained data directly from the respondents by filling out a questionnaire. For data collection, questionnaires were made using the Likert Scale for independent variables and the Guttman Scale for the dependent variable. The instrument used was a questionnaire containing ten questions regarding duration of use, knowledge, compliance, and subjective complications to the user's eyes. Processing and analysis of data are done by editing, coding, data entry, data cleaning, and data processing stages. Univariate analysis was used to get an overview of the frequency distribution of the independent variables, namely factors of length of use, knowledge, adherence, type of cleaning fluid, and subjective complaints to the eyes of contact lens users. In addition to univariate analysis, bivariate analysis was also carried out to determine the relationship between the two variables. This bivariate analysis identifies factors such as duration of use, knowledge, and compliance with subjective eye complaints of contact lens users. This study uses a chi-square analysis test to see the relationship between the independent and dependent variables.

**Result and Discussion**

This study observed several independent variables associated with subjective complaints in the eyes of contact lens cleaning fluid users. The variables observed were gender, duration of contact lens cleaning fluid use, knowledge about contact lens cleaning fluid, and compliance with contact lens cleaning fluid.

**Table 1. Gender Distribution of Respondents**

| No | Variable (n=40) | f | % |
|---|---|---|---|
| | Gender | | |
| | Male | 5 | 12,5 |
| | Female | 35 | 87,5 |

The majority of respondents in this study were women. The table above shows that the number of female respondents is seven times more than that of male respondents. It shows that women use more contact lens fluid, so the risk of eye complaints from box lens cleaning fluid users mostly occurs in women. The duration of contact lens use by respondents is shown in Table 1 below.

**Table 2. Distribution of contact lens cleaning fluid duration**

| No | Variable (n=40) | f | % |
|---|---|---|---|
| 1 | Length of use of contact lens cleaning fluid | | |
| | 1-3 months | 13 | 32,5% |
| | 3>months | 27 | 67,5% |

Based on the table above, it is known that most of the respondents have used contact lens cleaning fluid for more than three months, and only 32.5% of respondents have used contact lenses for less than < 3 months. The respondent's knowledge of contact lens cleaning fluids is presented in Table 2 below.

**Table 3. Knowledge Distribution of Contact Lens Cleaning Liquids**

| No | Variable (n=40) | F | % |
|---|---|---|---|
| 1 | Knowledge | | |
| | Insufficient | 23 | 57,5 |
| | Good | 17 | 42,5 |

The percentage of respondents who had less knowledge about eye lens cleaning fluids was more than respondents who had good knowledge about eye lens cleaning fluids. Respondents' compliance in using contact lens cleaning fluid is shown in the following table.

**Table 4. Distribution of Respondents' Compliance in Using Contact Lens Cleaning Liquid**

| No | Variable (n=40) | F | % |
|---|---|---|---|
| 1 | Obedience | | |
| | Obedient | 34 | 85,0 |
| | Disobedient | 6 | 15,0 |

The table above shows that most respondents were obedient in using contact lens cleaning fluid, namely 34 respondents (85%), and only six respondents (15%) did not comply with the rules for using contact lens cleaning fluid. The dependent variable in this study was subjective complications due to the use of contact lens cleaning fluid. This complication is indicated by three symptoms/signs: redness of the eyes, itching sensation of the eyes, and blurred vision. The variable symptom of eye redness, one of the complaints from using contact lens cleaning fluid, is described in Table 4 below.

**Table 5. Distribution of Redness in Respondents' Eyes**

| No | Variable (n=40) | F | % |
|---|---|---|---|
| 1 | Redness of the Eyes | | |
| | Yes | 10 | 25,0 |
| | No | 30 | 75,0 |

The proportion of eye redness experienced by one in four research respondents (25.0%). Eye complications are also characterized by an itchy sensation in the eyes, the distribution of which is described in Table 5 below.

**Table 6. Distribution of the Itchy Sensation in Respondents' Eyes**

| No | Variable (n=40) | F | % |
|---|---|---|---|
| 1 | Itchy Sensation in the Eyes | | |
| | Yes | 8 | 20,0 |
| | No | 32 | 80,0 |

The incidence of itchy eyes in contact lens cleaning fluid users was eight respondents (20%). It means that every one in five respondents to this study experienced an itchy sensation in the eyes. Another symptom observed as a complication of using contact lens cleaning solutions is blurred vision. The distribution of this variable is presented in Table 6 below.

