



**UWI**  
ST. AUGUSTINE  
CAMPUS

**PATTERNS OF PRESCRIBING CONTACT LENS AT THE UNIVERSITY OF THE  
WEST INDIES, OPTOMETRY CLINIC IN TRINIDAD**

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## Abstract

**Background:** Latest trends in the contact lens market and advancement in technology have led to an increase in prescribing and wear of contact lenses.

**Purpose:** To determine patterns of prescribing contact lenses at the University of the West Indies Optometry Clinic.

**Method:** A total of two hundred and forty-three patients who were prescribed with contact lenses from 2017 to 2018 at the UWI Optometry Clinic were reviewed. Demographics and data regarding type of lens, their design, methods of replacement, and the lens care regime advised to each patient were recorded. The data collected were analysed using tools in the Statistical Package for Social Sciences (SPSS).

**Result:** A total of 243 contact lens case files indicated that patients aged 4 to 73 with a mean age of  $29.6 \pm 12.4$  were fitted with contact lenses. One hundred and fifty-six (64.2%) were females and 87 (35.8%) were males. The majority of patients (68.3%) were between the ages of 20 to 39 years. Social occasion (34.9%) was the major reason for contact lens wear. Conventional soft lenses (53.1%) and daily disposable replacement schedules (60.5%) were the most commonly prescribed lens and modality of wear respectively. Multipurpose solution (14%) was prescribed the most in terms of lens care system.

**Conclusion:** The results obtained from this study indicated that there was in fact similarity to the data found in other contact lens prescribing research conducted globally.

## Definition of Terms

- ❖ **Refractive Errors:** occur when the eyes are unable to focus light directly on the retina due to its irregular shape, this results in blurry images. There are four types which includes: myopia (near-sightedness), hyperopia (far-sightedness), presbyopia (loss of near vision with age), and astigmatism. <sup>1</sup>
- ❖ **Spectacles:** is another word for a pair of glasses, it contains the appropriate lens power to correct a person's refractive error. <sup>1</sup>
- ❖ **Hyperopia:** known as farsightedness where a person can see objects in the distance sharp and clear but when it comes to viewing near objects it becomes blurred. The severity of a person's hyperopia influences their ability to focus. <sup>1</sup>
- ❖ **Myopia:** known as near-sightedness where a person can see objects that are near sharp and clear but when it comes to viewing distant objects it becomes blurred. The severity of a person's myopia influences their ability to focus. <sup>1</sup>
- ❖ **Astigmatism:** occurs when the eye structures such as the cornea and the lens are irregularly shaped/curved, it results in blurred vision, and it's rather common. <sup>1</sup>
- ❖ **Presbyopia:** occurs around the ages of 40 to 50 years because of the loss of the lens elasticity to focus/accommodate at near resulting in the person becoming more farsightedness. <sup>1</sup>
- ❖ **Keratoconus:** is an eye condition whereby the cornea overtime becomes very thin due to the continuous irregularity of the shape of the cornea. Some of the most common symptoms include blurry vision, double vision, and astigmatism. <sup>1</sup>
- ❖ **Demographic Profiles:** is known as statistical data based on factors of a person within a population such as a gender, age, occupation, addressed. <sup>1</sup>
- ❖ **Retrospective study:** in the medical field it is a study that looks backward in time, therefore utilizing previous patient's medical records or even

interviews with patients who were already known for having a certain illness.<sup>1</sup>

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# CHAPTER ONE: INTRODUCTION

## 1.0 Introduction

Recent advances in technology have made a great impact on eye care including contact lenses. Over 125 million people worldwide wear contact lenses for the management of visual anomalies including keratoconus, refractive error, and amblyopia. This is because contact lenses have been used over the years for cosmetic and therapeutic purposes.<sup>2</sup> Contact lens prescribing trends have been continually reported globally over the years but there is limited documented data available about the contact lens market and wearers trends in the Caribbean especially in Trinidad. Therefore, this study was done to better understand the patterns of contact lens prescribing in Trinidad to compare with the global trend. This chapter will explain the basic outline of the study including the aim, objectives, rationale, significance, and limitations.

## 1.1 Background of the Study:

Contact lenses can be defined as a transparent optical device with dioptric power wore directly on the cornea of the eye that assists in the correction of refractive errors.<sup>3</sup>

### 1.1.1 Lens Material

Contact lens materials consist of two types, which include rigid gas permeable (RGP) and soft contact lenses.<sup>4</sup> The RGP lens provides a sharper vision than soft contact lenses,<sup>5</sup> although soft contact lenses are more comfortable than RGP, it has low water content and oxygen permeability. A combination of RGPs and SCL are known as Hybrid contact lenses where the center is made of a rigid gas permeable plastic and surrounded by a soft lens material. This hybrid design is expensive but it has both the benefits of sharp optics and comfort.<sup>6</sup>

### 1.1.2 Lens Design

Also, over the past decade, the CL industry has experienced advancements in terms of the lens designs and materials which have influenced the modality of wear.<sup>7</sup> Soft contact lenses are produced in the form of spherical, toric, multifocal, and bifocal.<sup>8</sup> Spherical contact lenses have a central optic zone that imparts negative or positive spherical corrections used to correct simple refractive errors like myopia and hyperopia, unlike toric contact lenses that impart a

cylindrical correction used to correct astigmatism. Multifocal and bifocal lenses have two or more different power zones in the lens used to correct presbyopia and myopia and hyperopia.<sup>9</sup>

### **1.1.3 Uses of Contact Lens**

Contact lenses can be used to correct refractive errors, spectacle intolerance, aphakia, keratoconus, and other corneal irregularities.<sup>10</sup> Scleral lenses are the largest contact lens specially made to cover the cornea to treat keratoconus. Some contact lenses can be custom made with colored tints for sensitive eyes against UV rays, alleviate migraines, and improve reading of a person who has dyslexia.<sup>11</sup> The sports community prefers to correct vision with contact lenses but not only to improve eyesight but also to enhance performance.<sup>12</sup> Contact lenses also assist in cosmetic enhancement by changing the color of the eye.<sup>7</sup>

### **1.1.4 Modalities of Contact Lens Wear**

Modality refers to the length of time that contact lenses are worn.<sup>13</sup> There are two common CL modalities which are daily worn and extended wear. Contact lenses that are worn daily are removed every day at night time, whereas extended wear CL can be worn continuously for days, a week, or a month without removal.<sup>4</sup> In the US daily wear is the major modality of CL wear.<sup>14</sup> Frequency of wear replacement schedules refers to how often the CL are discarded and replaced which includes:

- Daily Disposable
- Two-weeks replacement
- Monthly replacement
- Quarterly replacement (3 months)
- Yearly replacement.

### **1.1.5 Lens Care Systems**

Proper lens care is important for minimizing contact lens complications as well as ensuring that the eyes are healthy and free from infections. The ideal CL care solutions system comprises several tasks including cleaning, disinfecting, rewetting, and storage of the lenses.<sup>15</sup> However, the most important part is disinfecting which can occur by different procedures such as chemicals, UV exposure, hydrogen peroxide, and heat.<sup>16</sup> It is important to know that care

systems for hard contact lenses (RGP) are different from care systems used with soft contact lenses.

### **1.1.6 Multipurpose Solutions (MPS)**

According to surveys in Jordan, Australia, and the US multipurpose solutions (MPS) is the most prescribed lens care system, and the least prescribed is the hydrogen peroxide system.<sup>7</sup> MPS is an all in one care system which is mostly prescribed to patients because it's easy to use.

#### ***Hydrogen Peroxide System***

The hydrogen peroxide system consists of two types which include the one-step and two-step methods. Practitioners usually prescribe this lens care system if the patient is allergic to ingredients in the multipurpose solution.<sup>17</sup>

#### ***Saline***

Firstly, it is important to know that a saline solution is used to rinse CL only and is not used to disinfect the lenses.

#### ***Daily Cleaners***

A daily cleaner is used for cleaning the lenses by loosening and removing deposits or debris from the lens, but it doesn't disinfect the lens.

#### ***Enzymatic Protein Removers***

Enzymatic protein removers clean the materials that the eyes deposit on the contact lenses over time.

## **1.2 Problem Statement**

Overall the design of the contact lens has improved greatly and is a well-recommended option by eye care specialists. However, contact lenses are not suitable for everyone, hence, it is important to assess each patient before prescribing a contact lens. The study of prescribing contact lenses has been conducted and reviewed in different countries to better understand the trends of prescribing contact lenses and the elements involved that may have an impact on the outcome. Although global contact lens practice trends are standard, there isn't enough research

information which states that contact lens prescribing in Trinidad emulates international contact lens prescribing patterns. However, this study was done to determine and provide the necessary information to fill this void. The results of this project will act as a guide for optometrist by, making it easier for further prescribing of contact lenses in Trinidad.

### **1.3 Aim of the Study**

The purpose of this study was to determine the patterns of prescribing contact lenses at the UWI Optometry Clinic in Trinidad.

### **1.4 Objectives**

- 1) To determine the purpose of prescribing contact lenses
- 2) To ascertain the demographic profile of contact lens wearers
- 3) To understand the most commonly prescribed contact lens type, lens material, and design.
- 4) To describe the most commonly prescribed contact lens modality, wearing schedule, and replacement schedule.
- 5) To determine the lens care systems commonly prescribed

### **1.5 Research Questions**

- 1) What are the purposes of prescribing contact lenses in the UWI Optometry Clinic?
- 2) What are the demographic profiles of the contact lens wearers in the UWI Optometry Clinic?
- 3) What are the most frequently prescribed contact lens type, lens material, and design?
- 4) What are the most commonly prescribed contact lens modality, wearing schedule, and replacement schedule?
- 5) What are the lens care systems that are usually prescribed by contact lens practitioners in the UWI Clinic?

