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**Knowledge, attitudes and practices of Trinidad and Tobago's  
population towards Ultraviolet eye Protection.**

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## **ABSTRACT**

Background: Ultraviolet light contributes significantly to a multitude of eye-related pathologies amongst the Caribbean population due to our climate and geographical location. While there are various international studies concerning the knowledge, attitudes and practices (K.A.P) of the public on UltraViolet eye protection, no such data is available in Trinidad and Tobago. A hindered quality of life can manifest from such eye pathologies which often require surgical intervention in the more progressed stages. No prior data concerning UltraViolet eye protection has been collected in Trinidad and Tobago before and this study aims to fulfil this role. The findings gathered can be implemented into preventative measures of UV related eye pathologies specific to the Trinidad and Tobago population.

Aim: To assess the knowledge, attitudes and practices of Trinidad and Tobago's population towards Ultraviolet eye protection.

Method: A quantitative cross-sectional study was done among the targeted 385 participants in Trinidad and Tobago for which data collection occurred from February 2021 to May 2021. A structured questionnaire was utilized both online and physically, which contained questions that assessed demographics, knowledge, attitude and practices.

Results: Of the targeted population of 385 persons, 234 questionnaires were completed thus having a 60.78% response rate for which (29.87%) came from in-person and (30.91%) online. The mean age and standard deviation (SD) of participants were ( $36.17 \pm 14.222$ ) in-person and ( $24.34 \pm 9.405$ ) online. The in-person questionnaires reflected a true representation of the mean age of Trinidad and Tobago ( $p=0.984$ ) whereas the online questionnaires were skewed to a younger age group 18-24 years where ( $p<0.001$ ).

About (90-100%) participants for both mediums were aware that UV exposure contributes to skin cancer however less than half, (49.5%) in-person and (44.5%) online, were aware of its link to pterygium and cataract. Participants who expressed UV protective eyewear as being important to them, (55.8%) in-person and (53.8%) online, also showed a link to utilizing it for the intended purpose of preventing UV radiation from entering the eyes as well as reducing glare and light intensity whereas some, (34.5%) in-person and (48.6%) online, still saw it as a fashion accessory. It was also found that those who found personal importance of UV protective eyewear were more likely to use it often. The most popular reason for not using protective eyewear was a lack of thought put towards the topic in general, (62.1-76.6%).

Conclusion: This study was able to prove that there is indeed a lack of knowledge among the Trinidad and Tobago population concerning the effects of UV exposure and the eyes. However positive correlations between knowledge, attitudes and practices were found which infers that by increasing knowledge through patient educational programs, positive attitudes will be promoted, in turn encouraging better practices.

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

Ultraviolet radiation (UVR) is a type of electromagnetic radiation, naturally produced by the sun. Its wavelength ranges from 10-400 nm and can also be divided into UVA, UVB and UVC of which, UVA and UVB can contribute to some common eye pathologies. This is due to their high energy rays which can penetrate living tissue and disrupt chemical reactions and molecules causing major biological consequences.<sup>1,2</sup> In particular, DNA readily absorbs UVB radiation which causes the disruption of hydrogen bonds in the molecular structure. This is the mechanism that leads to many cancers where cells multiply uncontrollably; it can also lead to uncontrolled cell death. Some of these occurrences may fall into the scope of detection by optometric service, but many pathologies can also directly affect the eye as an organ.

Ultraviolet exposure has been extensively documented to contribute to skin cancers and is widely known to do so by the general population, however UV radiation (UVR) exposure is also a contributing factor in the development of many ocular pathologies; photokeratitis, pterygium, macular degeneration and cataracts being a few examples of conditions that become more likely to develop with increased UVR exposure over time.<sup>1,3,4,5</sup> For the average person, there are many different means of protecting their eyes such as sunglasses, Transitions® Light Intelligent Lenses™ and ACUVUE® OASYS with Transitions™ contact lenses; all of which have advantages and disadvantages. Sunglasses, for instance, are more efficient at blocking UVR with a more encapsulating design akin to that of goggles.<sup>6</sup> Lenses only protect the inner surface of the eye and not the outer structures which are also at risk of damage. With all products, however, consumers must be aware that not all UV filters are made equally.<sup>7</sup>

Knowledge about what methods protect the eyes as well as attitudes towards using them have been examined in other international studies however, concerning the Caribbean no such study has been conducted.