**Table 7. Distribution of Respondents' Vision Blur**

| No | Variable (n=40) | F | % |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | Blurred Vision | | |
| | Yes | 6 | 15,0 |
| | No | 34 | 85,0 |

As many as six respondents (15%) who used contact lens cleaning fluid experienced blurred vision, and 34 respondents (85%) did not complain.

Independent Variable Relationship with Eye Redness. The effect of each independent variable on eye redness is shown in Table 8 below.

**Table 8. Factors Affecting Symptoms of Eye Redness**

| No | Variable (n=40) | Redness of the Eyes | | Total | p | OR | 95%CI |
|---|---|---|---|---|---|---|---|
| | | Yes (n=10) | No (n=30) | | | | |
| 1 | Gender | | | | | | |
| | Female | 9(25,7%) | 26(74,3%) | 35(100%) | 0,783 | 1,4 | 0,1- |
| | Male | 1(20,0%) | 4(80,0%) | 5(100% | | | 14,1 |
| 2 | Length of Use | | | | | | |
| | of Contact | 8(29,6%) | 19(70,4%) | 27(100%) | 0,559 | 2,3 | 0,4- |
| | Lenses | 2(15,4%) | 11(84,6%) | 13(100%) | | | 12,9 |
| | > 3 months | | | | | | |
| | 1-3 months | | | | | | |
| 3 | Knowledge | | | | | | |
| | Insufficient | 6(26,1%) | 17(73,9%) | 23(100%) | 0,853 | 1,1 | 0,3- |
| | Good | 4(23,5%) | 13(76,5%) | 17(100%) | | | 4,9 |
| 4 | Obedience | | | | | | |
| | Disobedient | 5(83,3%) | 1(16,7%) | 6(100%) | 0,000 | 29,0 | 2,8- |
| | obedient | 5(14,7%) | 29(85,3%) | 34(100%) | | | 303,3 |

The incidence of eye redness was experienced more by female contact lens cleaning fluid users (25.7%) compared to those who were male (20.0%). However, statistically, gender was not associated with redness of the eyes as indicated by a value > α 0.05 (p=0.783). Nearly a third of respondents who had used contact lens cleaning fluid for over three months experienced eye redness. This incidence rate is lower in respondents who have used contact lens cleaning fluid within 1-3 months. The bivariate analysis showed no relationship between the duration of contact lens cleaning fluid use and eye redness as indicated by > α 0.05 (p=0.559).

Respondents with poor knowledge about contact lens cleaning fluids experienced more eye redness than those with good knowledge (26.1% vs. 23.5%). Based on the results of the Chi-Square statistical test analysis, it can be seen that the respondents' knowledge of contact lens cleaning fluid has no significant relationship with symptoms of eye redness. It is indicated by a value > α 0.05 (0.853). Approximately 83% of respondents who did not comply with the use of contact lens cleaning fluid experienced symptoms of redness in the eyes. This figure is almost six times higher than respondents who comply with using contact lens cleaning fluid. These results were also reinforced by the Chi-Square statistical test analysis, which showed a significant relationship between adherence to the use of contact lens cleaning fluid and symptoms of eye redness. It is indicated by a value > α 0.05 (p=0.000). Based on the odds ratio (OR) value of 29.0, respondents who are not compliant have a 29 times greater risk of experiencing symptoms of redness of the eyes than those who comply. Factors that affect the sensation of itching in the eyes are shown in Table 9 below.