## **1.6 Significance of Study**

1. The findings from this study will redound to assist in the understanding of the contact lens local market in Trinidad so as to compare the data with the results of other developed contact lens markets. Therefore, it will allow the practitioners of Trinidad to remain side by side with the trends of international contact lens practices.
2. It will also aid the suppliers of contact lenses to actively encourage and market products that are needed in Trinidad.
3. This research will also help serve as a guide in the assessment of common factors that are known to influence the trends in prescribing contact lenses in Trinidad.
4. It will serve as a baseline for further studies

## **1.7 Delimitation of Study:**

This study is delimited to patients that visited the UWI Optometry Clinic and were prescribed with contact lenses from January 2017 to December 2018

## CHAPTER TWO: LITERATURE REVIEW

### 2.0 Introduction

Research is a scientific or systematic search for information on a particular issue or subject. Therefore, research studies relevant to the topic, "The patterns of prescribing contact lenses", were reviewed to supply the necessary context for the current study. This literature synthesized findings of a total of twenty (20) previous research studies conducted in different parts of the world. The main purpose of the literature review is the comparative analysis of the previous research findings with the future results found in this study. The information extracted from these studies were based on the following objectives:

- Purpose of prescribing contact lenses
- Demographic profiles of contact lens wearers
- Contact lens type, material, and design
- Contact lens modality, wearing and replacement schedules
- Lens care system

### 2.1 The Purpose of Prescribing Contact Lenses

A qualitative research study by Moodley<sup>13</sup> to determine the trends in prescribing contact lenses in KwaZulu-Natal, South Africa for the correction of common refractive errors reported that 215 (39%) of the 550 contact lenses prescribed were for cosmetic purposes. Similar findings were reported in Karnataka, India<sup>2</sup> and Malaysia<sup>18</sup> at 159 out of 371 (42.9%) and 1435 out of 2472 (58%) respectively. A cross-sectional study, in Saudi Arabia<sup>19</sup>, to find out the awareness and practice of soft contact lens wear and care among female students of King Saud University, recorded that 68 out of the 100 survey population were prescribed contact lenses for cosmetic purposes. Also, studies were done among optometrists in Jordan<sup>7</sup> and Korea<sup>20</sup> to determine their prescribing patterns also reported cosmetic as the major reason for prescribing contact lenses. However, a study in Abuja, Nigeria<sup>21</sup> indicated that the major reason for prescribing contact lenses was high refractive error 251 (78.2%).

## 2.2 Demographic Profile of Contact Lens Wearers

### *Gender*

The General Optical Council (GOC), one of nine UK healthcare regulators and optical professions in the UK, surveyed in 2015 on 2,043 respondents who live in the UK and currently wear and buy contact lenses. Nearly two-thirds (1312) of contact lens wearers were females (64%) while a third were males 737 (36%). Over half of contact lens wearers (1144) (56%), were aged between 25 and 44, while 388 (19%) were aged 45 to 54 and 245 (12%) were aged 55 to 64. Relatively few (163 (8%) were aged 18 to 24 or 65+ 102 (5%). This was the only study found which included the employment status of participants. The results also showed that more than half (1144 (56%) of the participants currently have a paid full-time job while 363 (16%) were in part-time work and 143 (7%) were self-employed. The remaining 429 (21%) were not currently in employment or declined to respond. <sup>22</sup>

Likewise, in the six-year retrospective longitudinal study that was conducted in the University of South India, to examine the changes in the pattern of prescribing soft contact lenses in an optometry centre located in Selangor.<sup>23</sup> The details presented were based on 1273 soft contact lenses dispensed to participants of which 845 (66%) were females and 428 (34%) were males. The mean age of the female wearers was 24.0±8.3 years and for males, it was 27.0±11.2 years. Also, the study conducted in Malaysia by Mohd-Ali<sup>18</sup> in 2019 analysed the patterns of use and knowledge about contact lens wear in teenagers. The questionnaires were administered to eight secondary schools where 2474 of the 8500 were completed. The mean age of respondents was 14.8 ± 1.5 years. The majority of contact lens wearers were females 1880 (76%) and 594 (24%) were males.

A survey was conducted on the trends of contact lens prescribing for a duration of thirteen years from 2002 to 2014 in the United States.<sup>24</sup> The contact lens practitioners were randomly selected and asked to provide information with regards to 10 consecutive contact lens fits between January and March every year. Over the thirteen years, a total of 1650 survey forms were received from US practitioners representing details of 7702 contact lens fits. The mean (±SD) age of lens wearers was 33.6 (±15.2) years, of whom the majority of the 7702 contact lens wearers were females accounting for 4775 (65%) of the population. Also, Thite et al<sup>25</sup> did a study on contact lens prescribing patterns among practitioners in India. A total of 227 practitioners were included resulting in 2270 fits. The mean age of the patients was 26.8 (±7.4) years, of whom the majority of wearers were recorded to be 1521 (67%) females.

Another research, conducted by Haddad et al<sup>7</sup>, on the trends of prescribing contact lenses in Jordan of a sample population of 1730, observed that the majority of contact lens wearers were females with 1125 (65%) females and 605 (35%) males. Also a study in Karnataka, India<sup>2</sup> to understand the patterns of use of contact lens among college students, recorded that out of the 371 contact lens wearers recorded, 295 (79.5%) were females. The females subjects had a higher rate of contact lenses usage which may be related to between-sex differences in the attitudes toward cosmesis generally.<sup>26</sup>

### ***Age***

A study done by Turner<sup>22</sup> in the United Kingdom, found most contact lens wearers to be between the ages of 25 and 44 years out of 2048 individuals surveyed. Also, the case study conducted by Cooper et al<sup>27</sup> in the United States to determine the rate of myopia progression in children fit with a commercially available extended depth of focus multifocal soft contact lens with attributes theoretically expected to slow the progression of myopia included 32 consecutive patients belonging to the age group 6 to 19 years.<sup>27</sup> Similar results were obtained in a study done in a public hospital in Curitiba<sup>28</sup> to assess the demographic and behavioural profile of patients who wear contact lenses. Of the 69 people interviewed at the hospital, 39 (56.52%) acquired CL. Of which 38 (55.07%) were between the ages of 20 to 49, 41 (69.56%) were women and 28 (40.58%) had finished high school.

### ***Occupation***

The study conducted in the United Kingdom by Turner<sup>22</sup> noted the working status of contact lens wearers; 1144 (56%) were found to be full-time employed, 327 (16%) were part employed and 143 (7%) were self-employed while the remaining 429 (17%) were currently not employed or omitted to mention their job status. Also another study in Abuja, Nigeria<sup>21</sup> reported the majority 154 (48%) of contact lens wearers to be students, 67 (21%) were lawyers, 43 (13%) were bankers, 35 (10%) were administrators, 16 (5%) were beauticians, 3 (1%) traded and 3 (1%) were housewives. Other studies in Saudi Arabia<sup>18</sup> and Selangor<sup>19</sup> on students and teenagers did not report the occupational but the majority of the population can be presumably categorized as students or unemployed.

## ***Address***

A study conducted in the United Kingdom stated that 279 (87%) of contact lens wearers to reside in urban areas as compared to 42 (13%) in the rural area.<sup>22</sup> Other studies<sup>7, 13,19,21,25</sup> did not report on the residence of contact lens wearers. Also, information concerning the contact lens wearer's ethnicity was not analysed nor included in other studies. Therefore, future studies that will compare contact lens wearing among rural and urban dwellers are recommended.

### **2.3 Contact Lens Type, Material, and Design**

A research study conducted for thirteen years by Efron et al<sup>24</sup> with regards to the trends of prescribing contact lenses in the United States showed a decrease in the rigid lens fitting from 1001 fits (13.0%) in 2002 to 7240 fits (9.4%) in 2014. The majority of the 7702 contact lens fit throughout the thirteen years was soft contact lenses.<sup>24</sup> Conversely, a study in Jordan<sup>7</sup> on 1730 people reported that soft contact lens was the most prescribed accounting for 1579 (91.6%) of all contact lenses prescribed. Nine hundred and fifty-two of which (60.3%) were conventional hydrogel lenses and 627 (31.3%) were silicone hydrogel lenses, therefore, rigid lenses were least prescribed (8.4%). Similar findings were reported in Karnataka in India<sup>2</sup> where out of 371 contact lenses prescribed, 365 (98.4%) were soft contact lenses and 6 (1.6%) were RGP lenses.

Also, Moodley's study in South Africa reported that out of 550 contact lenses prescribed, 468 (85%) were soft contact lenses, out of which 314 (67%) were silicone hydrogel and 154 (18%) were hydrogel.<sup>13</sup> It was also observed that out of 550 contact lenses prescribed, 1509 (87.2%) were spherical lenses and 221 (12.8%) were toric lenses. RGP and scleral lenses were found to be the least prescribed at 11 (2%) and 6 (1%) respectively. A ten-year study<sup>11</sup> on trend related to prescribing contact lens in Australia from 2000 to 2009 reported that the majority of CL prescribed were SCL. They also reported that there was an increase in the prescribing of SiHy and a reduction in the amount of mid-water hydrogel lenses prescribed.

Also in another survey<sup>29</sup> on the compliance of daily disposable (DD) contact lens wear in Australia, Norway, the United Kingdom (UK), and the United States (US). Silicone hydrogel (SiHy) daily disposable lenses were worn by 113 (14%) individuals. A study in Abuja, Nigeria<sup>21</sup> to determine the common contact lens prescribing trends among optometrists on 120 registered optometrists randomly selected from opticals in Abuja from January to December

2016 found that three hundred and eleven (96.9%) contact lenses prescribed were conventional soft contact lenses while 10 (3.1%) were RGP. The spherical CL designs were the most (78.2%) prescribed contact lens design, followed by cosmetic CL (14.2%) and toric 1(3.4%).

