TITLE: Contact lens complications of patients visiting a University Eye Clinic

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We wish would offer our vote of thanks to Ms Pennola Mitchell- Edmund for allowing us to access patient files to facilitate our data collection.

We also wish to express our sincere gratitude to the various patients who volunteered their time and energy to become a part of this research. The willingness and immense patience shown by each patient is duly noted and appreciated.

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ABSTRACT

Objective: To determine the percentage of patients that experience contact lens complications at the University of the West Indies (UWI) Optometry Clinic as well as to establish and assess common physiological complications of the cornea and conjunctiva that occur in those that wear either soft, rigid and scleral contact lenses, of that percentage.

Methods: Contact lens wearers of the clinic were identified, contacted via telephone and asked if they would be interested in participating in the study. Once they agreed, participants visited the clinic wearing their contact lenses two hours prior as instructed. Participants were required to give verbal and written consent before completing a questionnaire. The anterior part of the eye was observed using a slit lamp and times 10, 16 and 25 magnifications were used to view the conjunctiva and cornea appropriately. The data collected was analysed using SPSS.

Results: The study included 19 participants, mainly females aged 18-25 who were mostly wearing soft, daily disposable contact lenses. There were three scleral patients and no RGP patients participating in the research. The most common symptom reported was dry eyes, and the most common complication was hyperaemia. All participants reported washing their hands before inserting lenses but a few participants were still sleeping and showering in their lenses, overwearing them, and not cleaning or disposing of their lens cases within the recommended time.

Conclusion: Patients' age and compliance were two major factors that contributed to patients having or not having complications. Patient knowledge of contact lens complications and proper care practices did not influence how patients cared for their contact lenses.

INTRODUCTION:

A complication can be medically defined as an unanticipated problem that arises following a procedure, treatment or illness[1]. A contact lens complication is an adverse event caused by contact lens wear where the wearer may or may not experience symptoms that move them to seek care or pharmacological/ clinical intervention. It has been reported that the prevalence of contact lens complications globally, can be as high as thirty-nine percent [2]. These complications can occur in all lens modalities and can be classified into mild or severe [3].

Contact lens complications can further be categorized into infectious and non-infectious. Infectious complications are associated with pathogens and microbes invading ocular tissue while non-infectious refer to functional complications; like hypoxia and abrasions for example. Scleral contact lenses are large contact lenses which rest on the sclera, creating a tear-filled vault over the cornea. Because these are larger, some complications may arise when trying to fit one's patient such as infection, hypoxia, blanching/impingement and inflammation-related events [4].

Conjunctival blanching is caused by a tight lens or one that is too steep inducing local pressure on the conjunctiva which can leave NaFl staining once removed. Air bubbles may also get trapped behind the lens when fitting which may cause discomfort or vision problems, if left, and may lead to the formation of dellen or a corneal dry spot[5]. A rigid gas permeable or RGP lens is a hard contact lens made up of oxygen-permeable polymers while a soft lens is more flexible but does not allow oxygen to pass through as freely[6]. Following the use of soft or gas-permeable lenses, patients may encounter various complications. In instances of RGP lenses, where the lens is crafted smaller than the cornea, corneal staining may manifest as a common issue. Contact Lens Induced Papillary Conjunctivitis (CLPC) or Contact Lens Acute Red Eye (CLARE) are additional complications that might arise from the use of said lenses.

CLPC is characterized by hypersensitivity-related inflammation of the tarsal palpebral conjunctiva. It is easily seen with NaFl. CLARE on the other hand occurs as a result of an inflammatory reaction of the cornea and conjunctiva in response to pathogens Alternatively, the use of soft contact lenses might result in corneal oedema due to insufficient oxygen transmission to the cornea. [7].

RELEVANCE TO PUBLIC HEALTH

This study is important to the participants as it will heighten awareness of the complications associated with the type of contact lenses they are fitted for and the propagation for further knowledge on the preventative measures that can be taken to reduce the risk of each complication.

It is useful to public health because, like any other health research, the public is educated on each type of contact lens and the various risks that can lead to ocular complications that result from non-compliance as a patient. This study involves clinical trials which are useful when making comparisons to past studies done globally as there can be varying complications for different locations across the globe

BACKGROUND

Scleral lenses are used to treat a variety of conditions including corneal irregularities like keratoconus, corneal ectasia, refractive errors as well as ocular surface disease [8]. In the early stages of keratoconus soft contact lenses are used while rigid gas-permeable lenses and scleral lenses are used in more advanced cases. RGP and soft contact lenses are also used to correct refractive errors like myopia, hyperopia and astigmatism and as an alternative to spectacles. Despite the advantages of these lenses, complications occur due to various reasons such as the lenses staying on the ocular surface past their recommended time and improper handling or after-care.

In a study conducted in Ghana, it was found that the prevalence of contact lens complications was 29.06% [9]. The most frequently occurring was giant papillary conjunctivitis, followed by corneal infiltrates and keratitis, corneal abrasion, dry eye and lastly, corneal oedema. Similarly, it was found that contact lens-induced papillary conjunctivitis was the most common complication in a study conducted at BP Koirala Lions Centre for Ophthalmic Studies (BPKLCOS), Nepal. This was 36.9% of all soft contact lens wearers that experienced complications in this study. Other complications included superior punctuate keratitis (SPK), conjunctivitis, meibomian gland dysfunction (MGD) and corneal vascularization [10].

In the early stages of scleral lens development, some of the most common complications that wearers experience are neovascularization and corneal oedema, while modern scleral lenses are designed to have better oxygen transmissibility which reduces corneal hypoxia and oedema. Some complications associated with RGP wearers are ocular redness due to 3 & 9 o'clock staining, Contact Lens Induced Papillary Conjunctivitis, corneal dellen and contact lens ulceration[11].

In the study conducted by Kobia-Acquah et al, it was found that the main causes of these CL complications were improper lens cleaning/poor hygiene, non-compliance or wearing the lenses over the recommended time and poor lens fit [9]. Therefore, it can be concluded that adherence to the appropriate lens wear regimen, good personal hygiene and patient compliance coupled with frequent follow-ups may prevent or reduce the occurrence of these contact lens complications.

The majority of research material found on the prevalence of complications surrounding various contact lenses is based globally and there was no published article or research that was dedicated to investigating these complications in the Caribbean or Trinidad and Tobago for that matter. Hence, there is a need to explore this topic by conducting this research and providing findings which can reflect on the population and perhaps the region. It can also further influence future research projects.

LITERATURE REVIEW:

A study by Aldebasi et al. [3] was published in 2016 which revealed the prevalence of contact lens-related complications among patients at a hospital during six months. The study sample was one hundred and two patients and it was stated that ninety-four of them were using soft contact lenses, while eight patients were using RGP lenses. Some of the complications that were seen in the study were papillary conjunctivitis, SPK and corneal vascularization but these were seen to be occurring mostly in soft contact lens patients rather than those that wore RGP lenses. Another study[12] done in 2015, reported that the short-term adaptation to RGP lenses is quite difficult as the initial comfort of the lenses is quite low in comparison to soft lenses. Hence, this limits the use of RGP lenses worldwide.

In a study conducted at a tertiary eye care centre in India [11] in 2011, regarding the prevalence of contact lens-related complications, it was found that there were more contact lens complications reported for those patients that wore soft contact lenses than in those that wore RGP lenses. It was discovered that 20.58% of patients in the study population encountered complications, with 59.47% of those being females. The results also indicated that among the student population, females were significantly more prone to experiencing complications than males.

In a study conducted in 2014 across five cities in the US, 542 soft contact lens wearers aged between 12 to 33 years were examined to evaluate the relationship between age and corneal infectious and inflammatory events[13]. The findings indicated that younger wearers between the ages of 18-25 years were more likely to engage in poor practices such as sleeping and showering with their lenses on. Additionally, younger wearers were observed to have lower hand-washing rates compared to older wearers.

Therefore, it was concluded that age can influence lens-wearing behaviours, and younger contact lens wearers are at a higher risk of developing corneal infectious and inflammatory events due to their poor practices.

A study[3] conducted in Saudi Arabia discussed the importance of patient compliance as it relates to developing some of the previously listed complications. The results obtained from the study showed that more than fifty per cent of contact lens wearers were non-compliant with instructions regarding lens care and hygiene practices, while more than fifty per cent were guilty of purchasing their lenses without visiting the optometrist for professional advice.

In 2011[14], a study was conducted at an Optometry clinic at the University of Texas Southwestern Medical Centre to assess the relationship between perceived and definite compliance with awareness of risk and behaviour. The results showed that 86% of 162 contact lens users believed they were compliant while 14% admitted to being non-compliant. Upon examination, it was established that 32% showed good compliance, 44% displayed average compliance and 245 were non-compliant. Through investigations, 8% of patients reported awareness of risk factors and good hygiene practices, such as prompt replacement of contact lens cases. This awareness is after a history of previous contact lens complications. It was concluded that a large proportion of patients continue to be non-compliant despite knowing the risks.

Another study[13] conducted by Bui et al. involving non-compliance with contact lens wear and care practices was done in 2010 at Texas, Dallas Forth Metroplex and Texas Southwestern Medical Center. In the medical centre, 91% of participants identified complications by their names while 58% of participants in the general community were able to name them. Most patients successfully listed the risk factors that lead to contact lens complications and 85% of them believed that they were compliant but via a standard scoring level it was determined that of 433 patients, 2% exhibited good compliance and 0.4% were fully compliant with their contact lens wear and care practices.

According to Walker et al., in a study[15] involving the complications of scleral lenses, the complications associated with these lenses are unique and can be classified as anomalies. Some of these complications include epithelia bogging, midday fogging and even limbal bearing. While scleral lenses do result in corneal hypoxia and ultimately oedema, it has been shown that the advances made to scleral contact lenses have helped to reduce the amount of corneal oedema in the short-term use of these lenses[16]. As a result, it is expected that there will be fewer changes in the corneal physiology with scleral lenses as compared to soft and RGP.

A study carried out in 2012 [17] by Cheung et al. focused on the microvascular abnormalities in the bulbar conjunctiva of contact lens users. The purpose of the study was to investigate whether the damage was caused to the conjunctival microcirculation by direct occlusion when the lens interacted with or damaged the vessels or whether the damage was caused to the bulbar conjunctiva directly when a lens rested unevenly on the bulbar conjunctiva. It was suggested that if a lens isn't fitted properly it can lead to corneal abrasions, damage to the underlying vessels, damage to the bulbar conjunctiva and ultimately discomfort to the patient.

Apart from improper fitting, it was suggested that if the edge of the lens was improperly fitted there would be long-term damage caused to the vessels and the bulbar conjunctiva because of abrasion. One complication that may arise is conjunctivitis[18], which is when there is inflammation of the bulbar conjunctiva which is the clear tissue covering the white of the eye. It can occur when the eye is damaged and becomes infected.