The goals of this study are to focus on assessing the quality of knowledge and the perceptions held by Trinidad and Tobago's population on the use of eyewear designed to limit the transmittance of Ultraviolet radiation. The researchers aimed to evaluate these factors with the use of online and in-person questionnaires as well as discern any trends within different demographics.

The research and its corresponding questions were designed to uncover insights and determine whether the population of Trinidad and Tobago understands the importance of such protection. The significance of the study is to inform optometric professionals of public opinion on UV rays with regards to eye health in Trinidad and Tobago. It would also entail ways we can approach to get this information across, such as educational programs and enhanced patient care.

## **1.1 Background of the study**

Past research surrounding the use of UV protective measures have been explored internationally to differing extents, and not all are related to the ocular system specifically, however, there are no local or regional studies related to this specific topic. This research will therefore compare itself to research done overseas. The lack of data availability on UV effects on the eyes within Trinidad and Tobago is a matter of concern, considering that the UV index within the Caribbean is very high in comparison to other regions<sup>8,9</sup> due to our geographical location. According to a study done by Vashist P. and his colleagues in 2020,<sup>10</sup> it was found that geological location does play a role in the formation of ocular pathologies, more specifically cataracts as investigated in this study where it was found that regions in India located closer to the equator reported the highest rate of cataract formation. Similarly, in a study conducted by Liu L and colleagues,<sup>11</sup> investigated the geographical prevalence and risk factors for pterygium where a strong positive correlation between regions located geographically higher and the prevalence of pterygia was found. In considering our tropical climate and the amount of sun exposure experienced in the Caribbean, this study would be quite beneficial to both optometric personnel within Trinidad and Tobago as well as the consumers of the services provided by them, since there seems to be an increased risk of developing UV related eye pathologies within regions of similar climate due to location.

## **1.2 Statement of the Problem or Rationale of study/Motivation for the study**

The eye is one of the most susceptible organs to sun-induced damage. However, only a few people associate UV radiation with eye-related problems. Most effects of UV radiation are not sudden but rather cumulative over our lifetime thus young persons need to take early precautions in protecting their eyes.<sup>1,2,4</sup> While it may be generally understood within the optometric profession that Trinidad and Tobago has a high incidence rate of Ultra Violet related eye pathologies due to our geographical location and climate<sup>11</sup> it is uncertain of how aware the rest of the population are about the damaging effects of UV radiation to the eyes and the importance of wearing UV eye protection. The UV Index amongst the Caribbean countries is very high compared to temperate countries such as the US, UK and Canada<sup>8,9</sup> thus the population of Trinidad and Tobago is at a greater risk of developing UV related pathologies. Ample supplies of UV protection (sunglasses, photochromic lenses and photochromic contact lenses) are available in Trinidad and Tobago and are recommended by optometrists in private and institutional practices but the cases continue to be higher than a global average. There is also no data available for analysis to support a reason for this high incidence nor that a high incidence has been observed by optometrists in Trinidad and Tobago. Regarding the hypothesis, the research aims to compare the knowledge, attitudes and perceptions of the Trinidad and Tobago population with those of international populations examined through similar studies, albeit ones not focused on the ocular system but are still related to UV exposure and the knowledge and practices used to combat it.

The research also aims to determine if the same perceptions and behaviours are held by the same groups within the population or if there is a delineation of opinion between some demographics.

In perspective, this analysis of the demographics will allow those who use the information gathered in the study to easily identify areas of greater concern for education and awareness.

### **1.3 Aim or Purpose of the study**

This study aims to assess the knowledge, attitudes and practices of Trinidad and Tobago's population towards Ultraviolet eye protection as well as to gather an area of unexplored data locally which can hopefully be used to ultimately benefit the field of optometry concerning patient education and awareness.

### **1.4 Specific objectives of the study**

During the duration of this study we hope to cover the following objectives:

1. To determine the level of awareness of what UV related pathologies are.
2. To determine the level of knowledge about UV protective eyewear.
3. To determine the populations' attitude towards using UV protection.
4. To determine the frequency of UV eye protection usage.
5. To determine the factors that influence the populations' willingness to use UV eye protection.