## **2.4 Contact Lens Modality, Wearing Schedule and Replacement Schedule**

Haddad et al<sup>7</sup> evaluated the trends in prescribing contact lens among optometrists in Jordan. The report showed that out of 1730 contact lens wearers prescribed, 881 (50.9%) were monthly lenses and 353 (20.4%) were daily disposables. However, in a cross-sectional study in Karnataka, India<sup>2</sup> 359 (96.8%) were daily worn, and 12 (3.2%) were extended wear out of the 371 contact lenses prescribed. On the other hand, Efron et al 2010<sup>11</sup> stated in their study in Australia over the 10 years that the decline in extended-wear fitting could be a result of daily disposable eliminating the need for a lens care system and improved ocular health. It is important to know that rigid lenses are durable and cannot be mass-produced as compared to soft lenses, therefore, it is not viable to replace them more frequently than every six months, and hence, RGP's are more fitted for extended wear.

A survey in the UK on 2048 individuals to determine the frequency of wear of contact lenses revealed that approximately half of the respondents (49%) wear contact lens every day followed by 553 (27%) wearing them 3-5 times a week, then 225 (11%) wearing them 1-2 times a week and 348 (17%) wearing them occasionally.<sup>22</sup> However, in another study in the USA,<sup>24</sup> it was reported that 7047 from 7702 (91.5%) of rigid lenses wearers wore them primarily for 7 days in a week (7 d/wk) to avoid inconveniences of patients readapting to rigid lenses if not worn full time. In KwaZulu-Natal, South Africa, the majority 451 (82%) of the 550 contact lens wearers replaced their lens monthly followed by daily replacement 61 (11%) then yearly replacement 17 (3%).<sup>13</sup>

In an international survey of 1000 participants from thirty-nine different countries between the periods of January to March (2006-2010) for a total of five years to determine the extent of prescribing (EW) CL worldwide and to associate both demographic profile and fitting patterns.<sup>30</sup> Overall, EW represented only a sum of 78 (7.8%) of all the soft CL wearers with a range of (0.6%) 6 in Malaysia and 27% 270 in Norway. A similar study was conducted in Korea between the periods of 2010 to 2013. A total of 400 survey questionnaires were randomly posted to Korean Optometric clinics for 4 years and a total of 1937 contact lenses were prescribed. Silicone hydrogel lenses had 349 (18%) fits for all the soft CL and the toric

design lenses had a total of 330 (17%) fits for the soft lenses. It was revealed that the prescription rate for toric contact lenses had increased within 4 years because of the continuous emphasis on the toric lens marketing and manufacture.<sup>20</sup>

## **2.5 Lens Care System**

Maqsood et al<sup>19</sup> reported that contact lens care can have an impact on the success of contact lens wear as well as the patient's satisfaction. The survey was based on the basic hygiene practice and care of soft contact lenses related to the frequency of replacement, steps in care regimen, and storage case of the soft contact lens. The lack of proper practice was found even in educated and knowledgeable consumers such as medical students that may increase the risk of complications associated with contact lens wear. A similar study carried out by Haddad et al<sup>7</sup> in Jordan observed that most (88.9%) practitioners prescribed multipurpose solutions as compared to hydrogen peroxide (1-step and 2-step) 48 (2.8%). According to Efron et al<sup>24</sup>, contact lens wearers refrain from using lenses as a result of having poor contact lens hygiene. This is because it increases the risk of developing toxic epitheliopathy with the inappropriate use of the lens care systems techniques and solutions recommended.

A study in Malaysia<sup>18</sup> on the patterns of use and knowledge about contact lens wear in teenagers concluded that half (56%) of the respondents do not have sufficient knowledge about the risks of wearing CLs out of the 2474 total participants assessed. They also observed that there is a risk with the inappropriate use of the polymer-degrading effects of heat disinfection, and the low efficacy of chlorine and various non-chemical disinfecting systems (ultraviolet, ultrasound, and agitation). These complications have resulted in the disuse of such systems. Maqsood et al<sup>19</sup> conducted a study in Saudi Arabia with a sample population of 100 contact lens wearers and found that 52 of the contact lens wearers clean their contact lenses with the solution before inserting and storing and only 31 participants clean their lens case weekly.

They also recorded that 59 contact lens wearers used to wash their hands before wearing soft contact lenses. This can be a result of a lack of awareness regarding the importance of cleaning contact lenses. A study was done in Asia Pacific<sup>17</sup> to determine whether patients follow the recommended hygiene practices. It was reported that 35% of patients cleaned their lenses 2.9 minutes per day, 70% did not clean lens cases every day and 50% kept their lens case longer than three months. In a multi-country study<sup>29</sup> to assess compliance with daily disposable

contact lenses wear 18%, 12%, 7%, and 4% non-compliance with the replacement of daily disposable contact lenses (DDCLs) was noted in Australia, US, UK, and Norway respectively.

## **CHAPTER THREE: METHODOLOGY**

### **3.0 Introduction:**

This chapter outlined the research design, study size, study population, sample size, sampling procedure, inclusion and exclusion criteria, test and instrument used, data collection procedure, data analysis, legal and ethical considerations.

### **3.1 Research Design**

This was a retrospective study that involved the use of case files of 243 patients who visited the UWI Optometry Clinic between the periods of January 2017 to December 2018. A retrospective study is where the data is based on past research results which may be acquired from existing sources such as medical records, Hence, the outcome has already occurred so it can only be observed.<sup>31</sup>

### **3.2 Study Population**

The population of this study included all patients of different ages, gender, and ethnic groups that visited the UWI Optometry Clinic from January 2017 to December 2018.

#### **3.2.1 Study Site**

This study was conducted at the University of the West Indies, Optometry Clinic located at Couva Multi Training Facility, Trinidad. The School of Optometry is a Medical Science program offered in the Caribbean only at the University of the West Indies, St. Augustine Campus in Trinidad. The UWI Optometry clinic provides both training and eye care services to the Trinidad Population. Patients come from different regions of Trinidad for eye care services at the UWI clinic. In 2009 Trinidad and Tobago had only 98 registered optometrists, 97 of whom were in the private sector.<sup>32</sup> However, there is no public data on how many optometrists that are currently registered in Trinidad and Tobago.

The University of the West Indies (UWI) is a regional University in the Caribbean. The University has three locations, Mona Campus in Jamaica, Cave Hill Campus in Barbados, and St. Augustine Campus located in Trinidad. Trinidad and Tobago is an English speaking twin-island country off the northern coast of South America and the coast of North-Eastern

Venezuela. In 2019, the estimated population of Trinidad and Tobago was 1.39 million.<sup>33</sup> Trinidad is ethnically heterogeneous unlike Tobago, however, it is dominated by two ethnic groups being the Africans and the Indians.<sup>34</sup>

### **3.2.2 Inclusion Criteria**

All patients that visited the UWI Optometry Clinic who were prescribed with contact lenses between the periods of January 2017 to December 2018 were included.

### **3.2.3 Exclusion Criteria**

All patients that visited the UWI Optometry clinic from January 2017 to December 2018 and were prescribed with contact lenses but have incomplete documentation on their case files were excluded.

### **3.3 Sample Size**

The sample size was not calculated because it is a retrospective study.

### **3.4 Data Collection Procedure**

All patient case files that were recorded by the UWI Clinic from January 2017 to December 2018 were reviewed. The patients who were prescribed contact lenses were extracted and the information regarding the types of contact lenses prescribed, design, modality, lens care system, and complications including their demographic profiles were documented.

### **3.5 Data Collection Instrument**

The data that was collected in this research project was obtained from previous records of patients who visited the UWI Optometry clinic between the periods of January 2017 to December 2018.

### **3.6 Data Management**

The information collected from all the contact lens patient case files were organized and categorized concerning the objectives of the study and entered into a spreadsheet in excel. The

information collected about the contact lens wearer profile was also recorded on a Microsoft Excel spreadsheet.

### **3.7 Data Analysis**

The data were analysed with tools such as Chi-square in the Statistical Package for Social Sciences (SPSS) and the results were graphically presented.

### **3.8 Legal and Ethical Considerations**

- Approval to conduct this study was obtained from the Ethics Committee of the University of the West Indies, St Augustine Campus Trinidad, and Tobago.
- Permission to assess patient case files was obtained from the Optometry Unit.
- The anonymity of all information obtained was maintained and the datasheet was kept in a secure place during and after the study.
- A password-protected computer was used to store information that only the researchers had access to

## CHAPTER FOUR: RESULTS

### 4.0 Introduction

This chapter presents the results of 243 reviewed case files of patients prescribed with a contact lens at the University of the West Indies Optometry clinic from January 2017 to December 2018.

### 4.1 Demographic Profile of the Contact Lens Wearers

Out of the 243 patients case files reviewed, 156 (64.2%) patients were females and 87 (35.8%) were males. Their ages ranged from 4 to 73 years with a mean age of  $29.6 \pm 12.4$  years. The majority (68.3%) of the patients were aged between 20 to 39 years. A good number (54.3%) of them reside in rural areas. The majority (41.6%) of the contact lens wearers were students (Table 4.1). The Pearson Chi-Square test indicated that there was a significant relationship between the wearer's occupation and the purpose of the contact lens ( $p = 0.05$ )

**Table 4.1: Distribution of the Contact Lens Wearers according to their Occupation.**

Occupation	Frequency	Percentage (%)
Student	101	41.6
Health care	17	7
Unemployed	24	9.9
Computer and technology	32	13.2
Education and social services	17	7.0
Hospitality and service industry	11	4.5
Business management	29	11.9
Architecture and Engineer	7	2.9
Law	5	2.1
Total	243	100

## 4.2 Purpose of Prescribing

The major reason for prescribing contact lenses was for social occasions (34.9%), followed by cosmetics (11.5%) and therapeutic (12.8%) (Table 4.2). The purpose of wear (prescribing) was found to be significantly associated with gender ( $p=0.002$ ).