The study by Cheung et al. [17] also included contact lens users and non-users and from the results obtained it was shown that amongst contact lens users there was a wide vessel diameter, tortuosity, vessel sludging and vaso-occlusion when the lens was removed and in all cases of these complications, it was noted that the edge of the contact lens was resting on the underlying vessels. However, the study used hydrogel soft lenses but since then silicone hydrogel lenses have been placed on the market and it has been shown to decrease the effects caused to the cornea as well as to the conjunctiva which was inferred in another study[19] by Stapleton.

A similar study [20] conducted by Donshik, investigated the incidence of giant papillary conjunctivitis and the risk factors that predisposed frequent replacement contact lens wearers to GPC in 47 subjects. From these silicone hydrogel lens wearers, the data showed that 10 patients developed GPC. Of the patients replacing their lenses every four weeks or longer, 36% developed GPC but of those that replaced their lenses more frequently; less than four weeks, the incidence of GPC was 4.5%. It was concluded that the frequency at which patients replaced their lenses contributed greatly to developing giant papillary conjunctivitis.

In 2017[21], a study was conducted in Rafha Hospital, Saudi Arabia in which 143 subjects were investigated for the risk of developing contact lens complications. It was shown that of the reusable wearers, three female subjects developed GPC, two of which were monthly wearers and one being an annual wearer.

According to a journal[22] focused on the review of contact lens-related complications, ocular discomfort is considered a complication rather than a symptom associated with a complication. As with any other complication, there were risk factors that can lead to experiencing ocular discomforts, such as patient compliance and ocular surface conditions. This complication is mostly associated with RGPs and soft contact lenses and has an incidence rate of 24 –94%.

In 2021, a study [23] was conducted among the population of South Delhi to examine the relationship between knowledge, attitude, and practices towards contact lens wear. The results indicated that in general, contact lens wearers had poor knowledge of appropriate parameters for using contact lenses and the associated complications. However, those who exhibited satisfactory hand hygiene and lens cleaning practices were found to have good lens case hygiene, as well as appropriate storage and lens removal practices.

The sample size for the study was 104 participants, including 33 males and 71 females, and the data was obtained through a questionnaire. The results revealed that a small percentage of patients had been wearing their lenses for an extended period, with most wearing them for less than five years. Additionally, a higher proportion of patients used daily wear lenses compared to extended or continuous wear lenses, with some users being uncertain of the lens modality they were using.

Of the participants, only 55.7% used the correct cleaning procedures, while the remaining percentage were either not aware of or were not using the recommended cleaning procedure. The study also found that patients who cleaned their contact lens cases more frequently had a significantly lower risk of developing infections such as acanthamoeba. However, some patients were not cleaning their lenses as instructed, which increased their risk of infections due to using water instead of the recommended cleaning solution.

STATEMENT OF THE PROBLEM

Physiological complications associated with scleral, RGP and soft contact lenses are a fairly common occurrence. The frequency and severity of these occurring in the Couva Hospital and Multi-Training Facility (Eye Clinic) must be observed and investigated to determine the percentage of patients experiencing these contact lens complications in the study population. It should be done to determine if physiological complications do occur amongst contact lens wearers in this region and if they are present, compare the types as well as the causes of the complications to those contact lens patients in different geographical locations.

AIM OF STUDY

The purpose of this study is to determine the percentage of patients that experience contact lens complications at the Couva Hospital and Multi-training facility, and of that percentage, establish and assess at least five common physiological complications of the cornea and conjunctiva that occur in those that wear either soft, rigid and scleral contact lenses. Contact lens complications can often lead to ocular discomfort which can contribute to the dropout rate of contact lenses [9]. Hence, the research also aims to investigate whether patients report significant discomfort when corneal and conjunctival complications are experienced.

OBJECTIVES:

(i) To identify the conjunctival complications occurring in sixty (68) contact lens patients of a University Eye Clinic.

(ii) To compare and contrast the severity and frequency of complications in scleral, gas-permeable and soft contact lens wearers.

(iii) To determine if there is an association between ocular discomfort and conjunctival contact lens complications.

(iv) To determine the prevalence of contact lens complications amongst patients of different genders and ages.

(v) To determine if contact lens complications experienced by contact lens wearers are associated with non-compliance of the wearers.

HYPOTHESIS:

From the literature review, it was found that complications in soft contact lens wearers occur more than complications in RGP wearers and complications in soft contact lens wearers also occur more than scleral lens complications. That is, patients who wear soft contact lenses experience more complications compared to patients that wear RGP lenses and compared to scleral contact lens wearers[11]. It was seen that this was because of non-compliance among patients.

ETHICAL APPROVAL/CONSIDERATIONS

Before obtaining data for the study, this research proposal was submitted to the scientific research ethics committee for approval. A consent form consisting of a request for patient permission and assurance of patient data confidentiality was included to ensure the privacy of the questionnaire responses. Furthermore, the research received approval from the ethics committee on January 27th , 2023, with our group being assigned the reference number CREC-SA.1856.

METHODOLOGY

This study is a prospective cohort study which involved recruiting patients from those who visited a university eye clinic. It was conducted at the Couva Hospital and Multi-training facility which had a study population of around 10,000 patients. From this population, only patients currently wearing contact lenses were included. The sample size was calculated as sixty-eight patients using the Raosoft software, using a 90% confidence level, 10 % margin of error, and 50% distribution rate with a population size of 10,000 but only nineteen patients participated in the study. The sampling technique used was convenience sampling as patients were included in the study based on their availability to participate.

Inclusion Criteria

- Patients that were eighteen years and over.
- Patients that were current contact lens users.
- Patients with refractive errors.
- Patients wearing their lenses for three or more hours.

Exclusion Criteria

- Patients with previous corneal surgeries.
- Paediatric patients
- Patients with ocular complications not relating to contact lenses
- Patients that didn't wear contact lenses
- Patients with limited mobility of their arms and hence could not have worn contact lenses and as such they didn't fit the criteria.
- Diminished mental capacity because they don't wear contact lenses and did not fit the contact lenses criteria.

Data Collection

The data collection took place from February 2023 to April 2023.

Tool

The assessment of the common complications associated with each type of contact lens was conducted by the co-investigators using two methods of data collection. These methods included direct observation via a contact lens assessment and an interview in the form of a questionnaire.

Consent - This study involved asking patients who visited the clinic for an aftercare contact lens appointment if they were interested in participating. Once they provided written and oral consent, the researchers collected data on the complications associated with the specific type of lens they were wearing.

Procedure

Firstly, patients were escorted to a cubicle as this space facilitated both the questionnaire and contact lens assessment. Patients were asked if their contact lenses have been in their eyes for at least 3-4 hours to ensure that they have adjusted to the lenses and that any reactions will be accurately seen. The questionnaire was done before the contact lens assessment, and it was completed by the co-investigators conducting the exam to ensure that accurate answers were obtained. The patient was seated and asked a series of questions for which the responses were provided and thus recorded on the form. Upon completion of the questionnaire, the slit lamp examination began.

Before starting the examination, the slit lamp was sanitized and adjusted to ensure that the patient was comfortable and aligned. The slit lamp was then set up to standard as per the Atlas of Primary Eyecare procedures[24]. The first part of the exam involved observation of the cornea and conjunctiva with the contact lenses in the eyes. This process entailed scanning for any hyperaemia of the bulbar conjunctiva(redness), impingement of vessels, corneal oedema (swelling), corneal ulcers, blanching (white colour) and compression of the conjunctival vessels in scleral lenses. For soft and rigid lenses, the conjunctiva was also observed for hyperaemia, blanching, corneal oedema and corneal ulcers. In some cases, there were lens deposits seen on the contact lenses which can lead to complications such as microbial keratitis, infiltrates and superficial keratitis.

The second part of the exam involved the assessment of the cornea and conjunctiva with the lenses removed from the eyes. The lens was removed from the eyes by the patient using the respective techniques and the co-investigator observed this process as this could have been a complication in itself. This assessment was done using fluorescein on the ocular surface and the use of a cobalt blue filter on the slit lamp. Fluorescein was inserted by wetting a fluorescein strip with preserved saline solution and applying a gentle dab onto the bulbar conjunctiva of the patient's eye when the upper eyelid was held open, as the patient looked down as per Rachael Peterson et al [25]. The upper eyelid was everted using a cotton swab and the superior palpebral conjunctiva was examined for papillary conjunctivitis, granuloma and lid wiper epitheliopathy. Likewise, the inferior palpebral conjunctiva was examined for the exact complications as the superior conjunctiva, but the lids were not everted but rather pulled down. The bulbar conjunctiva was then scanned to observe if there was any staining present at the superior bulbar conjunctiva as this could have indicated limbal keratoconjunctivitis[26].

Other regions such as the nasal, temporal and inferior sections of the bulbar conjunctiva were also scanned for any hyperaemia. Finally, the cornea was scanned for superior epithelial arcuate lesions, soft lens-associated corneal hypoxia, corneal ulcers and corneal erosions.

Upon completion of the assessment, the data was recorded using a record sheet and if patients experienced any complications, they were informed of such and managed accordingly.

Data Analysis

Data was collected about complications such as oedema, conjunctivitis and corneal staining. This data was then inputted into Spss version 28.0.1.0 to produce analytical data such as chi-squares and graphs representing the percentage of contact lens complications associated with wearing different types of contact lenses amongst patients at the university eye clinic as well as the percentage of the study population experiencing each type of complication observed.

Data protection

Patient confidentiality was maintained during this study by ensuring that the patient's demographic information was only shared between the co-investigators and the principal investigator. The names of our patients were not included in the study and as such trends were only made based on age, gender, lens type, lens material and modality.

RESULTS:

After conducting the questionnaires, the slit lamp examination was performed for each patient in which the conjunctiva and cornea were assessed for complications using white light and blue light for viewing NaFl staining. The figures below illustrate the complications seen amongst a few wearers that participated in the study.