### **1.5 Research questions**

1. What is the level of awareness within the population of Trinidad and Tobago?
2. What does the population know about UV protective eyewear?
3. What is the population's attitude towards using protective UV eyewear?
4. Does the population use UV protective eyewear frequently?
5. What are the reasons why the population may not want to wear UV protective eyewear?

### **1.6 Hypothesis**

Hypothesis: There is a lack of knowledge of the effects of UV radiation on the ocular system as well as how to effectively utilize UV protective eyewear.

Questions Related to Hypothesis:

- How much correct knowledge does the general population know about the harms of UV exposure?
- How much correct knowledge does the general population know about the purpose of UV protective eyewear?
- What opinions do the general population hold towards the use of UV protective eyewear?
- How does the general population use UV protective eyewear, if ever?

### **1.7 Significance of the study**

This study would enable us to grasp the level of awareness, attitudes and just overall knowledge the public may have regarding the topic of UV eye protection. This knowledge would be able to help optometric personnel understand the factors which limit personnel from effectively using UV eye protection by further understanding if there are any misconceptions regarding UV eye protection by the public. This study would be quite beneficial to both optometric personnel within Trinidad as well as the consumers of the services provided by them, such that due to our tropical climate and increased risk of developing UV related eye pathologies, the data collected will serve as a vehicle for driving the importance of why Optometrists should recommend and educate patients on the use of UV protective eyewear. Also, during screenings and outreach community activities, optometry students can endorse more frequent UV eye protection usage and the implementation of public health programmes in the optometric service.

### **1.8 Delimitation of the study**

This study concentrated on the public population in Trinidad and Tobago and assessed those over the age of 18. It was conducted both online and in person. The in-person aspect of this study was conducted in various public places across Trinidad such as gyms, shopping areas and various businesses whilst the online part was sent to various personnel through social media platforms.

## **1.9 Limitation of the study**

A major impediment to this study was the current global pandemic caused by the Covid-19 virus. The data collection process was affected due to lack of physical contact caused by the Covid-19 virus (Inability to physically collect data in Tobago hence only online questionnaires will be used there). Another limitation was the lack of Secondary data on our topic in Trinidad and Tobago. There was also participation bias where responses from online questionnaires were not guaranteed. Also, not all persons approached by the researcher agreed to participate in the study due to their time constraints. Concerning the type of data collection chosen, that being questionnaires, in-depth data could not be obtained therefore limiting the amount of information gathered from the population. Literacy skills were required to complete the questionnaire so if a person was illiterate the questionnaire could not be completed. Response bias also existed whereby participants may not have answered truthfully especially in the section where practices were evaluated.

Respondents may have found the questionnaire tedious resulting in a questionnaire not being completed. The closed-ended questions also would have led to forced decisions leading to respondents feeling pressured into giving “socially acceptable” answers.

## **1.10 Definition of terms**

1. Ultraviolet (UV) – Invisible rays that are part of the energy that comes from the sun, can burn the skin, and cause skin cancer. It can also be broken down into 3 types of rays, ultraviolet A, B and C, each having their implications on life.<sup>12</sup>

2. UV Protection Eyewear – These are specific glasses in which the lenses have UV blocking properties that block most of the harmful UV A & B light from damaging the eyes.<sup>6</sup>
3. Photochromic lenses – a light-sensitive spectacle lens that reduces light transmission in sunlight and increases transmission in reduced light.<sup>13</sup>
4. Pterygium – This is a noncancerous growth of the conjunctiva that can interfere with vision if it progresses aggressively. It is usually caused by UV light exposure and rarely affects vision.<sup>14</sup>
5. Cataracts – This is when the lens of the eye becomes hazy, blurry or cloudy due to the breaking down of proteins within the lens. UV light is a major factor when it comes to the formation of cataracts, UV eye protection can help prevent it.<sup>15</sup>
6. Municipalities – this is usually a town or district that has its local government. In Trinidad, the municipalities are the cities of Port-of-Spain and San Fernando, the Boroughs of Arima, Chaguanas and Point Fortin.<sup>16</sup>
7. Cross-sectional study – refers to analyzing observational data within a population at a given time.<sup>17</sup>
8. Socio-demographic – This refers to the general characteristics of a population such as age, gender, ethnicity, educational level, location, e.t.c.<sup>18</sup>
9. Low Vision – According to the WHO, low vision refers to someone who has a best-corrected visual acuity of 20/60 or a visual field less than 10 degrees from the point of fixation.<sup>19</sup>
10. Willingness – is the urge or readiness of a person who is prepared to perform a task.<sup>20</sup>
11. Awareness – is the act of having knowledge or concern about a certain topic or fact.<sup>21</sup>