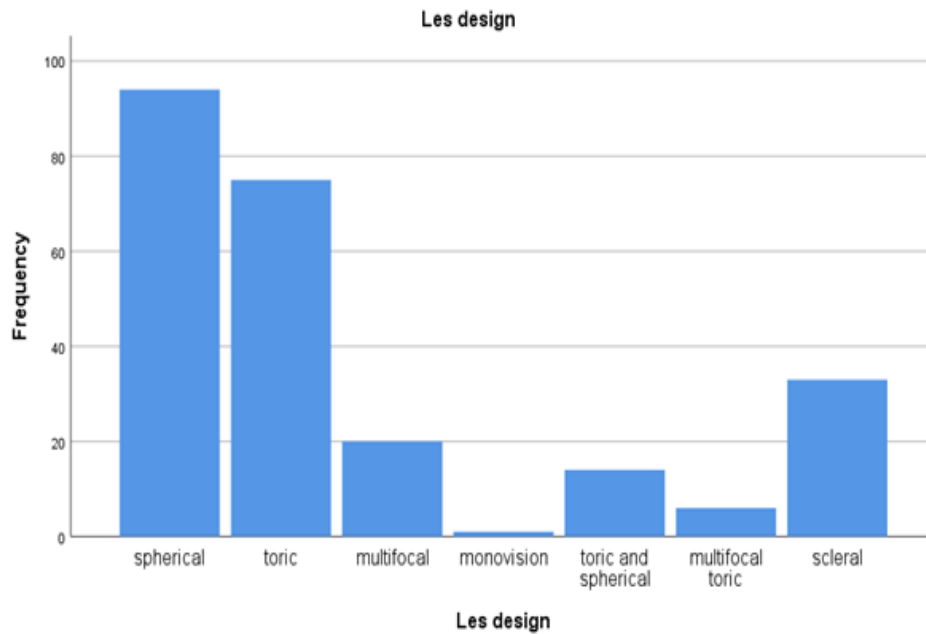
**Table 4.2: Purpose of Prescribing Contact Lens**

	<b>Purpose of Prescribing</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Valid</b>	No response is given	22	9.1
	Social Occasions	85	34.9
	Therapeutic	31	12.8
	Cosmetics	28	11.5
	Gain Experience	18	7.4
	Previous Wearer	30	12.3
	Sharper Vision	7	2.9
	Sports	22	9.1
<b>Total</b>	243	100.0	

### 4.3 Contact lens Type, Material, and Design

The majority (85.2%) of the contact lenses prescribed were soft and 129 (53.1%) of the soft were hydrogel and 78 (32.1%) were SiHy lenses. Most of the contact lenses prescribed were spherical (38.7%) followed by toric (30.9%) and scleral contact lenses (13.6%) (Figure 4.1).

**Figure 4.1 Distribution of the Contact Lens Design**



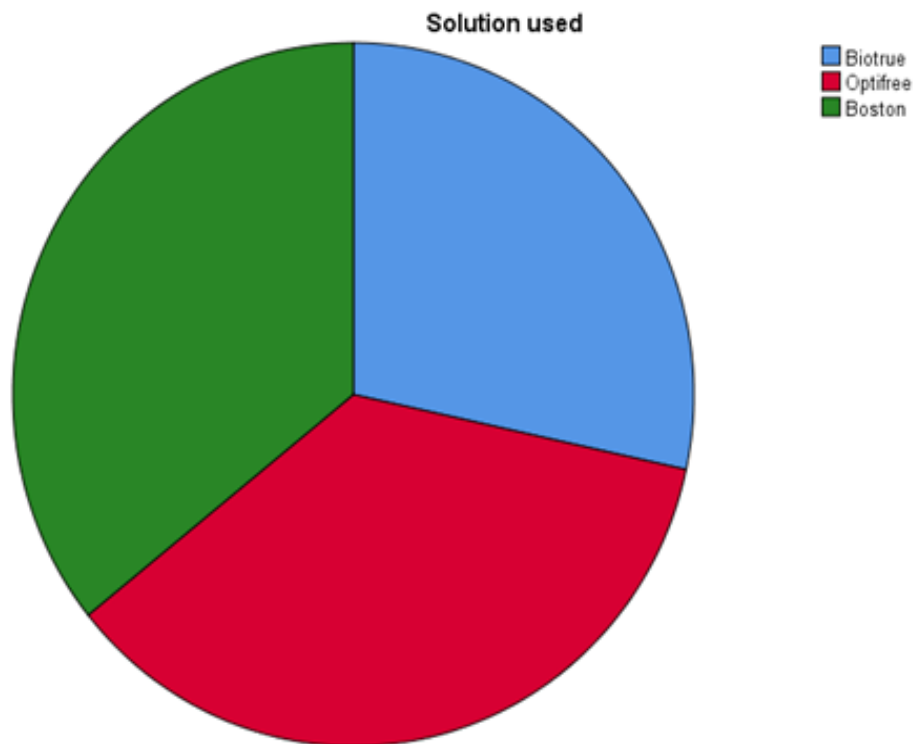
### 4.4 Contact Lens Modality of Wear and Replacement Schedule

The majority (53.5%) of contact lens wearers preferred to wear their contact lens for between 7 to 12 hours per day followed by 65 (26.7%) that preferred to wear between 1 to 6 hours and 5 (2.1%) who could wear up to 13 to 18 hours per day. A good number (60.5%) of the contact lenses prescribed were daily disposables and 39 (16%) was a monthly replacement. Most patients 42 (17.3%) reported that they wanted to wear their contact lenses for 2/7 days of the week, followed by 34 (14%) for 7/7 days per week.

#### 4.5 Lens Care System

The most prescribed contact lens care system was multipurpose. Opti free and Boston advance solutions were the most (14%) prescribed solution followed by Biotrue (11.1%) solution (Figure 4.2). One hundred and forty eight (60.9%) case files did not have any record of lens care systems for the patients.

**Figure 4.2 Distribution of Contact lens Cleaning Solution**



## **CHAPTER FIVE: DISCUSSION, CONCLUSION, and RECOMMENDATION**

### **5.0 Introduction**

This is the first study on contact lens prescribing patterns in Trinidad and Tobago. The chapter discussed the results presented in Chapter 4 concerning the demographical profile, the purpose of prescribing contact lens, the modality of wear, wearing schedule, replacement schedule, and lens care system.

### **5.1 Discussion**

#### **5.1.1 Demographic Profiles**

##### **5.1.1.1 Gender**

One hundred and fifty-six patients (64.2%) prescribed with contact lenses in this study were females and 87 (35.8%) were males. Similar findings were documented in studies done in the University of South India<sup>23</sup>, United States<sup>24</sup>, India<sup>25</sup>, United Kingdom <sup>22</sup>, and Jordan <sup>7</sup>. However, a study in Karnataka <sup>2</sup> and Malaysia <sup>18</sup> recorded the percentages of female wearers as 79.5 % and 76% respectively. Regardless, the number of female contact lens wearers has been constantly higher than males since the inception of the international prescribing trends project which began in 1996. <sup>13</sup> The higher rate of contact lens usage by females could be because females have a higher standard attributed to aesthetics than males as suggested by Riley et al<sup>26</sup> and Tabushi et al <sup>28</sup>.

##### **5.1.1.2 Age**

The ages of contact lens wearers recorded in this study ranged from 4 to 73 years with a mean age of  $29.6 \pm 12.4$ . The majority (68.3%) of contact lenses were prescribed to persons between the ages of 20 to 39 years, followed by those between the ages of 40 to 64 years (19.8%). A study done by Turner<sup>22</sup>, in the United Kingdom, found most contact lens wearers to be between the ages of 25 and 44 years which was similar to the finding of this study. Also, a study conducted by Ezinne et al<sup>21</sup> in Abuja, Nigeria recorded most contact lens wearers to be between the ages of 20 to 40 years. The high use of contact lenses in this age group could be due to better optical, occupational, sports, and cosmetic benefits of contact lenses.

### **5.1.1.3 Address**

This study revealed that the majority of (54.3%) of contact lens wearers resided in rural areas as opposed to the 108 (44.4%) in the urban areas. This is contrary to a study by Turner<sup>22</sup>, in the United Kingdom, where 279 (87%) of contact lens wearers reside in urban areas as compared to 42 (13%) in the rural area. The difference in findings could be due to the location of the clinic. For example, if the clinic is closer to those in the rural areas then it will be more accessible to patients who resided in rural areas compared to urban areas.

### **5.1.1.4 Occupation**

The majority (41.6%) of the contact lens wearers were students. This could be due to the proximity of the UWI Optometry clinic to the St. Augustine campus where students could easily access eye care services at affordable prices. This correlates with a study in Abuja, Nigeria<sup>21</sup> that reported the majority (48%) of contact lens wearers to be students.

## **5.1.2 Purpose of Prescribing Contact Lens**

The main purpose of prescribing contact lens in the UWI Optometry clinic was found to be for social occasions (34.9%) which is in correlation with the global trend.<sup>13, 18, 19</sup> On the contrary, high refractive error was recorded as the major reason for prescribing contact lenses in a study in Abuja, Nigeria.<sup>21</sup> The high use of contact lens for social occasions can be attributed to the preference of contact lens over spectacles.