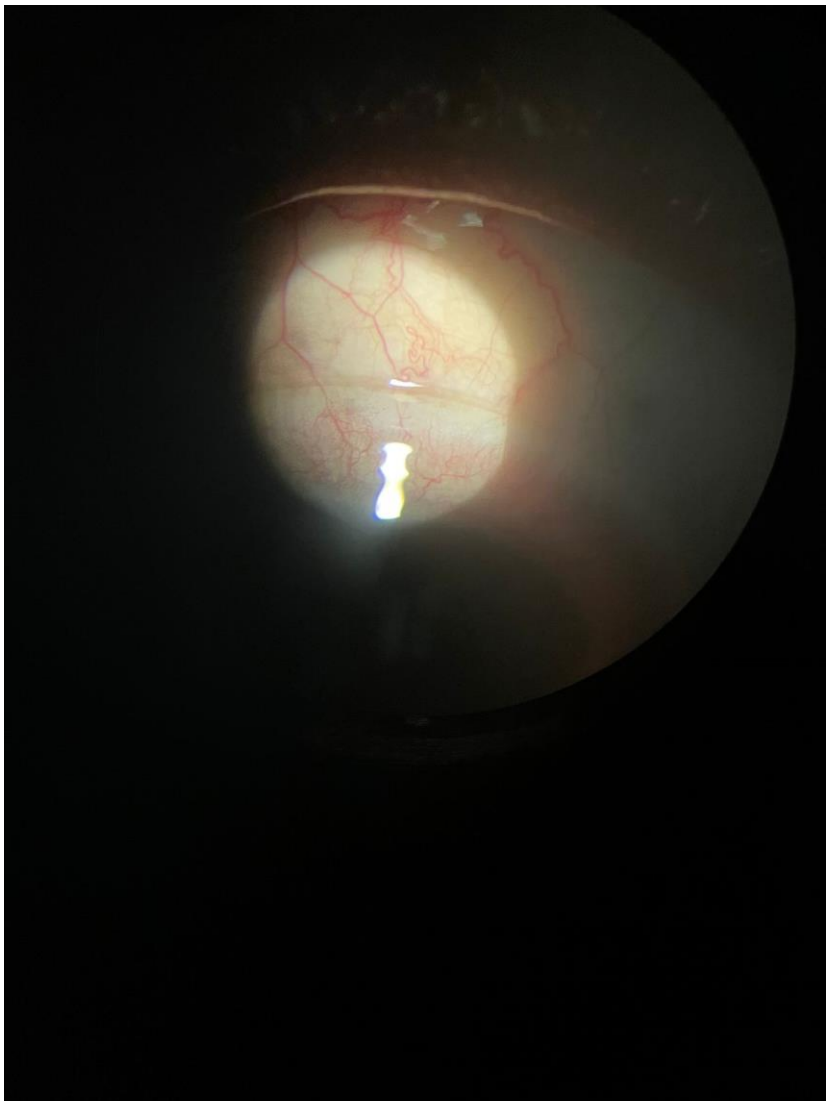

Figure 1 showing blanching and corneal neovascularization in a scleral wearer (right eye)

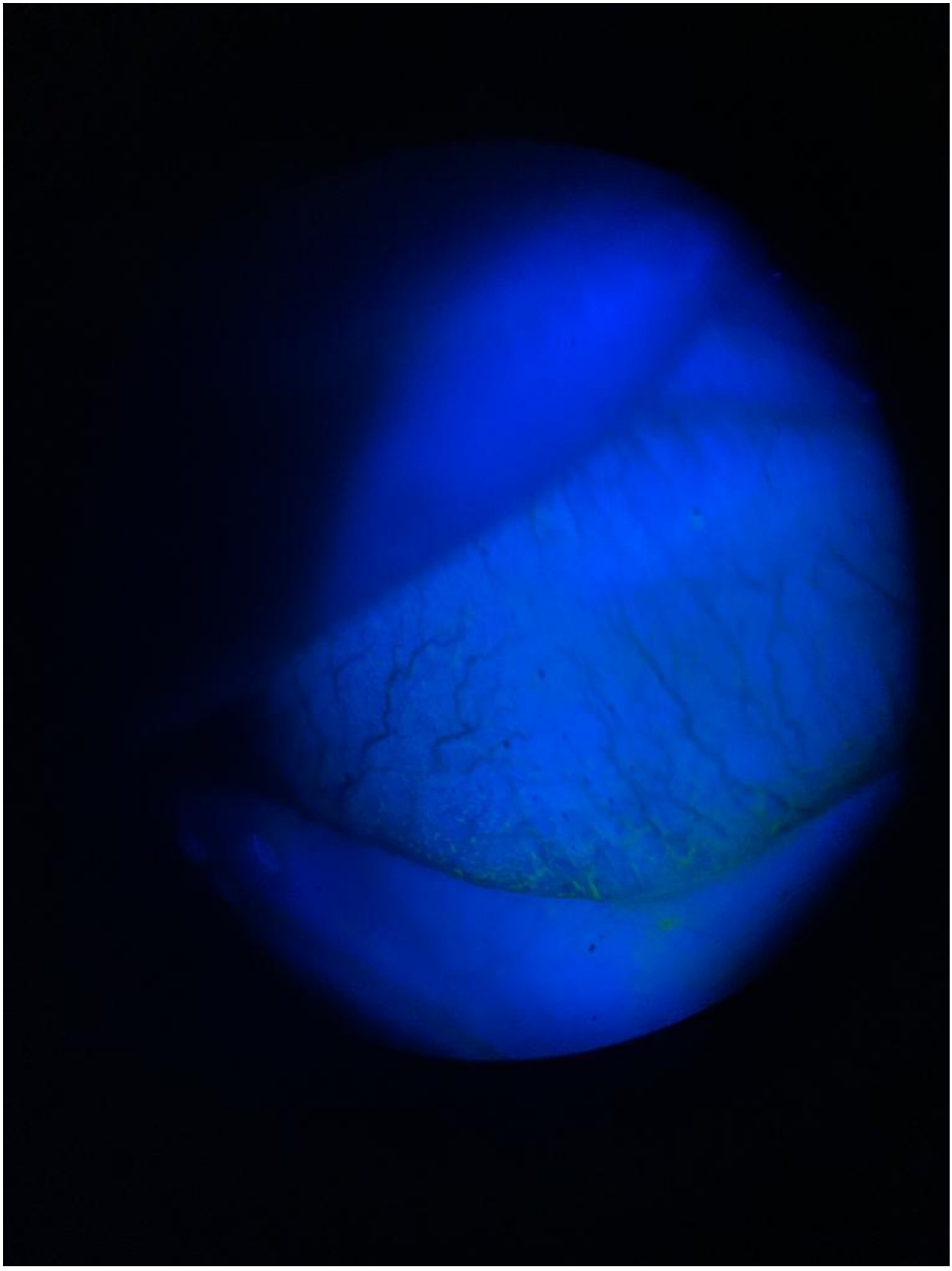

Figure 2 showing NaFl staining of the palpebral conjunctiva of a soft lens wearer (right eye)

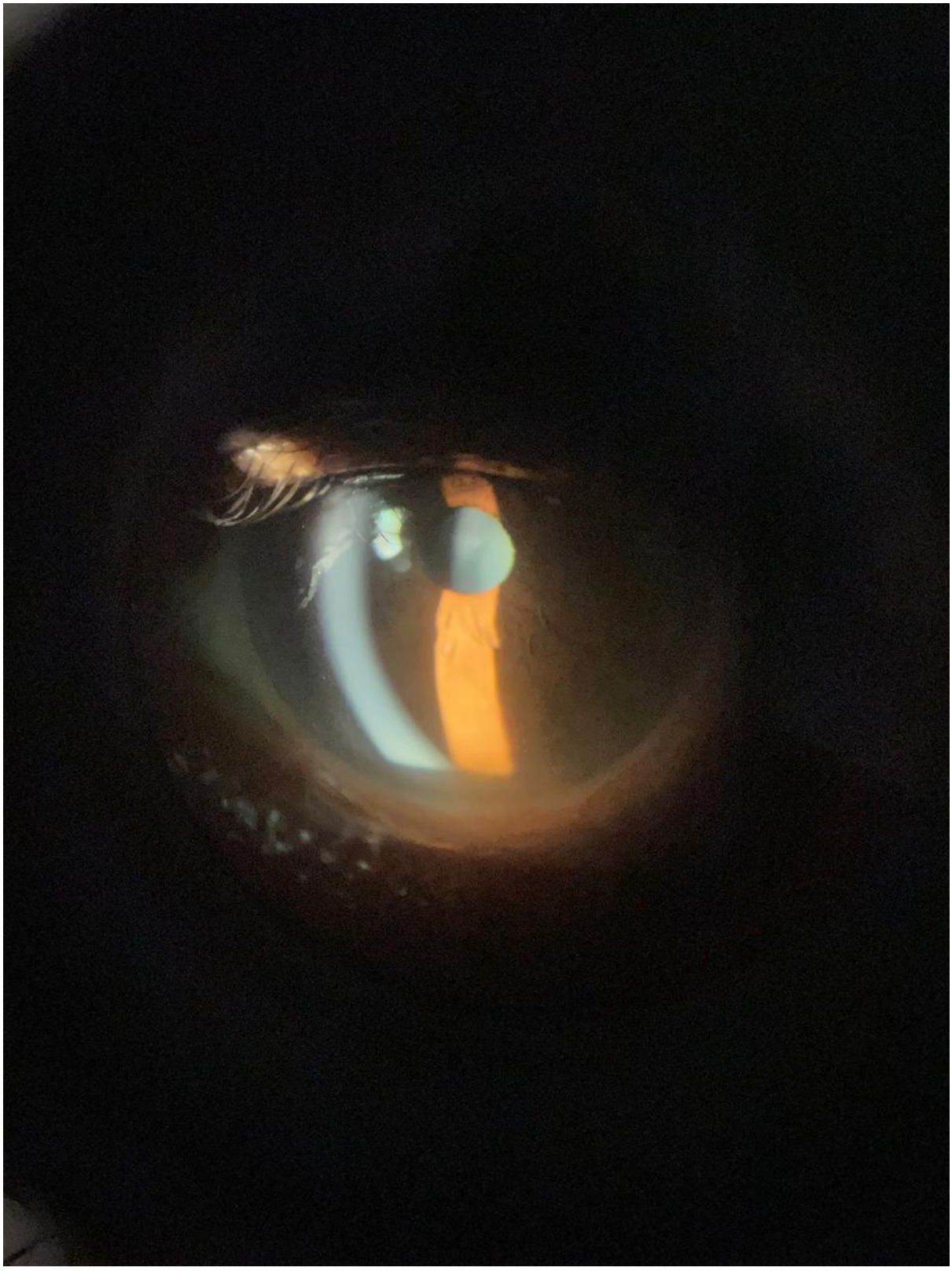

Figure 3 showing lens deposits of a scleral lens wearer (left eye)

Demographic		Frequency n(%)
Age	18-25	11(57.9)
	26-35	3(15.8)
	36-45	4(21.1)
	46-65	1(5.3)
	Total	19(100.0)
Gender	Male	3(15.8)
	Female	16(84.2)
	Total	19(100.0)

Table 1 showing patient demographics

Category		Frequency n(%)
Lens type	soft	16(84.2)
	scleral	3(15.8)
	RGP	0(0.0)
	Total	19(100.0)
Lens Modality	daily disposable	14(73.7)
	monthly disposable	2(10.5)
	conventional wear	3(15.8)
	Total	19(100.0)
Contact Lens Wearer	1-3mos	3(15.8)
	4-6mos	1(5.3)
	1-5yrs	11(57.9)
	6-10yrs	2(10.5)
	11-20yrs	2(10.5)
	Total	19(100.0)
Average daily wear hours	5-8hrs	15(78.9)
	9-10hrs	1(5.3)
	11-12	3(15.8)
	Total	19(100.0)
Maximum daily wear hours in last 6 montha	5-8hrs	15(78.9)
	9-10hrs	1(5.3)
	11-12	3(15.8)
	Total	19(100.0)
Average days per week lenses are worn	1 day	2(10.5)
	2-3days	10(52.6)
	4-5days	2(10.5)
	6-7days	5(26.3)
	Total	19(100.0)

Table 2 showing the frequency distribution for the type of lenses worn as well as the wearing schedule of each participant