**Table 9. Factors Affecting the Sensation of Symptoms of Itchy Eyes**

| No | Variable (n=40) | Itching in the Eyes Yes (n=10) | No (n=30) | Total | p | OR | 95% CI |
|---|---|---|---|---|---|---|---|
| 1 | Gender | | | | | | |
| | Female | 8(22,9%) | 27(77,1%) | 35(100%) | NA | NA | NA |
| | Male | 0(0,0%) | 5(100,0%) | 5(100% | | | |
| 2 | Length of Use of | | | | | | |
| | Contact Lenses | 7(25,9%) | 20(74,1%) | 27(100%) | 0,177 | 4,2 | 0,5-38,4 |
| | > 3 months | 1(7,7%) | 12(92,3%) | 13(100%) | | | |
| | 1-3 months | | | | | | |
| 3 | Knowledge | | | | | | |
| | Insufficient | 5(21,7%) | 18(78,3%) | 23(100%) | 0,749 | 1,3 | 0,3-6,4 |
| | Good | 3(17,6%) | 14(82,4%) | 17(100%) | | | |
| 4 | Obedience | | | | | | |
| | Disobedient | 6(100,0%) | 0(0,0%) | 6(100%) | NA | NA | NA |
| | Obedient | 2(5,9%) | 32(94,1%) | 34(100%) | | | |

NA=*Not applicable*=Data cannot be analyzed

Respondents who experienced an itchy sensation in the eyes only came from female respondents, around 23%. Because the symptoms of itching in the eyes are not distributed in all genders, further analysis of the Chi-Square statistical test cannot be carried out. Meanwhile, related to the variable duration of using contact lens cleaning fluid, the incidence of itching sensation in the eyes is higher in those who have used contact lens cleaning fluid for a long time (> three months) compared to those who have only used contact lens cleaning fluid for 1-3 months. However, based on bivariate analysis, there was no relationship between the length of time using contact lens cleaning fluid and the sensation of itching in the eyes, as indicated by a value of > α 0.05 (p=0.177). The same result was found in the knowledge variable, which showed no relationship between knowledge about contact lens cleaning fluid and symptoms of itchy eyes (p=749).

The incidence of itching sensation in the eyes was more common in those with poor knowledge than respondents with good knowledge about contact lens cleaning fluids (21.7% vs. 17.6%). In the compliance variable, the table above shows that all respondents who were not compliant in using contact lens cleaning fluid experienced an itchy sensation in the eyes. Whereas in the obedient respondents, the incidence of itching in the eyes was only experienced by around 6 percent of respondents. However, the relationship between these two variables cannot be analyzed further because there is no distribution of respondents who do not experience symptoms of itchy eyes in those who are non-compliant (0%). Blurred vision and the factors that influence it are presented in Table 10 below.

**Table 10. Factors Affecting Symptoms of Blurred Vision**

| No | Variable (n=40) | Blurred Vision Yes (n=6) | No (n=34) | Total | p | OR | 95% CI |
|---|---|---|---|---|---|---|---|
| 1 | Gender | | | | | | |
| | Female | 6(17,1%) | 29(82,9%) | 35(100%) | NA | NA | NA |
| | Male | 0(0,0%) | 5(100,0%) | 5(100% | | | |
| 2 | Length of Use of | | | | | | |
| | Contact Lenses | 5(18,5%) | 22(81,5%) | 27(100%) | 0,369 | 2,7 | 0,3-26,1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | > 3 months | 1(7,7%) | 12(92,3%) | 13(100%) | | | |
| | 1-3 months | | | | | | |
| 3 | Knowledge | | | | | | |
| | Insufficient | 5(21,7%) | 18(78,3%) | 23(100%) | 0,165 | 4,4 | 0,5-42,2 |
| | Good | 1(5,9%) | 16(94,1%) | 17(100%) | | | |
| 4 | Obedience | | | | | | |
| | Disobedient | 3(50,0%) | 3(50,0%) | 6(100%) | 0,009 | 10,3 | 1,4-75,7 |
| | Obedient | 3(8,8%) | 31(91,2%) | 34(100%) | * | | |

NA=*Not applicable*=Data cannot be analyzed

Of all the independent variables observed, only the compliance variable had a significant relationship with visual blurring, as indicated by a value > α 0.05 (p=0.009). Based on the odds ratio (OR) value of 10.3, it can be said that respondents who are not compliant with using contact lens cleaning fluid have a ten times greater risk than respondents who comply. Judging from the distribution of the incidence of blurred vision, 50% of respondents who did not comply experienced symptoms of blurred vision. Whereas in obedient respondents, blurred vision only occurred in 8.8%.