## **5.1.3 Contact Lens Type, Material and Design**

### **5.1.3.1 Lens Type**

The results showed that most (85.2%) contact lenses prescribed in the clinic were soft contact lenses. Similar findings were found in other parts of the world<sup>7, 11, 21</sup> Also, a study by Efron et al<sup>24</sup> with regards to the trends of prescribing contact lenses in the United States showed a decrease in the rigid lens fitting. Reduction in the use of other contact lenses could be due to a lack of information on the latest development in the contact lens industry. Also, the lack of experience, knowledge, and skills of the optometrists in the procedure of fitting RGP lenses and scleral lenses when it comes to managing high irregular refractive astigmatism and pathologies like keratoconus could be the reason for not prescribing them.

### **5.1.3.2 Lens Material**

Of the 207 soft contact lenses prescribed, 129 (53.1%) were hydrogel and 78 (32.1%) were silicone hydrogel (SiHy) lenses. Similar findings were recorded by Efron et al<sup>24</sup> and Ezinne et al<sup>21</sup> at 60.3% and 96.9% respectively. Conversely, Moodley<sup>13</sup> and Efron et al<sup>11</sup> reported SiHy lenses as the most prescribed over conventional hydrogel contact lenses. Conventional hydrogels are more convenient and affordable as opposed to GP lenses, however, the high oxygen permeability of the silicone hydrogel material has major benefits overall. The high rate of conventional hydrogel lenses prescribed in this study could be attributed to the lack of proper education on the benefits of SiHy lenses and the latest development on the market as well as the availability of the newer developed contact lenses to the UWI Optometry Clinic and these countries. It can also be due to the cost of the SiHy lenses.

### **5.1.3.3 Lens Design**

In terms of the lens design, most (38.7%) contact lenses prescribed were spherical lenses, followed by toric lenses (30.9%). Similar findings were reported in studies by Moodley<sup>13</sup> and Ezinne et al<sup>21</sup>. This could be because practitioners prefer to prescribe spherical lenses for patients with astigmatism. After all, they tend to be more comfortable and cheaper than toric lenses. Also, the contact lens wearers may be unaware of toric lenses and the practitioners may not be skilled or experienced in fitting and or assessing toric lenses. And, because these toric lenses are newly developed in the contact lens market, patients' prescriptions may not be available in the lenses due to their limited range.

## **5.1.4 Contact Lens Wearing Schedule and Replacement Schedule/Modality**

### **5.1.4 .1 Modality/ Replacement Schedule**

Daily disposable was the most (60.5%) prescribed contact lenses in this study. Similar findings were reported by Unnikrishnan et al<sup>2</sup> and Efron et al<sup>11</sup>. It could be because this modality of wear is easy to comply with and does not require a complicated lens care system. However, studies conducted by Haddad et al<sup>7</sup> and Moodley<sup>13</sup> found that monthly lenses were the most frequently prescribed lenses as compared to daily disposables. Also a study in Abuja, Nigeria<sup>21</sup> reported three months of disposable contact lenses as the most prescribed modality of lens

wear. Variation in the findings could be due to the availability of the lenses by the supplier as well as the affordability of these lenses for patients.

#### **5.1.4.1 Wearing Schedule**

More than half of the patients 130 (53.5%) wore their contact lenses for 7 to 12 hours a day followed by 65 (26.7%) for 1 to 6 hours and 5 (2.1%) for 13 to 24 hours. The majority of the responses for wearing time in hours 43 (17.7%) and wearing time in days 56 (23.0%) did not state how long patients wanted to wear their lenses. This can be a result of the examiner failing to ask the patients the relevant questions or not recording the information given to them effectively. It was found that the majority of 20 out of the 36 persons who were prescribed rigid lenses were reported to be worn by wearers for 7 days of the week. Likewise, in the United States of America<sup>24</sup>, it was reported that 91.5% of rigid lenses wearers wore them primarily for 7 days in a week (7 d/wk) to avoid inconveniences of patients readapting to rigid lenses if not worn full time. In a survey<sup>22</sup> in the UK, it was revealed that 49% of the respondents wore contact lenses every day. The least reported wearing schedule was 6 days of the week.

#### **5.1.5 Lens Case System**

The most prescribed contact lens care system was multipurpose (14%). Similar findings were recorded in Jordan and Nigeria.<sup>7, 21</sup> This could be because multipurpose solutions are easier to use and have fewer complications when compared to others such as hydrogen peroxide system which is less affordable and has a risk of corneal toxicity. The choice of multipurpose solutions in this study could also be due to the preference of the practitioner, and the type of contact lens prescribed. Moreover, the limited variety of solutions by the suppliers as well as the fact that various contact lens companies recommend certain solutions for their lenses could also influence the choice of the lens care system.

### **5.2 Conclusion based on the Study Objectives**

This is the first study on patterns of prescribing contact lenses in Trinidad and Tobago and it showed that contact lenses were mostly worn by females and students. The majority of contact lens wearers were between the ages of 20 to 39 years and the major reason for prescribing contact lenses was for social occasions. Most contact lens wearers reside in rural areas. Conventional hydrogel lenses with spherical design and daily wear were the most prescribed

lens type and modality of wear. The patients preferred to wear their lenses for two days a week between 7 to 12 hours per day. Multipurpose was the most prescribed lens care system. This information is important to optometrists and contact lens practitioners in Trinidad and Tobago to keep them updated on the market trends to compare with the global market.

### **5.3 Limitations and Recommendation**

#### **5.3.1 Limitations**

- The study was susceptible to bias in terms of selection bias and information bias because of its retrospective nature
- Incomplete patient's information or missing data associated with retrospective studies reduced the total number of files reviewed which affected the data analysis.
- No previous study in Trinidad and Tobago to compare with the current study findings

#### **5.3.2 Recommendations**

There are no studies in Trinidad and Tobago to compare contact lens prescribing trends to international trends. We, therefore, make the following recommendations:

- Future studies to include the general population and other optometrists in Trinidad and Tobago
- Similar studies to be done in other parts of Trinidad and Tobago.
- To conduct a nationwide study on contact lens prescribing patterns

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## **APPENDIX**

### **Appendices 1: Letter of Permission to conduct a study at the UWI Optometry Clinic**

The Head, Optometry Unit,  
Department of Clinical Surgical Sciences,  
Faculty of Medical Sciences,  
University of the West Indies,  
St. Augustine,  
Trinidad and Tobago.

Dear Sir,

#### **PERMISSION TO CONDUCT A STUDY**

We, Gabrielle Harbajan and Anesha Crooks, optometry students of the University of the West Indies, Trinidad and Tobago, do hereby write to request your permission to conduct a study at the Optometry clinic. We are currently studying for our Bachelors in Optometry and it is one of the requirements to be fulfilled.

The purpose of our study is to determine the patterns of prescribing contact lenses in Trinidad by reviewing case files of patients that visited the clinic from January 2017 to December 2018 so as to compare with the results of other developed countries. The study has been given ethical clearance and approval by the University of the West Indies. There will be no direct contact with the patients. The information will be collected anonymously and kept confidential.

Thank you for your understanding and consideration in this matter.

Yours sincerely,

Anesha Crooks and Gabrielle Harbajan.

## Appendix 2: Exemption Letter



### THE UNIVERSITY OF THE WEST INDIES

ST AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES  
CAMPUS RESEARCH ETHICS COMMITTEE  
TEL.: (1-868) 662-2002 ext. 82755 E-mail: [campusethics@sta.uwi.edu](mailto:campusethics@sta.uwi.edu)

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October 3 2019

**Dr. Ngozika Ezinne (Anesha Crooks and Gabrielle Harbajan )**

Dr. Ngozika Ezinne, Optometry Unit,  
Department of Clinical Surgical Sciences, Faculty of Medical Sciences,  
UWI, St. Augustine Campus, Trinidad. Email: [Ngozika.Ezinne@sta.uwi.edu](mailto:Ngozika.Ezinne@sta.uwi.edu)

Dear Dr. Ngozika Ezinne ,

**Ref: CREC-SA.0037/09/2019**

**Title: Patterns of Prescribing Contact Lens in Trinidad: A case of UWI Optometry Clinic.**

I am pleased to advise that your application for research on the above captioned topic has met the criteria for Exemption from Review from the Campus Research Ethics Committee, St. Augustine.

Sincerely,

Surendra Arjoon (Prof.) Chairman  
Ethics Committee

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Digitally generated by UWIScholar

## Appendices 3: Data Collection Instrument on Excel

The screenshot displays the Microsoft Excel interface with a spreadsheet titled "Data Collection Instrument - Microsoft Excel". The spreadsheet is titled "Patterns of Prescribing Contact Lenses in Trinidad: A case of UWI Optometry Clinic". The spreadsheet is organized into columns for data collection:

- Column A:** Patient ID (rows 2-23)
- Column B:** Purpose of prescribing contact lens
- Columns C-E:** Demographic profiles of contact lens wearers (Age, Gender, Address, Occupation)
- Columns F-Q:** Contact Lens (Type, Material, Design, Modality, Wearing Schedule, Replacement schedule, Lens Care System)

The spreadsheet is currently empty, with only the headers and a few data points in the Patient ID column (rows 2-23) visible. The Excel ribbon shows the "HOME" tab selected, with various options for font, alignment, and data manipulation. The Windows taskbar at the bottom shows the system tray with the date and time (9:11 PM, 23/06/2020).