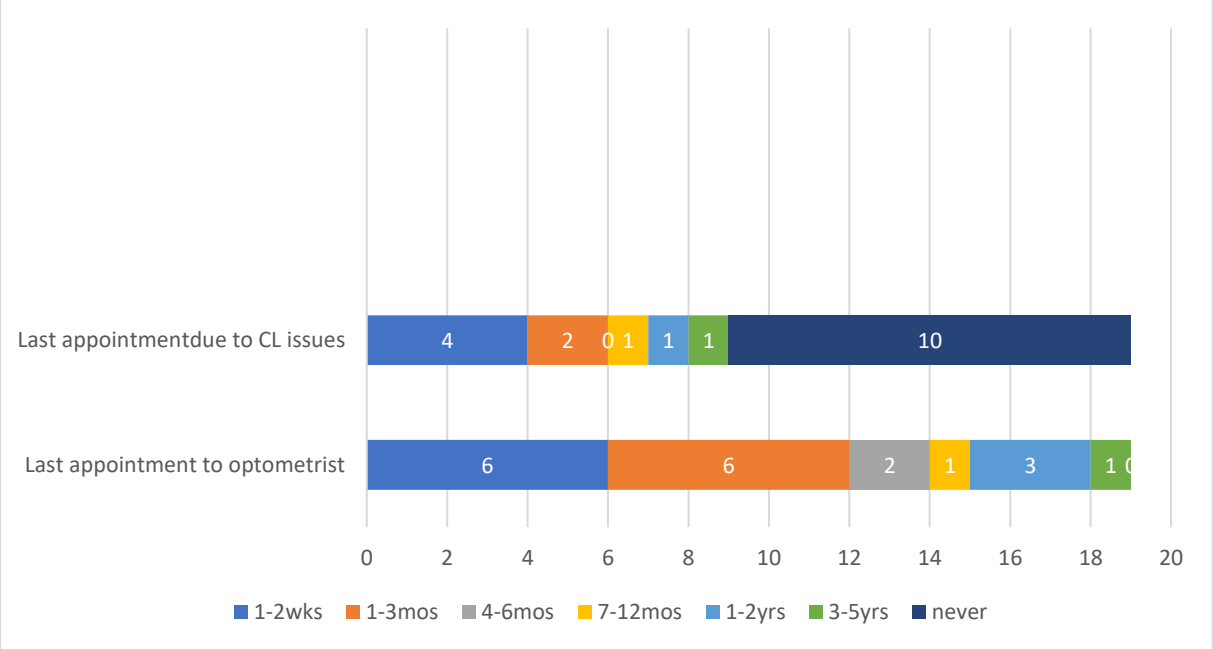

Figure 4 showing the frequency of last eye and CL appointments for the number of participants