12. Attitude – the way that you think and feel about someone or something.<sup>22</sup>
13. Quantitative research – this is research based on traditional scientific methods that generate numerical data.<sup>23</sup>
14. Conjunctiva – the thin layer that covers the front of the eye and the inside of the eyelids.<sup>24</sup>

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

Main sources of information have been obtained from international studies as no similar studies were currently conducted in the targeted population. The study by Alghamdi, AlAklabi and AlQantini in 2016,<sup>25</sup> showed an increase in knowledge about sun protection and skin cancers from respondents who were in the female, young and student categories, meanwhile, men and young were associated with long hours of sun exposure. This trend of young female students being more knowledgeable and cautionary about the sun was implied to be due to cosmesis. Inference can be made that females are more open to using sun protection as it is viewed as decoration or accessory and find it more socially acceptable than those outside this category. Likewise, males, who are possibly more exposed to the sun due to work, a lack of concern for cosmesis or social norms spend more time exposed to UV. Although not directly related to eye protection, they can be extended to the current study due to UV related focus of both studies.

These trends may be true for the local population as well but can diverge due to differing societal norms and social customs. Youth may also not correlate to increased sun exposure in the local population as in more modern times, the youth is seen as “shut-ins,” spending extensive hours on electronic devices. Additionally, the study reported that 41% of respondents never used sunscreen which is the primary defence against UV rays expected of the participants. A similar conclusion may be drawn in this study where sunglasses and UV tinted optical correction are not as commonly used as initially thought.

Another study conducted by Janjani and colleagues<sup>26</sup> had similar gender demographic correlations but the researchers also analysed the correlation between knowledge and attitude, and behaviour and knowledge, both of which had at least some degree of positive correlation. This illustrates that programmes centred around improving the quality of knowledge in the population can be an effective tool for increased UV protective eyewear and practices. This finding can also be the contrary in the local population for this study, in which case other means of encouraging proper eye protection may need to be utilised by both private and public sources.

In contrast to the two studies discussed above, research done by Yurtseven and colleagues,<sup>27</sup> found that both men and women had the same level of knowledge about the negative and positive effects of the sun. However, there was a small increase in the use of protective measures taken by females than males, which can be true for the target population of this study. Despite this, the current research focuses on eye protection which may have no gender difference due to spectacles or optical correction of some kind being necessary to both.

The study by Kirk and Greenfield<sup>28</sup> showed that both genders possessed adequate knowledge about skin cancer and UV exposure, but the primary motivator for sun-protective behaviours was body image. Kirk and Greenfield concluded that “Public health strategies may benefit from appearance-related skin cancer prevention campaigns, encouraging safer parental sun-related habits and correcting sun-related misconceptions,” which is the expected utilisation of the information gathered by the current study.

A study was done by Gao, Liu and Liu<sup>29</sup> in China also centred their research around UV effects and public opinion and was conducted with a greater focus on the eye.

The study done through self-administered multiple-choice questionnaires discovered that the prevention of skin cancers was the main reason for reducing sun exposure at 55.4% but preventing ocular damage was at 1.8%. Additionally, knowledge of skin cancer and sunburn was 95.6% and 92.2% respectively while 27.8% knew of cataracts and 3.1% knew of pterygium. A survey conducted in the UK <sup>30</sup> found that 30% of the population are unaware of the damaging effects of UVR on the eyes and 69% were unaware that it can cause cataracts. Furthermore, only 40% of sunglasses wearers use them to protect their eyes from UV exposure, and 17% thought they were “a waste of money.”