## Appendices 4: Raw Data

Patterns of Prescribing Contact Lenses in Trinidad: A case of UWI Optometry Clinic												
Purpose of prescribing contact lens	Demographic profiles of contact lens wearers										Lens Care System	
	Age	Gender	Address	Occupation	Type	Material	Design	Wearing Time		Modality of Wear Replacement		
								Hours per day	Days			
1	Social Occasions	44	F	Rural	Unemployed	Soft	Hydrogel	Spherical	12/24	2-3/7	Daily Disposable	-
2	Therapeutic	30	M	Urban	Management & Business	Hard (Scleral)	GP	Scleral	5/24	-	Yearly	boston solution
3	Previous Wearer	51	F	Urban	Law	Soft	SiHy	Toric	8/24	-	Daily Disposable	-
4	Gain Experience	51	F	Urban	Law	Hard (Scleral)	GP	Scleral	8/24	-	Yearly	boston solution
5	Social Occasions	23	M	Urban	Student	Soft	Hydrogel	Toric	6-8/24	3/30	Daily Disposable	-
6	Cosmetics	23	M	Urban	Student	Soft	SiHy	Spherical	8-12/24	5-7/7	Daily Disposable	-
7	Social Occasions	22	F	Urban	Student	Soft	Hydrogel	Spherical	5-8/24	3/30	Daily Disposable	-
8	Previous Wearer	23	F	Urban	Student	Soft	Hydrogel	Toric	8/24	1/30	Daily Disposable	-
9	Cosmetics	22	F	Urban	Student	Soft	Hydrogel	Toric	8/24	-	Daily Disposable	-
10	Social Occasions	59	F	Urban	Management & Business	Soft	SiHy	Multifocal	8/24	2/7	Daily Disposable	-
11	Cosmetics	20	F	Rural	Student	Soft	Hydrogel	Spherical	8/24	1-2/7	Daily Disposable	-
12	Social Occasions	23	F	Rural	Student	Soft	Hydrogel	Spherical	5/24	2/7	Daily Disposable	-
13	Sports	25	F	Urban	Computer & Technology Education & Social Services	Soft	Hydrogel	Spherical	5-6/24	1/7	Daily Disposable	-
14	Previous Wearer	28	M	Rural	Student	Soft	Hydrogel	Spherical	10/24	3/7	Daily Disposable	-
15	Social Occasions	22	M	Urban	Student	Soft	SiHy	Spherical	5/24	2/7	Daily Disposable	-
16	Sports	38	M	Rural	Computer & Technology	Soft	Hydrogel	Spherical	8/24	4/30	Daily Disposable	-
17	Sports	31	M	Urban	Computer & Technology	Soft	SiHy	Toric	10/24	5/7	Daily Disposable	-
18	Social Occasions	52	M	Rural	Health Care	Soft	Hydrogel	Toric	7/24	2-3/7	Daily Disposable	-

19	Gain Experience	16	F	Urban	Student	Soft	Hydrogel	Toric	6/24	-	Daily Disposable	-
20	Social Occasions	14	M	Urban	Student	Soft	SiHy	Spherical	6/24	-	bi-weekly	optitru solution
21	Sports	53	M	Rural	Management & Business	Soft	SiHy	Spherical	10/24	7/7	bi-weekly	optitru solution
22	Gain Experience	44	F	Urban	Computer & Technology	Soft	SiHy	Toric	8/24	-	Daily Disposable	-
23	Previous Wearer	36	F	Rural	Computer & Technology	Soft	Hydrogel	Toric and Spherical	3/24	7/7	Daily Disposable	-
24	Cosmetics	30	M	Rural	Computer & Technology	Hard (Scleral)	GP	Scleral	8-12/24	6-7/7	Yearly	boston solution
25	Cosmetics	35	F	Rural	Management & Business	Soft	Hydrogel	Toric	10/24	2/7	Daily Disposable	-
26	Cosmetics	36	F	Urban	Management & Business	Soft	SiHy	Toric	4-5/24	5/7	Monthly	BioTrue solution
27	Social Occasions	28	M	Rural	Unemployed	Soft	Hydrogel	Spherical	3-4/24	2/7	Daily Disposable	-
28	Sports	27	F	Rural	Architecture & Engineering	Soft	Hydrogel	Toric	6-8/24	2-3/7	Daily Disposable	-
29	Social Occasions	20	F	Rural	Student	Soft	Hydrogel	Spherical	3/24	2/30	Daily Disposable	-
30	Previous Wearer	33	F	Rural	Education & Social Services	Soft	Hydrogel	Spherical	8-12/24	6/7	Daily Disposable	-
31	Cosmetics	34	F	Rural	Management & Business	Soft	SiHy	Spherical	8/24	3/7	Daily Disposable	-
32	Previous Wearer	19	M	Urban	Student	Soft	SiHy	Spherical	12/24	6/7	Monthly	BioTrue solution
33	Crisper Vision	22	M	Rural	Unemployed	Hard (Scleral)	GP	Scleral	8/24	7/7	Yearly	boston solution
34	Gain Experience	29	F	Rural	Computer & Technology	Soft	Hydrogel	Spherical	8/24	3/7	Daily Disposable	-
35	Previous Wearer	44	F	Rural	Architecture & Engineering	Soft	SiHy	Toric and Multifocal	12/24	7/7	Monthly	optitru solution
36	Sports	20	M	Rural	Student	Soft	Hydrogel	Toric and Spherical	10-12/24	3/7	Daily Disposable	-
37	Social Occasions	21	M	Urban	Student	Soft	SiHy	Spherical	6/24	2/7	Daily Disposable	-
38	Social Occasions	20	F	Rural	Student	Soft	Hydrogel	Spherical	12/24	2/7	Daily Disposable	-

39		49 F	Rural	Computer & Technology	Soft	Hydrogel	Toric	4-8/24	4-8/7	Daily Disposable	-
40	Sports	21 M	Urban	Student	Soft	Hydrogel	Toric	2/24	2/7	Daily Disposable	-
41	Social Occasions	30 F	Rural	Computer & Technology	Soft	Hydrogel	Spherical Toric and Spherical	8/24	2/7	Daily Disposable	
42	Social Occasions	23 F	Rural	Student	Soft	Hydrogel	Spherical	9/24	2/7	Daily Disposable	
43	Cosmetics	17 F	Rural	Student	Soft	SiHy	Toric	10/24	5/7	Monthly	BioTrue solution
44	Gain Experience	41 F	Rural	Management & Business	Soft	SiHy	Spherical	8/24	4/7	Monthly	optitru solution
45	Sports	22 M	Urban	Student	Soft	Hydrogel	Toric	4-6/24	2/7	Daily Disposable	
46	Cosmetics	23 F	Urban	Student	Soft	SiHy	Toric	10-12/24	4-5/7	Monthly	optitru solution
47	Social Occasions	22 F	Rural	Student	Soft	Hydrogel	Toric	6/24	2/7	Daily Disposable	
48	Sports	57 M	Rural	Computer & Technology	Soft	Hydrogel	Spherical	7/24	2-3/7	Daily Disposable	
49	Social Occasions	34 F	Rural	Health Care	Soft	SiHy	Spherical	8/24	6/7	Monthly	BioTrue solution
50	Therapeutic	27 M	Rural	Health Care	Hard (Scleral)	GP	Scleral	12/24	7/7	Yearly	boston solution
51	Sports	22 M	Rural	Health Care	Soft	Hydrogel	Spherical	8/24	2/7	Daily Disposable	
52	Therapeutic	34 F	Urban	Management & Business	Hard (Scleral)	GP	Scleral	10/24	7/7	Yearly	boston solution
53	Therapeutic	38 F	Rural	Management & Business	Hard (Scleral)	GP	Scleral	12/24	7/7	Yearly	boston solution
54	Social Occasions	34 M	Urban	Unemployed	Soft	Hydrogel	Spherical	10-12/24	2/7	Daily Disposable	
55	Sports	19 M	Rural	Student	Soft	Hydrogel	Spherical	7/24	2/30	Daily Disposable	
56	Social Occasions	23 F	Rural	Student	Soft	Hydrogel	Spherical	8/24	2-3/30	Daily Disposable	
57	Sports	22 M	Urban	Student	Soft	Hydrogel	Spherical	5-8/24	2-3/7	Daily Disposable	
58	Previous Wearer	21 F	Urban	Student	Soft	Hydrogel	Spherical	6/24	2/7	Daily Disposable	
59	Previous Wearer	23 M	Urban	Student	Soft	Hydrogel	Toric	8-9/24	3/7	Daily Disposable	
60	Career	23 M	Rural	Student	Soft	SiHy	Toric	4/24	3/7	bi-weekly	optitru solution

											solution
61	Cosmetics	21 F	Urban	Student	Soft	Hydrogel	Spherical	8/24	4/7	Daily Disposable	
62		32 F	Rural	Unemployed	Soft	Hydrogel	Spherical	6/24		Daily Disposable	
63	Gain Experience	25 F	Urban	Student	Soft	SiHy	Spherical	8/24	2-3/7	Monthly	
64		24 M	Urban	Student	Soft	Hydrogel	Spherical	8/24	3/7	Daily Disposable	
65	Social Occasions	22 F	Rural	Student	Soft	Hydrogel	Spherical	4/24		Daily Disposable	
66	Social Occasions	73 M	Urban	Computer & Technology	Soft	Hydrogel	Multifocal			Monthly	optitru solution
67	Social Occasions	34 F	Urban	Computer & Technology	Soft	Hydrogel	Spherical			Daily Disposable	
68	Sports	21 M	Urban	Computer & Technology	Soft	Hydrogel	Toric	5/24	4/7	Daily Disposable	
69		47 F	Rural	Management & Business	Soft	Hydrogel	Spherical and Toric	5/24	3/7	Daily Disposable	
70	Cosmetics	50 F	Urban	Health Care	Soft	SiHy	Multifocal	8/24	5/7	Monthly	BioTrue solution
71	Social Occasions	25 F	Rural	Management & Business	Soft	Hydrogel	Spherical and Toric	5/24		Daily Disposable	
72	Social Occasions	22 M	Rural	Unemployed	Soft	Hydrogel	Spherical			Daily Disposable	
73	Cosmetics	21 F	Urban	Engineer	Soft	Hydrogel	Toric	10/24	2/7	Daily Disposable	
74	Social Occasions	26 F	Urban	Health Care	Soft	SiHy	Toric	8/24	2/30	Monthly	BioTrue solution
75	Cosmetics	14 F	Rural	Student	Soft	Hydrogel	Toric			Daily Disposable	
76	Previous Wearer	20 F	Rural	Student	Soft	SiHy	Toric	10/24	2/7	bi-weekly	optitru solution
77	Previous Wearer	22 F	Urban	Student	Soft	SiHy	Spherical			Monthly	BioTrue solution
78	Social Occasions	44 F	Rural	Education & Social Services	Soft	SiHy	Multifocal			Daily Disposable	
79	Social Occasions	24 F	Rural	Management & Business	Soft	Hydrogel	Spherical	5/24	1/7	Daily Disposable	
80	Therapeutic	58 M	Rural	Management & Business	Hard (Scleral)	GP	Spherical		7/7	Yearly	boston solution
81	Social Occasions	23 F	Urban	Student	Soft	Hydrogel	Spherical and	12/24	3/7	Daily Disposable	