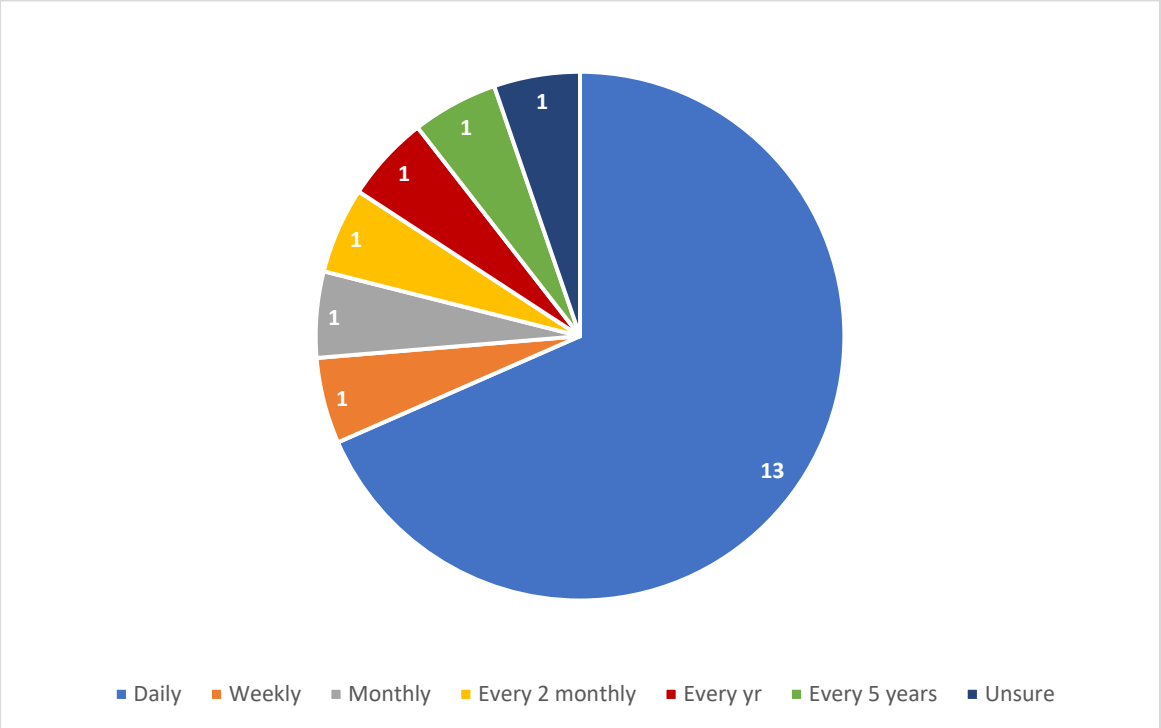

Figure 5 showing the lens replacement schedules of the participants

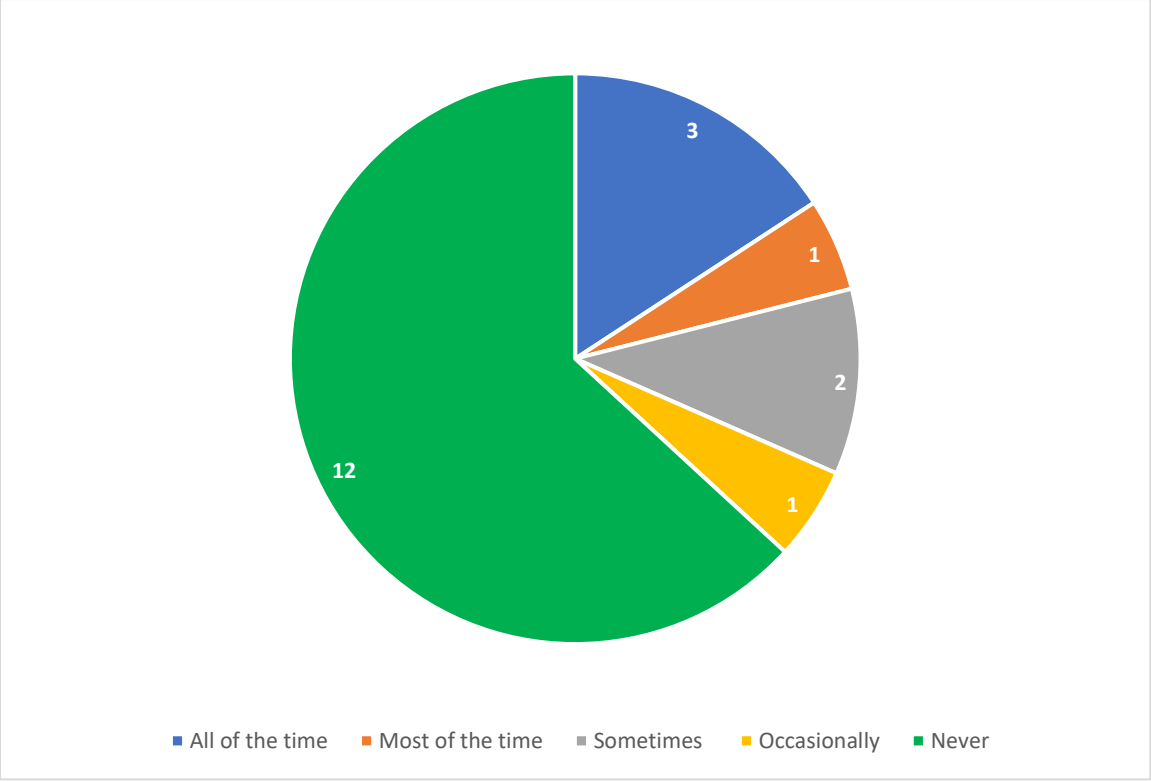

Figure 6 showing the Insertion/ Removal Struggle times of participants

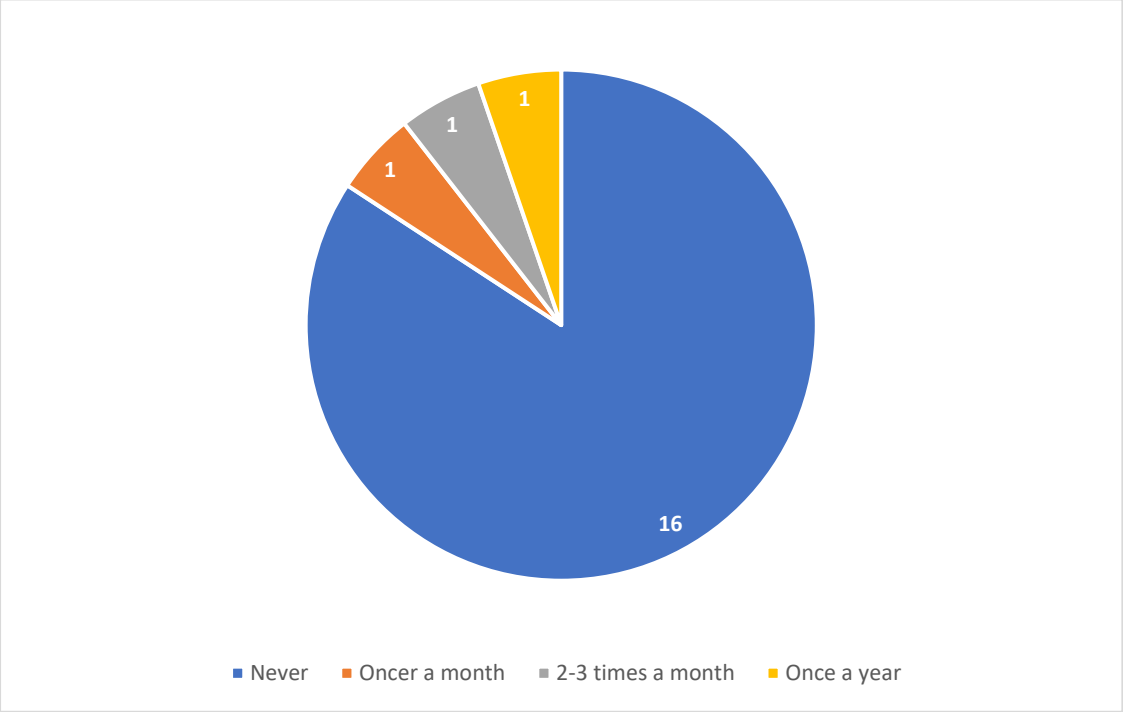

Figure 7 showing how often participants sleep with contact lenses

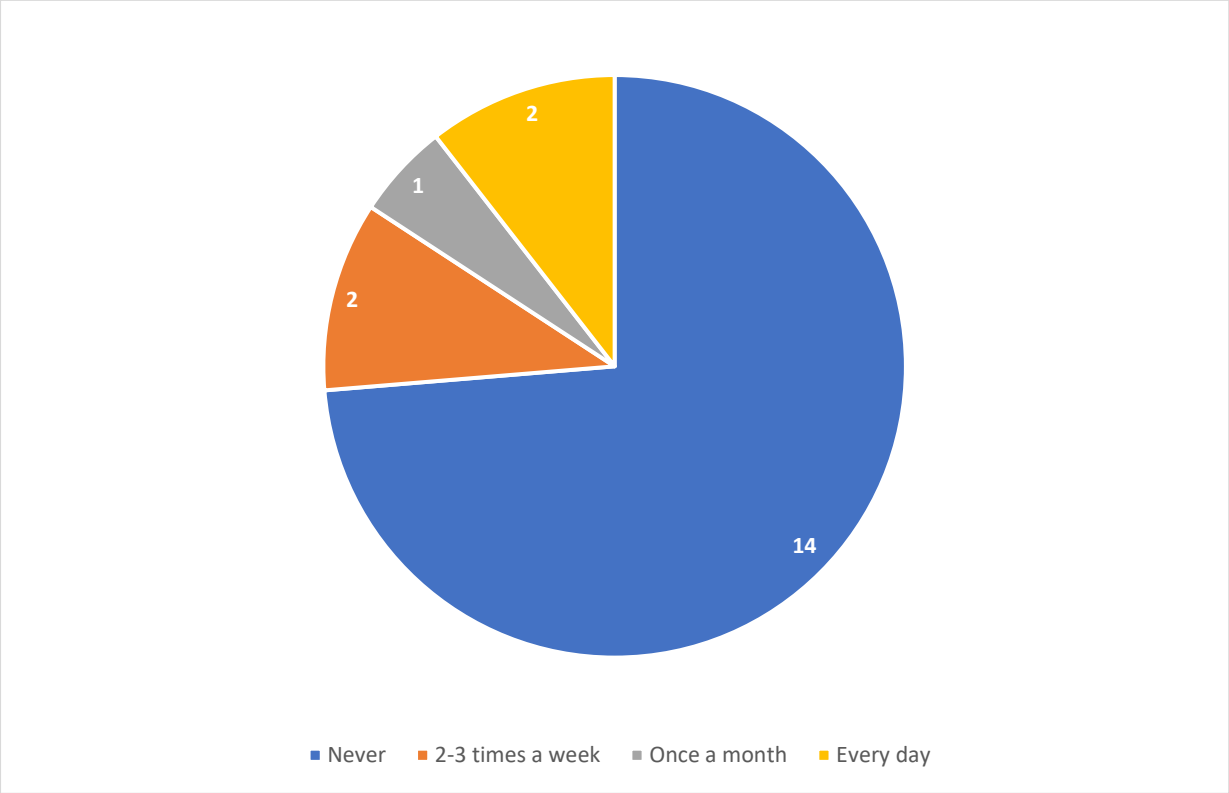

Figure 8 showing how often participants shower with contact lenses

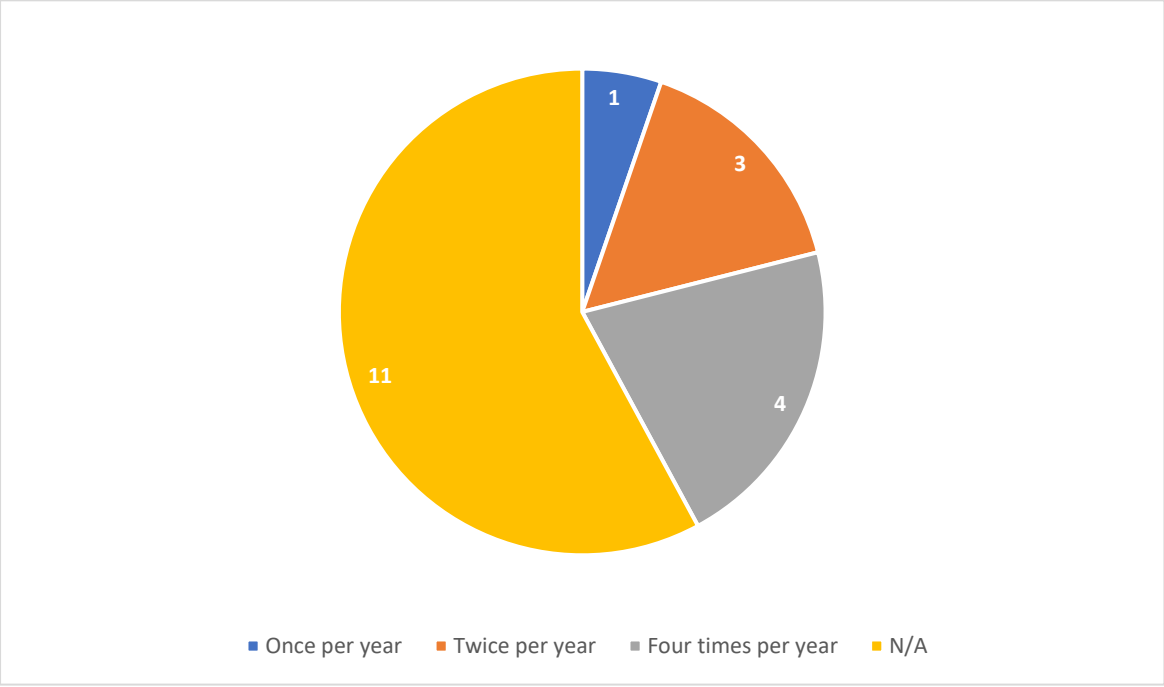

Figure 9 showing frequency of contact lens case replacement among participants

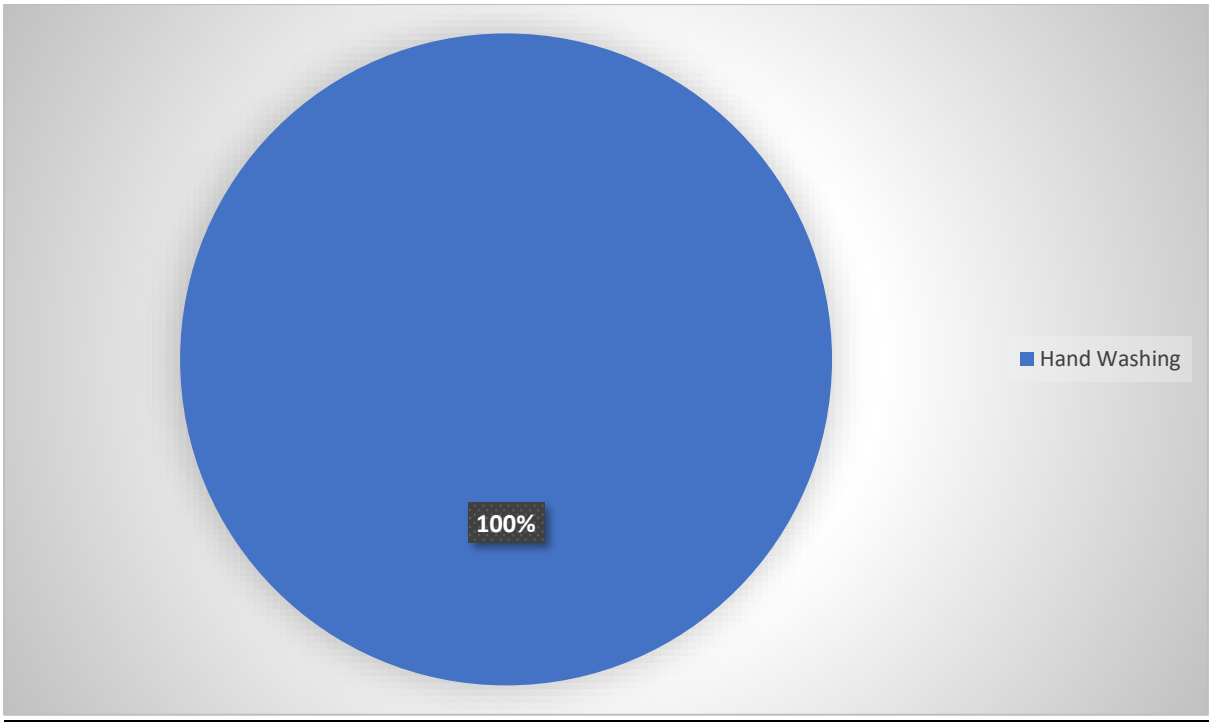

Figure 10 showing frequency of hand washing before CL insertion

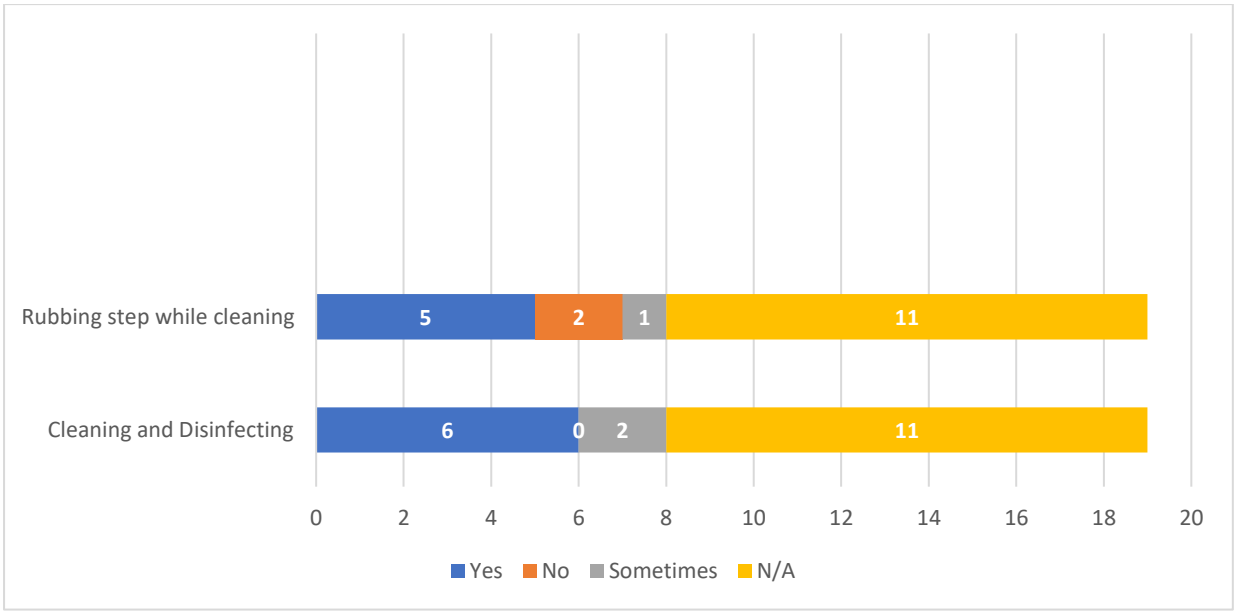

Figure 11 showing frequency of rubbing step and cleaning/disinfecting for participants