All male respondents in this study did not experience any symptoms of blurred vision. While in female respondents, there were as many as 17.1% of respondents who experienced blurred vision. Using contact lens cleaning fluid for> 3 months causes around 18.5% of cases of blurred vision. This figure is higher than the respondents who had used contact lens cleaning fluid in the last 1-3 months (7.7%). However, this difference is not statistically significant, as indicated by a value > α 0.05 (0.369), so it can be said that there is no relationship between duration of use and subjective complications to the user's eyes. The knowledge variable regarding contact lens cleaning fluid did not have a significant relationship with the incidence of blurred vision in respondents, as indicated by a value > α 0.05 (p=0.165). Nevertheless, bivariate data shows that blurred vision occurs more in respondents with poor knowledge than in respondents with good knowledge (21.7% vs. 5.9%).

Based on the bivariate analysis, this section will discuss the results of the research that has been carried out. The statistical analysis of the chi-square test on the relationship between the independent variable and the dependent variable showed that the length of contact lens wear and knowledge were not significantly related to redness of the eyes, the sensation of itching in the eyes, and blurring of vision. At the same time, adherence could not be analyzed for the sensation of itching in the eye due to one cell having an expected value of 0 (0%). The results of the chi-square statistical analysis, which is significantly related, are the variable compliance with redness and blurring of the eyes.

The statistical analysis of the chi-square test showed no significant relationship between the duration of use of contact lens cleaning fluid and eye redness, itchy sensation in the eyes, and blurred vision. An itchy sensation in the eyes is a hypersensitivity reaction caused by non-infectious allergies. When the mast cells produce histamine, then the histamine stimulates the C nerve endings, which are in the superficial part. Nerve C is an unmyelinated nerve that also functions as a tickle receptor. After the C nerve impulse receives the nerve impulse, it is passed to the dorsal fibers and then forwarded to the spinal cord. At the interior commissures of the spinal cord, the simple crosses to the anterolateral column of the opposite side and then ascends to the brainstem or thalamus to be interpreted as the sensation of itching. Respondents did not experience this condition as a result of not having a hypersensitivity reaction even though they were exposed to non-infectious allergen

substances that come in contact with the eyes or if the longer a person is exposed to an allergen, the body will gradually adapt more and more, so that the longer and more often liquids are used. With contact lens cleaner, the risk of hypersensitivity reactions decreases. Likewise, with complaints of redness of the eyes and blurring of vision, the blurring of vision occurs due to an itchy sensation in the user's eyes, which makes the user respond to rubbing his eyes, which can cause redness.

Based on the results of the chi-square statistical test analysis, it can be concluded that there is no relationship between knowledge and eye redness, itchy sensation in the eyes, and blurred vision. Notoadmojo [27; 28] said that information influences one's knowledge and that someone with a lot of information will have extensive knowledge; knowledge is also influenced by educational background. In this study, there was no relationship between knowledge and subjective complaints about users' eyes. This study showed a significant relationship between compliance with subjective complaints, such as itchy sensations in the eyes and blurred vision. It can be explained by the more disobedient in using contact lens cleaning fluid, both in choosing the type of liquid and how to clean it, the higher the risk of experiencing subjective eye complaints. And if someone is not careful in choosing the type of cleaning fluid and is not careful in considering the use of a good and correct contact lens cleaning fluid. It is a risk factor for complaints of itching sensations and blurred vision.

## Conclusion

The conclusions from the results of a study conducted on 40 FK UKI Class 2018 student respondents who used contact lens cleaning fluid were: a) The use of contact lens cleaning fluid in terms of the length of time using contact lens cleaning fluid did not have a significant relationship with subjective complaints against the user's eyes contact lenses (redness of the eye, itchy sensation of the eye, and blurring of vision); b) The use of contact lens cleaning fluid in terms of the knowledge factor does not have a significant relationship with subjective complaints about the eyes of contact lens users (redness of the eye, itchy sensation in the eye, and blurred vision); and c) The use of contact lens cleaning fluid in terms of compliance factors in the use of contact lens cleaning fluid has a significant relationship with subjective complaints about the eyes of contact lens users. Therefore, it is expected that contact lens users will be more careful in choosing the type of contact lens cleaning fluid, be more obedient in caring for contact lenses and still pay attention to the instructions for use so that complaints that can be caused can be prevented as much as possible.

### Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

### Consent

As per international standard or university standard, respondents’ written consent has been collected and preserved by the author(s).

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