125	Cosmetics	52	M	Rural	Management & Business	Soft	<a href="#">SiHy</a>	Multifocal	10/24	3/7	Daily Disposable	
126	Cosmetics	23	M	Urban	Unemployed	Soft	Hydrogel	Toric	6/24	4/7	Monthly	<a href="#">BioTrue solution</a>
127	Gain Experience	22	F	Urban	Student	Hard Scleral	GP	Scleral	4/24	1/7	Yearly	<a href="#">boston solution</a>
128	Previous Wearer	35	F	Urban	Education & Social Services	Soft	Hydrogel	Toric	10/24	5/7	Daily Disposable	
129	Career	40	F	Rural	Management & Business	Soft	Hydrogel	Toric	10/24	5/7	Daily Disposable	
130	Social Occasions	20	M	Rural	Student	Soft	<a href="#">SiHy</a>	Toric	4-6/24	4/7	Monthly	<a href="#">BioTrue solution</a>
131	Cosmetics	21	F	Rural	Student	Soft	<a href="#">SiHy</a>	Toric	3/24	1/7	Monthly	<a href="#">BioTrue solution</a>
132	Therapeutic	21	F	Urban	Student	Hard Scleral	GP	Scleral	12/24	7/7	Yearly	<a href="#">boston solution</a>
133	Therapeutic	17	F	Urban	Student	Hard Scleral	GP	Scleral	12/24	6/7	Yearly	<a href="#">boston solution</a>
134	Social Occasion	25	F	Rural	Law	Soft	Hydrogel	Spherical		3/7	Daily Disposable	
135	Social Occasion	36	F	Urban	Unemployed	Soft	Hydrogel	Spherical	11/24		Daily Disposable	
136	Gain Experience	23	M	Urban	Student	Hard Scleral	GP	Scleral	12/24	6/7	Yearly	<a href="#">boston solution</a>
137	Social Occasions	25	F	Rural	Health Care	Soft	Hydrogel	Toric	4/24		Daily Disposable	
138	Gain Experience	23	M	Rural	Student	Hard Scleral	GP	Scleral		6/7	Yearly	<a href="#">boston solution</a>
139	Crisper Vision	19	F	Rural	Student	Soft	<a href="#">SiHy</a>	Toric	12/24	1/7	Monthly	<a href="#">optitru solution</a>
140	Social Occasions	21	M	Rural	Hospitality and Service Industry	Soft	Hydrogel	Toric	8-9/24		Daily Disposable	
141	Social Occasions	28	M	Urban	Student	Soft	<a href="#">SiHy</a>	Toric	7/24	2/7	Monthly	<a href="#">optitru solution</a>
142	Therapeutic	18	F	Rural	Student	Hard Scleral	GP	Spherical	10/24	7/7	Yearly	<a href="#">boston solution</a>

143	Social Occasions	15	F	Rural	Student	Soft	<a href="#">SiHy</a>	Toric	-	-	Daily Disposable	-
144	Social Occasions	29	F	Urban	Education & Social Services	Soft	<a href="#">SiHy</a>	Spherical	8/24	-	Daily Disposable	-
145	Cosmetics	61	F	Rural	Hospitality and Service Industry	Soft	Hydrogel	Toric	-	-	Daily Disposable	-
146	Social Occasions	29	F	Urban	Management & Business	Soft	<a href="#">SiHy</a>	<a href="#">Spherical</a>	14/24	-	Daily Disposable	-
147	Social Occasions	30	F	Rural	Student	Soft	Hydrogel	Toric and Spherical	-	-	Daily Disposable	-
148	Social Occasions	40	M	Urban	Education & Social Services	Soft	Hydrogel	Spherical	10/24	2/7	Daily Disposable	-
149	Therapeutic	26	M	Urban	Student	Hard (Scleral)	GP	Scleral	4/24	-	Yearly	<a href="#">boston solution</a>
150	Sports	42	F	Rural	Education & Social Services	Soft	Hydrogel	Multifocal Toric	12/24	3/7	Daily Disposable	-
151	Cosmetics	22	F	Rural	Student	Soft	hydrogel	Spherical	5/24	7/7	Daily Disposable	-
152	Therapeutic	14	M	Rural	Student	Hard (Scleral)	GP	Scleral	8-12/24	-	Yearly	<a href="#">boston solution</a>
153	Therapeutic	31	F	Urban	Management & Business	Hard (Scleral)	GP	Scleral	8-12/24	-	Yearly	<a href="#">boston solution</a>
154	Social Occasions	56	F	Rural	Management & Business	Soft	Hydrogel	Multifocal	8/24	3/7	Daily Disposable	-
155	Sports	24	F	Urban	Health Care	Soft	Hydrogel	Spherical	8/24	1/7	Daily Disposable	-
156	Gain Experience	55	F	Rural	Computer & Technology	Soft	Hydrogel	<a href="#">Mono vision</a>	8/24	3/7	Daily Disposable	-
157	Sports	30	F	Rural	Education & Social Services	Soft	<a href="#">SiHy</a>	Spherical	2/24	4/7	Biweekly	<a href="#">Optifree solution</a>
158	Social Occasions	29	F	Rural	Computer & Technology	Soft	Hydrogel	Toric	3/24	2/30	Daily Disposable	-
159	Previous Wearer	47	F	Rural	Unemployed	Soft	<a href="#">SiHy</a>	Multifocal	8/24	6/7	Daily Disposable	-
160	Crisper vision	20	F	Rural	Student	Hard (Scleral)	GP	Scleral	8/24	7/7	Yearly	<a href="#">boston Solution</a>
161	Cosmetics	26	F	Rural	Student	Soft	Hydrogel	Toric	6/24	2/7	Daily Disposable	-
162	Social Occasions	22	M	Rural	Student	Soft	Hydrogel	Toric	10-12/24	1/7	Daily Disposable	-
163	Previous wearer	22	M	Urban	Police	Soft	<a href="#">SiHy</a>	Spherical	10/24	5/7	Monthly	<a href="#">Biotrue solution</a>
164	Therapeutic	11	M		Unemployed	Soft	<a href="#">SiHy</a>	Spherical	4/24	1/7	Monthly	<a href="#">Biotrue solution</a>
165	Social Occassions	27	F	Rural	Computer & Technology	Soft	Hydrogel	Toric and Spherical	10/24	1/7	Daily Disposable	-
166	-	38	F	Rural	Architecture & Engineering	Soft	<a href="#">SiHy</a>	Toric	-	-	Monthly	<a href="#">Biotrue solution</a>
167	Crisper vision	6	M	Rural	Student	Soft	<a href="#">SiHy</a>	Spherical	3/24	5/7	Monthly	<a href="#">Biotrue solution</a>
168	Social Occasions	22	F	Rural	Student	Soft	Hydrogel	Toric and Spherical	8/24	2/7	Daily Disposable	-
169	Therapeutic	36	F	Urban	Student	Soft	<a href="#">SiHy</a>	Toric	18/24	7/7	Biweekly	<a href="#">Optifree solution</a>
170	Social Occasions	58	F	Urban	Unemployed	Soft	<a href="#">SiHy</a>	Multifocal			Daily Disposable	-
171	Social Occasions	28	F	Rural	Education & Social Services	Soft	Hydrogel	Spherical		1/7	Daily Disposable	-
172	Gain Experience	40	F	Rural	Management & Business	Soft	<a href="#">SiHy</a>	Multifocal	5/24	4/7	Monthly	<a href="#">Optifree solution</a>
173	Previous Wearer	43	F	Rural	Management & Business	Soft	Hydrogel	Spherical	10-12/24	7/7	Daily Disposable	-