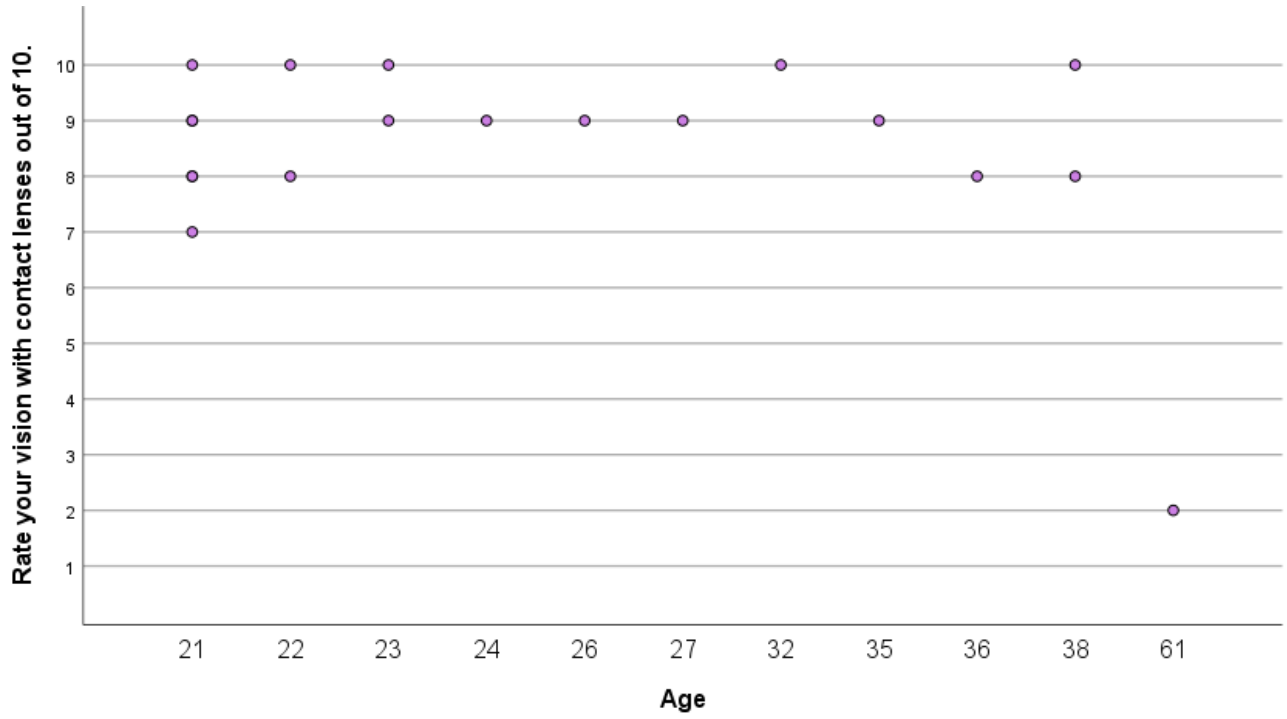

Figure 12 showing a Scatter Plot of Age vs Contact Lens Vision Rating

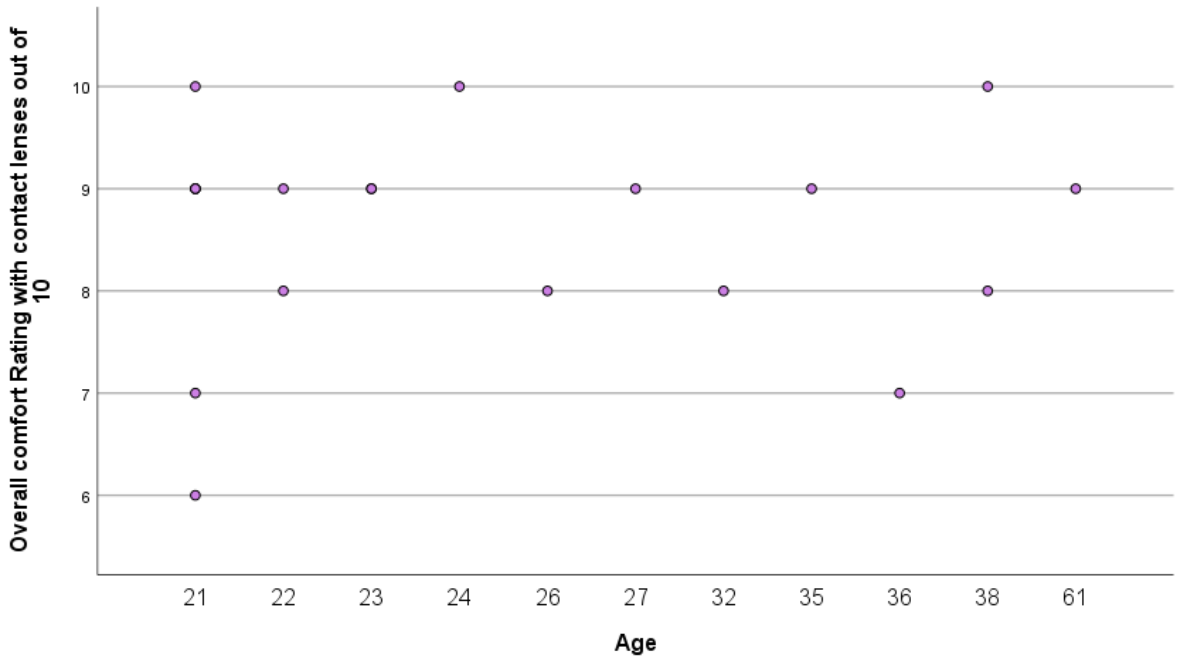

Figure 13 showing a Scatter Plot of Age vs Contact Lens Overall Comfort Rating

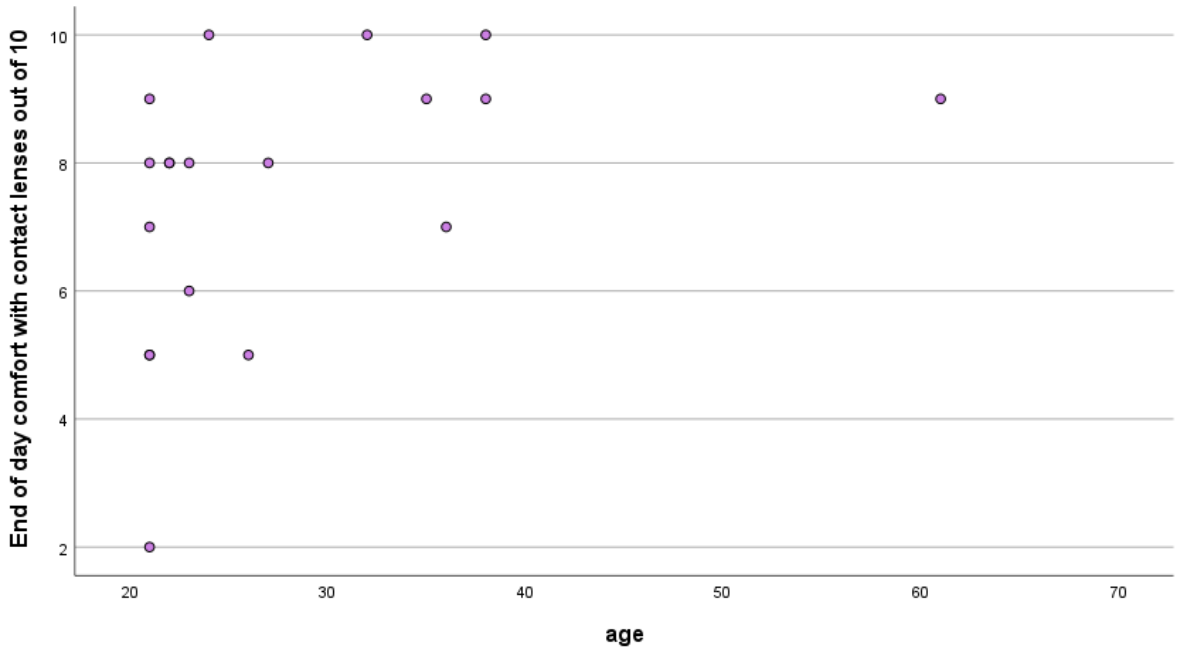

Figure 14 showing a Scatter Plot of Age vs Contact Lens End of Day Comfort Rating

Symptoms		Frequency
Redness	yes	5(26.3)
	no	14(73.7)
	Total	19(100.0)
Pain	yes	2(10.5)
	no	17(89.5)
	Total	19(100.0)
Blurry vision	yes	5(26.3)
	no	14(73.7)
	Total	19(100.0)
Dryness	yes	10(52.6)
	no	9(47.4)
	Total	19(100.0)
Burning	yes	1(5.3)
	no	18(94.7)
	Total	19(100.0)
Headaches	yes	1(5.3)
	no	18(94.7)
	Total	19(100.0)
Foreign Body Sensation	yes	1(5.3)
	no	18(94.7)
	Total	19(100.0)
Discharge	no	19(100.0)

Table 3 showing the symptoms experienced by each participant while wearing contact lenses

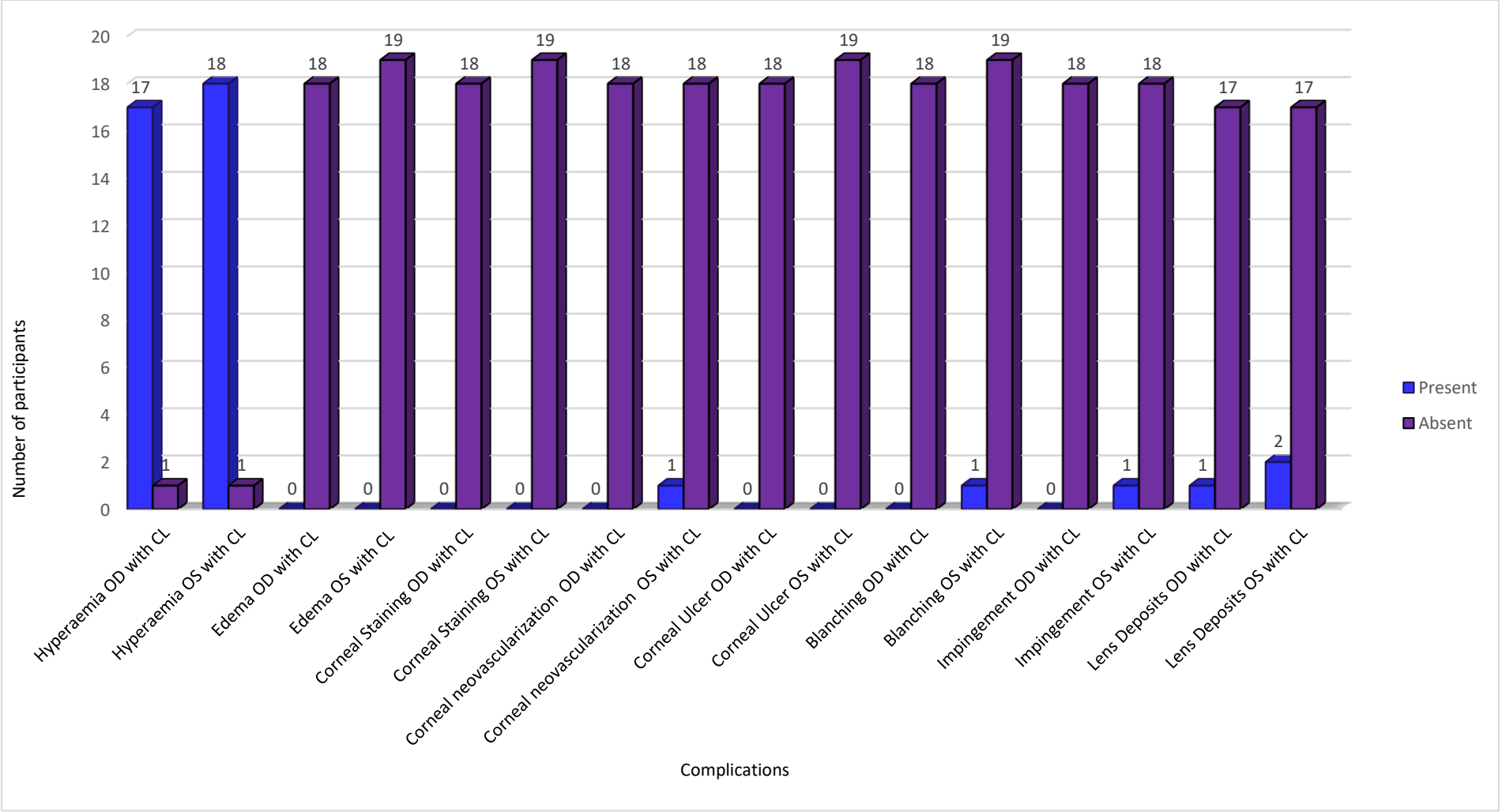

Figure 15 showing the number of participants experiencing complications with contact lenses inserted

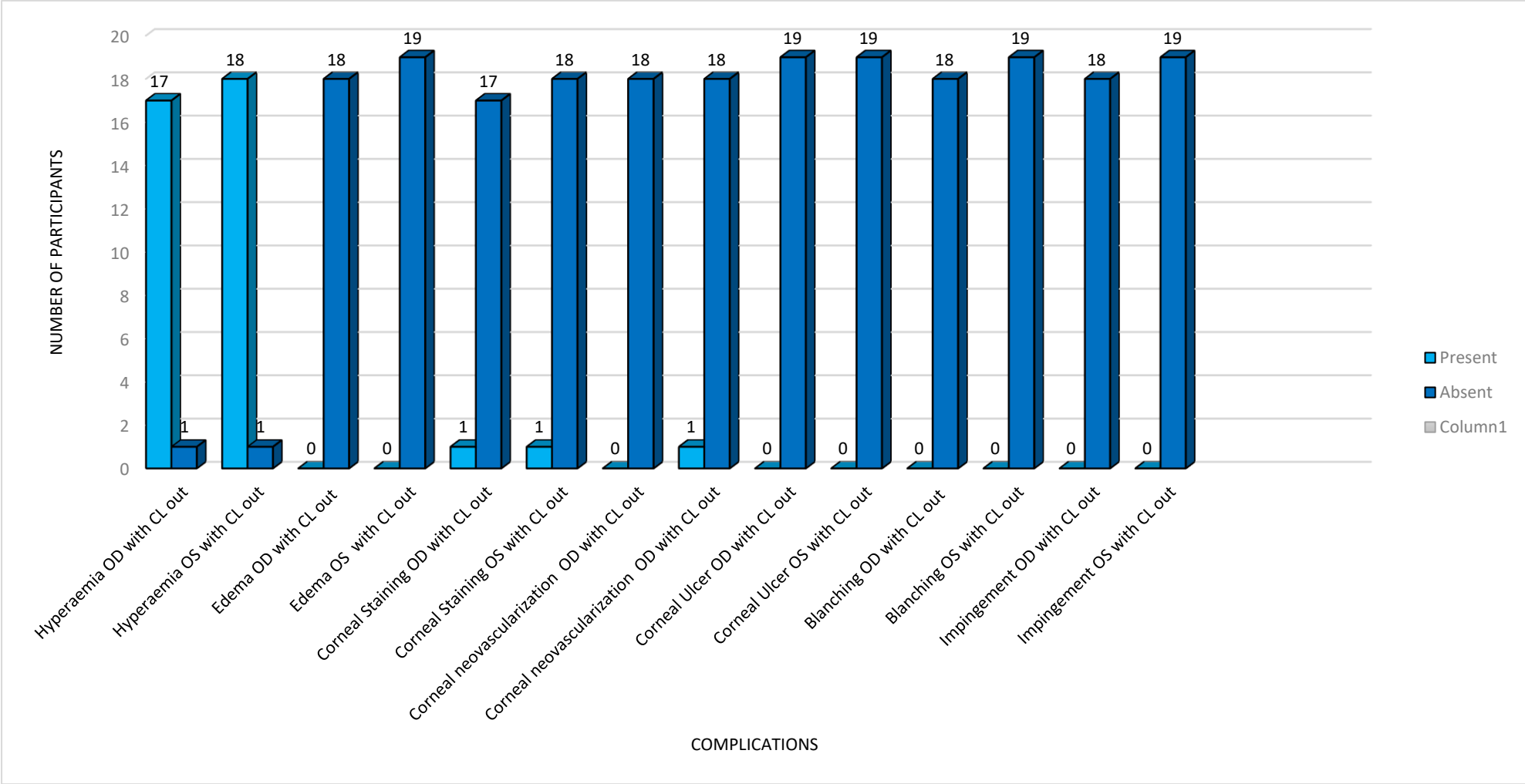

Figure 16 showing the number of participants experiencing complications with contact lenses removed

Questions	Age	Gender
Have you experienced redness while wearing contact lenses?	0.26	0.16
Have you experienced pain while wearing contact lenses	1.00	1.00
Have you experienced blurry vision while wearing contact lenses?	1.00	1.00
Have you experienced dryness while wearing contact lenses?	1.00	1.00
Have you experienced burning while wearing contact lenses?	1.00	1.00
Have you experienced headaches while wearing contact lenses?	1.00	1.00
Have you experienced any foreign body sensation while wearing contact lenses?	1.00	1.00
Presence of hyperaemia with lens in on right eye	1.00	1.00
Presence of hyperaemia with lens in on left eye	1.00	1.00
Presence of corneal staining with lens in on right eye	1.00	1.00
Presence of corneal staining with lens in on left eye	1.00	1.00
Presence of corneal neovascularization with lens in on left eye	0.32	1.00
Presence of lens deposits with lens in on right eye	0.28	1.00
Presence of lens deposits with lens in on left eye	0.08	1.00

Table 4 showing probability scores using fisher's exact test for contact lens related questions asked in the questionnaire

DISCUSSION:

This study aimed to investigate contact lens complications and their relation to wearers among a population in a university eye clinic in Trinidad and Tobago. Findings show that complications are influenced by age, lens type, modality and patient compliance which can be linked to dropout rates. From the study, most lens wearers were females between the ages of 18 to 25 years old, as shown in Table 1. This coincides with the study[27] completed in India in 2011 where 59.47% of patients with CL complications were female. Of our study population, 84% were soft lens wearers and 16% were scleral lens wearers.

There were no RGP lens wearers in this population. In a survey [28] done by Professor Morgan in 2022, it was stated that the number of RGP lenses fitted each year has remained constant for the past twelve years. Two to three percent of the yearly fitting rate of RGP lenses is due to orthokeratology. The results showed that these lenses are mainly fitted in the Netherlands and of the eleven countries where there is data on RGP fittings, it was reported that approximately 35 RGP lenses are fitted yearly for each country. Although RGP lenses offer unique advantages, the article reported that the majority of the population were fitted for soft and scleral lenses.

There were 14 daily disposable contact lens wearers (soft lenses), 2 monthly lens wearers and 3 conventional lens wearers according to Table 2. Thirteen daily disposable wearers and 2 scleral wearers reportedly wore their lenses for 8 hours a day with a maximum daily wear hours of 12 hours being 1 scleral lens wearer and 2 soft lens wearers. Of these 15 participants, 10 reportedly never experienced contact lens-related issues. However, all three scleral lens wearers experienced CL issues as well as two soft lens wearers.

These scleral lens wearers also wore their lenses for up to 7 days per week for 12 hours maximum. Of these, only one replaced their lenses every year while the other two are unsure and replaced them every 5 years, as seen in Figure 6. Hyperemia with and without lenses in was seen in all three scleral lens wearers. However, impingement, blanching, corneal neovascularization and some lens deposits were seen in one scleral wearer with lenses in as well. This participant also reportedly slept with their lenses 2-3 times a week and hence, may be linked to the ocular pain and a poor vision rating of 2/10 in this participant. This may be a result of the frequency of lens wear and replacement schedule of the lens as they only replace their lens every five years as opposed to the recommended yearly replacement.

The total population of participants reportedly washed their hands before inserting or removing contact lenses, as depicted in Figure 11. According to Bui[13], younger patients typically tend to have lower hand-washing rates so it was not expected that 100% of the population would have been washing their hands before lens insertion and removal. However, in another study[29] conducted amongst university students in Chengdu, the results showed that 95% of patients washed their hands before insertion and removal. According to the literature by Zhu and considering that our study population mainly comprised of patients between the ages of 18-30, the results demonstrated that younger users do not have a lower hand washing rate than older users.

Concerning symptoms experienced by participants in Table 3, none had any discharge indicating that no infections were present. No papillae or follicles were seen on the palpebral conjunctiva. This shows that Giant Papillary Conjunctivitis or CLPC is not a common CL complication at the UWI Optometry clinic. This was contradictory to the study conducted in 1999[20] which showed that frequent contact lens case replacement results in a lower rate of GPC development.

In our study, however, participants replaced their CL cases much less frequently, up to four times a year as shown in Figure 10. Therefore, it was expected that GPC would be seen more frequently throughout the study. [20]

Among the population, 26% of participants who were all soft lens wearers reported blurry vision. Of these, four participants also reported dryness. This is expected as blurry vision may result when contacts are worn for too long and the eyes get overly dry. 52% reported dryness, and one person reported foreign body sensation (an SCL wearer) along with headache and redness. One soft lens wearer also experienced burning and pain with a CL comfort rating of 6 which decreased to 5 at the end of the day. They allegedly replaced their daily disposables each day and did not overwear or shower with their lenses. They did, however, have difficulty with inserting and removing their lenses which may have contributed to the overall lack of comfort while lenses were worn. Lastly, 26% of participants reported redness. These were the two scleral wearers and three SCL wearers.