174	Cosmetics	19	F	Urban	Student	Soft	Hydrogel	Toric		8/24		Daily Disposable	
175	Social Occasions	24	F	Rural	Education & Social Services	Soft	Hydrogel	Spherical		8/24	5/7	Daily Disposable	
176	Keratoconus	24	F	Urban	Student	Hard (Scleral)	GP	Scleral		>6/24	7/7	Yearly	Boston solution
177	Therapeutic	6	M	Rural	Student	Soft	<a href="#">Sihy</a>	Spherical		2-3/24	5/7	Monthly	<a href="#">Biotrue</a> solution
178	Social Occasions	21	M	Rural	Student	Soft	Hydrogel	Spherical		10-12/24	3-4/7	Daily Disposable	
179	Cosmetics	51	F	Rural	Management & Business	Soft	<a href="#">Sihy</a>	Toric		8/24	6/7	Biweekly	<a href="#">Biotrue</a> solution
180	Social Occasions	27	F	Rural	Computer & Technology	Soft	Hydrogel	Toric		8/24	3/30	Daily Disposable	
181	Therapeutic	38	F	Rural	Hospitality and Service Industry	Hard (Scleral)	GP	Scleral		10/24	7/7	Yearly	Boston solution
182	Therapeutic	53	F	Rural	Computer & Technology	Soft	<a href="#">Sihy</a>	Multifocal Toric			7/7	Monthly	<a href="#">Biotrue</a> solution
183	Crisper vision	53	M	Rural	Hospitality and Service Industry	Soft	<a href="#">Sihy</a>	Spherical		8/24	6/7	Monthly	<a href="#">Biotrue</a> solution
184		23	M	Rural	Student	Soft	Hydrogel	Toric and Spherical				Daily Disposable	
185	Social Occasions	33	M	Rural	Hospitality and Service Industry	Soft	Hydrogel	Toric		5-6/24	1/7	Daily Disposable	
186	Sports	36	F	Rural	Computer & Technology	Soft	Hydrogel	Spherical				Daily Disposable	
187	Social Occasions	20	F	Urban	Student	Soft	Hydrogel	Spherical				Daily Disposable	
188	Therapeutic	4	F	Urban	Unemployed	Soft	<a href="#">Sihy</a>	Spherical		4/24		Monthly	<a href="#">Biotrue</a> solution
189	Social Occasios	23	F	Rural	Student	Soft	Hydrogel	Spherical and Toric				Daily Disposable	
190	Gain Experience	40	F	Rural	Hospitality and Service Industry	Soft	<a href="#">Sihy</a>	Toric				Monthly	<a href="#">Biotrue</a> solution
191	Social Occasions	23	F	Rural	Computer & Technology	Soft	Hydrogel	Spherical		5/24	1/7	Daily Disposable	
192	Social Occasions	22	F	Urban	Student	Soft	Hydrogel	Spherical and Toric		12/24	3/7	Daily Disposable	
193	Therapeutic	33	M	Urban	Computer & Technology	Hard (Scleral)	GP	Spherical		12/24	7/7	Yearly	<a href="#">boston</a> solution
194	Cosmetics	51	F	Urban	Education & Social Services	Soft	Hydrogel	Multifocal Toric		4-6/24	1/7	Monthly	<a href="#">Biotrue</a> solution
195	Sports	25	M	Rural	Architecture & Engineering	Soft	Hydrogel	Spherical		8-12/24		Daily Disposable	
196	Sports	13	F	Rural	Student	Soft	Hydrogel	Spherical		2-3/24	2/7	Daily Disposable	
197	Sports	40	M	Rural	Management & Business	Soft	Hydrogel	Spherical		12/24	2/7	Daily Disposable	
198	Gain Experience	22	F	Rural	Computer & Technology	Soft	Hydrogel	Spherical and Toric		8/24	2/7	Daily Disposable	
199	Cosmetics	19	F	Urban	Student	Soft	Hydrogel	Toric				Daily Disposable	
200	Social Occasions	46	M	Urban	Health Care	Soft	<a href="#">Sihy</a>	Multifocal				Monthly	<a href="#">Optifree</a> solution
201	Cosmetics	18	F	Rural	Unemployed	Soft	<a href="#">Sihy</a>	Toric			7/7	Biweekly	<a href="#">Optifree</a> solution
202		22	F	Rural	Management & Business	Soft	Hydrogel	Spherical				Daily Disposable	
203		29	F	Urban	Computer & Technology	Soft	<a href="#">Sihy</a>	Toric		10/24	7/7	Biweekly	<a href="#">Optifree</a> solution

204	Social Occasions	26	F	Urban	Law	Soft	<a href="#">Sihy</a>	Spherical		6/24	7/7	Biweekly	<a href="#">Optifree</a> solution
205	Sports	42	M	Rural	Unemployed	Soft	<a href="#">Sihy</a>	Spherical		8/24	2/7	Biweekly	<a href="#">Optifree</a> solution
206	Previous Wearer	21	M	Rural	Student	Soft	<a href="#">Sihy</a>	Toric and Spherical		10-12/24	3/7	Monthly	<a href="#">Optifree</a> solution
207	Cosmetics	30	F	Rural	Health Care	Soft	Hydrogel	Toric				Daily Disposable	
208	Previous Wearer	23	F	Urban	Student	Soft	Hydrogel	Spherical				Daily Disposable	
209	Previous Wearer	24	M	Urban	Health Care	Soft	<a href="#">Sihy</a>	Toric				Biweekly	<a href="#">Optifree</a> solution
210	Previous Wearer	30	M	Rural	Computer & Technology	Soft	<a href="#">Sihy</a>	Toric				Biweekly	<a href="#">Optifree</a> solution
211	Previous Wearer	45	F	Rural	Education & Social Services	Soft	<a href="#">Sihy</a>	Multifocal				Monthly	<a href="#">Biotrue</a> solution
212	Sports	22	M	Urban	Student	Soft	Hydrogel	Spherical		7/24	2-3/7	Daily Disposable	
213	Previous Wearer	56	F	Urban	Unemployed	Soft	<a href="#">Sihy</a>	Toric		2/24	2/7	Biweekly	<a href="#">Optifree</a> solution
214		24	F		Student	Soft	Hydrogel	Toric		6/24	1/7	Daily Disposable	
215	Career	32	M	Urban	Hospitality and Service Industry	Soft	Hydrogel	Spherical		3/24	6/7	Daily Disposable	
216	Social Occasions	20	F	Rural	Student	Soft	Hydrogel	Toric		4/24	1/7	Daily Disposable	
217	Sports	26	F	Rural	Student	Soft	<a href="#">Sihy</a>	Spherical		5/24	4/7	Biweekly	<a href="#">Optifree</a> solution
218	Social Occasions	25	M	Urban	Computer & Technology	Soft	Hydrogel	Toric			5/7	Daily Disposable	
219	Social Occasions	27	F	Urban	Education & Social Services	Soft	Hydrogel	Toric		5/24	5/7	Daily Disposable	
220		60	M		Unemployed	Soft	<a href="#">Sihy</a>	Toric		6/24	3/7	Biweekly	<a href="#">Optifree</a> solution
221	Therapeutic	32	M	Urban	Management & Business	Hard (Scleral)	GP	Spherical		12/24	7/7	Yearly	<a href="#">boston</a> solution
222	Cosmetics	22	F	Urban	Student	Soft	Hydrogel	Toric		12/24	7/7	Daily Disposable	
223	Therapeutic	32	M	Rural	Management & Business	Hard (Scleral)	GP	Scleral		16/24	7/7	Yearly	<a href="#">boston</a> solution
224	Cosmetics	29	F	Rural	Hospitality and Service Industry	Soft	<a href="#">Sihy</a>	Toric		9/24	7/7	Monthly	<a href="#">Optifree</a> solution
225	Therapeutic	23	F	Rural	Student	Hard (Scleral)	GP	Spherical		4/24	1/7	Yearly	<a href="#">boston</a> solution
226	Therapeutic	22	M	Urban	Student	Hard (Scleral)	GP	Spherical		14/24	7/7	Yearly	<a href="#">boston</a> solution
227	Cosmetics	21	F	Urban	Student	Soft	Hydrogel	Spherical		4/24	1/7	Daily Disposable	
228	Previous Wearer	23	M	Rural	Student	Soft	Hydrogel	Spherical		6-10/24	1/7	Daily Disposable	
229	Previous Wearer	34	F	Urban	Education & Social Services	Soft	<a href="#">Sihy</a>	Toric		14/24	5/7	Biweekly	<a href="#">Optifree</a> solution
230	Social Occasions	28	F	Rural	Student	Soft	Hydrogel	Toric		2/24	2/7	Daily Disposable	
231	Career	26	F	Rural	Education & Social Services	Soft	Hydrogel	Spherical		5/24	5/7	Daily Disposable	
232	Previous Wearer	24	F	Urban	Computer & Technology	Soft	Hydrogel	Spherical		4/24	1/7	Daily Disposable	
233	Social Occasions	25	F	Urban	Student	Soft	Hydrogel	Spherical		8/24	1/7	Daily Disposable	

234	Social Occasions	35	F	Urban	Education & Social Services	Soft	Hydrogel	Spherical	4/24	4/7	Daily Disposable	
235	Sports	64	F	Urban	Unemployed	Soft	Sihy	Multifocal	10/24	1/7	Daily Disposable	
236	Gain Experience	21	F	Urban	Student	Hard (Scleral)	GP	Spherical	6/24	2/7	Yearly	
237	Gain Experience	25	F	Urban	Management & Business	Hard (Scleral)	GP	Spherical	4/24	3/7	Yearly	
238	Social Occasions	20	F	Urban	Student	Soft	Hydrogel	Spherical		2/7	Daily Disposable	
239	Social Occasions	46	M	Rural	Computer & Technology	Soft	Sihy	Multifocal	12/24	1/7	Daily Disposable	
240	Sports	22	M	Urban	Student	Soft	Hydrogel	Spherical	12/24	1/7	Daily Disposable	
241	Previous Wearer	22	M	Rural	Student	Soft	Sihy	Toric	10/24	5/7	Biweekly	Optifree solution
242		33	F	Urban	Hospitality and Service Industry	Soft	Sihy	Spherical	3/24	4/7	Biweekly	Optifree solution
243	Therapeutic	17	F	Rural	Student	Hard (Scleral)	GP	Spherical	10/24	7/7	Yearly	boston solution