It is seen in Figure 13 that age may influence vision comfort with CLs. As the age increases from 21 to 38, the vision rating fluctuates between 8-10. However, at age 61, the vision rating plummets to 2. This is due to 'wear and tear' which are changes to the ocular surface and tear film, contributing to the decrease in CL visual comfort. In contrast, regarding comfort in Figures 14 and 15, age does not affect it as the comfort rating ranges from 6 to 10, regardless of age. Our study showed the ocular discomfort, therefore, is not a CL complication in itself but is a symptom of another complication that the patient may be experiencing[22].

Figures 16 and 17 showed that the majority of complications were absent with contact lenses in and out. Hyperemia was seen in 17 right eyes with CLs in and out and 18 left eyes with CLs in and out. Corneal staining and neovascularization were seen in one right eye respectively according to Figure 17. Lens deposits were noted in one right eye and two left despite 100% of participants reporting that they washed their hands before insertion (figure 11). This however may be attributed to Figure 12 which shows that six participants cleaned their lenses before insertion (when necessary) and five of them included the rubbing step. Considering that there were three scleral lens wearers, this suggests that some participants reused their DD lenses which may contribute to deposits forming. It is noted that one participant wore one scleral lens in the left eye due to Keratoconus in that eye.

Fisher's exact test is a statistical analysis used to determine if there is a statistically significant association between two categorical variables, in this case, age and gender with the experience of different symptoms while wearing contact lenses. From the results, it shows that for all the symptoms, the p-values are more than 0.05 suggesting that as it relates to age and gender, none of the symptoms were statistically significant. The p-value for age for the presence of lens deposits (lens in) was 0.08 which means that age may weakly influence the presence of lens deposits in the left eye. It is important to note though, that these results are based only on a small sample size and are therefore not conclusive. Further studies with larger sample sizes should be conducted to validate these findings.

LIMITATIONS OF METHODOLOGY:

- Insufficient sample size

The sample size in this study was relatively small and so it was difficult to identify significant statistical relationships within the data set. A larger sample size would have generated more accurate results to represent a greater population and perhaps minimize the disparities present.

- Patient integrity

The responses from the questionnaires such as handwashing, the frequency of sleeping and showering in lenses, frequency of handwashing as well as other hygiene practices, to name a few were based on the patient's level of honesty.

- Sampling bias

Given that convenience sampling was used to collect data, there was the issue that patients were included based on their availability. Hence, those that participated in the study may not have been a true representation of the general population of Trinidad and Tobago.

CONCLUSION:

In conclusion, 84% of the participants were females between the ages of 18 to 25 years old. There were more soft contact wearers that were using daily disposable lenses as opposed to biweekly and monthly wear. Three scleral wearers participated in the study, all of whom reported having contact lens issues. Unfortunately, there were no RGP wearers. The results showed that the most common symptom experienced by 52% of users was dry eyes. All nineteen participants were shown to have experienced some degree of hyperaemia, one scleral wearer had corneal neovascularization, blanching and impingement in one eye and two patients had lens deposits. All participants reported washing their hands before inserting their lenses which were also observed upon examination when they were asked to remove their lenses to be stained with Sodium fluorescein. Overall, the patients were educated on proper hygiene and lens care practices before contact lens wear but some patients still slept and showered in their contact lenses, overwore their contact lenses and refused to clean, disinfect and dispose of their contact lens cases as instructed. Hence, each patient was informed of the findings and was re-educated on the correct care regime and practices that would prevent unwanted contact lens complications in the future. Patient age and compliance were identified as the main factors associated with contact lens complications, while their knowledge of complications and proper care practices did not appear to have an impact on their lens care behaviour.

RECOMMENDATIONS

- Further studies should be done over a longer period such as within two to three years to obtain more statistical data on contact lens complications amongst contact lens wearers.
- More studies should be conducted within the Caribbean as there is insufficient regional data concerning contact lens complications.

NEXT STEPS

Upon the successful completion of our research, we intend to present the noteworthy discoveries of this study to the staff and students of the UWI Optometry clinic through an engaging PowerPoint presentation. Additionally, we hope to share our findings with a local newspaper to disseminate crucial information to a wider audience, thus yielding practical benefits to the community and potentially beyond. We encourage further research on the topic and continue to update and refine safety guidelines for contact lens use, including the development of new contact lens materials and designs that are less likely to cause complications.

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APPENDICES

THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TELEPHONE: (1-868) 662-2002 ext. 82755 E-mail: campusethics@sta.uwi.edu

January, 27 2023

Dr. Niall Farnon
Shanik Hilaire , Cassandra Boodram
Department of Clinical Surgical Sciences
Faculty of Medical Sciences
Email: Niall.Farnon@sta.uwi.edu

Dear Dr. Niall Farnon ,

Ref: CREC-SA.1856/11/2022

Title: Contact lens complications of patients visiting a University Eye Clinic

I am pleased to advise that your application for research on the above captioned topic has been approved on behalf of Campus Research Ethics Committee, St. Augustine.

Approval is valid for one (1) year.

Sincerely,

Professor Jerome De Lisle
Chair
Campus Research Ethics Committee

Digitally generated by UWIScholar

Data collection questionnaire

Date(dd/mm/yyyy): Age: Gender: ○ Male ○ Female

1. Which type of lens do you currently wear?
   ○ Soft lenses ○ RGP lenses ○ Scleral lenses

2. Which type of lens modality are you currently using?
   ○ Daily disposable ○ Daily wear ○ Monthly disposable ○ Extended wear

   ○ Continuous wear ○ Conventional

3. How long have you been wearing contact lenses?
   …….. (record year/months)

4. On average how many hours a day do you wear your lenses?
   ……. (Record hours)

5. What is the maximum number of hours a day you have worn contact lenses in the last 6 months?
   ….. (record hours)

6. On average how many days a week do you wear your lenses?
   …… (record days)

7. When was the last time you had an appointment for a CL assessment and/or full eye test?
   …….. (Record year/months ago)

8. When was the last time you had to visit an eye care provider due to issues with CL wear?
   …….. (Record year/months ago)

9. How often do you struggle with inserting and removing CL from your eyes?

   ○ all the time ○ most of the time ○ Sometimes ○ Occasionally

   ○ never

10. How often do you sleep with lenses?
    …. (Record times per week or month or per year)

11. How often do you shower with your lenses?
    …. (Record times per week or month or per year)

12. How often do you replace your lenses?
    ○ Daily ○ Weekly ○ Every two weeks ○ Monthly ○ Unsure

13. How often do you wash your hands before the insertion of your lenses?

    ○ Always ○ Often ○ Sometimes ○ Never

14. Do you clean and disinfect your lenses before using them?

    ○ Yes ○ No ○ Sometimes

15. During the cleaning process, do you remember to include the rubbing step?

    ○ Yes ○ No ○ Sometimes

16. How often do you replace your contact lens case?
    .....(Record times per year)

17. Rate your vision with the CL (out of 10, 1 being bad, 10 best)
    ……

18. Rate the overall comfort of the CL (out of 10, 1 being bad, 10 best)
    …….

19. Rate the end-of-day comfort of the CL (out of 10, 1 being bad, 10 best)
    ……

20. In the last six months, have you experienced any of the following while wearing CL?
    (Tick yes if you have experienced any of the following)

Condition	Yes
Redness	
Pain	
Discharge	
Blurry vision	
Dryness	
Any other issues (specify)	

INFORMED CONSENT AND PRIVACY AUTHORIZATION

FORM FOR CLINICAL STUDIES

Protocol Title : Contact lens complications of patients visiting a University Eye Clinic

Application No . : CREC-SA.1856/

Sponsor: Not applicable

Principal Investigator: Niall Farnon, Office- 1(868)225-1016, Clinic 1(868)225-1014, Cell 1(868) 481-9987, niall.farnon@sta.uwi.edu

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1. What should you know about this study?

a. You are being asked to join a research study.
b. This consent form explains the research study and your participation in the study.
c. Please read it carefully and take as much time as you need.
d. Please ask questions at any time about anything you do not understand.
e. Your participation is voluntary. If you join the study, you can change your mind later. You can decide not to take part or you can quit at any time. There will be no penalty or loss of benefits if you decide to quit the study.
f. During the study, we will tell you if we learn any new information that might affect whether you wish to continue to be in the study.
g. Ask your study doctor or the study team to explain any words or information in this informed consent that you do not understand.

2. Why is this research being done?

This research is being done to determine the percentage of patients that experience contact lens complications at a University Eye Clinic and of that percentage, establish and assess at least five common physiological complications of the cornea and conjunctiva that occur in those that wear or are interested in wearing either soft, rigid and scleral contact lenses

3. What will happen if you join this study?

If you agree to be in this study, we will ask you to do the following things:

Complete a questionnaire and participate in a slit lamp examination whereby the front part of the eye will be examined to detect any complications resulting from wearing contact lenses.

How long will you be in the study?
You will be in this study for approximately 15- 20 minutes.

How many people will be in this study?
Approximately 60 persons will be participating in this study.

4. **What are the risks or discomforts of the study?**
There are no more than minimal risks for this study.

5. **Are there risks related to pregnancy?**
There are **no** risks related to pregnancy.

6. **Are there any benefits to you being in the study?**
The benefits include being informed of whether there is a complication being experienced and further management.

7. **What are your options if you do not want to be in the study?**
You do not have to join this study. If you do not join, your care will not be affected.

8. **Will it cost you anything to be in this study?**
Yes No

9. **Will you be paid if you join this study?**
Yes No

10. **Can you leave the study early?**
YES, if you wish you do not have to continue in this study.

11. **What are some of the reasons for early discontinuation of the study?**
These reasons are unique to each individual and as such specific reasons cannot be stated to allow the study to be free of bias.

12. **How will your privacy be protected?**

a. ALL information about you will be protected.
b. The research team working on the study will collect information about you. This includes things learned from the procedures described in this consent form.
c. Depending upon the methodology, the investigator may also collect other information including your age and gender.
d. Only people on the research team will know your identity and that you are a participant in the research study.
e. You may cancel your permission to use your information at any time by notifying the Principal Investigator of this study in writing. The Principal Investigator's name, email address, phone and fax information are on page one of this consent form. If you do cancel your permission to use and disclose your information, your part in this study will end and no further information about you will be collected. Your cancellation would not affect information already collected in the study.

13. Will the study require any of your other healthcare providers to share your health information with the researchers of this study?

Yes No

14. Assent Statement

This study will be done to take a look at the front surface of the eye to be able to find out if any problems were caused by wearing contact lenses.

15. What other things should you know about this research study?

You should know that this type of study has not been done in Trinidad and Tobago.

16. What do you do if you have questions about the study?

Call the principal investigator. The email address and phone numbers are on page one of this consent form. If you cannot reach the principal investigator or wish to talk to someone else, call the University Ethics Committee at 662- 2002 Ext 82755

X _____ X _____

PATIENT'S SIGNATURE WITNESS