Sunglasses in particular are held under differing national standards but, generally, they must withstand up to 50 hours of exposure to a 450 W solar simulator. This standard test is currently being improved upon due to the findings of Masili and Ventura’s study <sup>31</sup> where the results were inconclusive and the proposed UV protection standards are not a true indicator of the life expectancy of the product. As such, sunglasses should be replaced every few years as the strength of the UV filter degrades over time and may need to be replaced more frequently by users that are more frequently exposed to UV. Another study was done by Giannos and Kraft <sup>32</sup> provided details on the effectiveness of various types of sunglasses and lens blanks as well as their proposed protection percentage claims.

The findings concluded that there is a need to assess sunglasses and eyewear before they are purchased because some of the sunglasses tested did not provide adequate UV eye protection as advertised by sellers, nor did increased price correlates to greater UV protection.

Similar to this was a study conducted by Rifai and Hornauer,<sup>33</sup> comparing the efficiency of various clear lenses with coatings against UV rays. It was found that clear lenses with UV coatings effectively absorbed and reduced direct UV exposure, in turn protecting the eye from UV rays.

In addition to sunglasses and clear UV filter lenses, Photochromic lenses, and photochromic contact lenses is another option for UVR protection. Senofilcon A class 1 UV-blocking contact lenses have been tested to significantly reduce the protein changes responsible for UVB related pathologies.<sup>34,35,36</sup> In conjunction with the above-mentioned methods, studies show that the use of eyewear alone does not fully protect the ocular and orbital structures due to the area of coverage, style, size and facial structure.<sup>36,37</sup> However contact lenses do not protect the conjunctiva, coated clear lenses and mid-sized sunglasses do not protect the lids and UV rays are reflected from the side of spectacle frames, therefore it is has been advised that persons should wear sun hats and reduce exposure during peak hours of the day, usually around 10 a.m. to 2 p.m.<sup>25,36</sup> These behaviours are therefore essential in reducing the amount of UV exposure to the ocular structures and should be known and utilised by the target population.

## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 Ethical consideration**

Permission before the commencement of this study was given by the UWI Optometry Unit to investigate the chosen topic. Ethical approval was also granted by the UWI Ethics committee after applying and completing a consent form which was distributed, along with the in-person questionnaires to each of the participants. These consent forms entailed the description of what a K.A.P study is as well as the purpose for conducting the research and the importance of the study was explained. It also explained that the questionnaire was designed to gather their insights and opinions from the population which would be kept anonymous and treated with confidentiality. The rights of participants were also mentioned and the fact that no harmful effects would have occurred throughout the duration of this one-time study. It was also explained to participants that giving consent and partaking in this study was completely voluntary and refusal to participate would be duly respected thus they would not be penalised. It was also explained to participants that the data collected from them would be securely stored in a password protected file in a password protected laptop only accessible to the researchers of this study for the duration of the study. Once the participant read through the consent form, understood what the study entailed and signed it in agreement we administered the questionnaire to them. While filling out the questionnaires participants were allowed to ask any questions about the study about any further benefits or risks which they may have been concerned about.

### **3.2 Research design**

This research was designed to be an observational cross-sectional study that focused on the opinions and perceptions of the general population of Trinidad and Tobago towards UltraViolet protective eyewear. Through the use of self-administered in person and online questionnaires, primary data was collected from a simple random sample of the general population in Trinidad. These consisted of 16 close-ended questions and 4 open-ended questions. The questionnaires were distributed to around 430 persons over the age of 18 via social media such as Whatsapp groups, Facebook and Instagram through a directed google forms link as well as in person at locations such as malls and other shopping centres, health centres and various other public places within the 5 municipalities of Trinidad namely the cities of Port-of-Spain and San Fernando as well as the Boroughs of Arima, Chaguanas and Point Fortin. The questionnaires were objected towards obtaining information about the participants' perception, awareness and knowledge regarding the effects of UV exposure to the eyes, ways harmful effects of this exposure can be reduced, the importance of using protective wear, and the appropriateness of UV protective eyewear usage. All participants were informed of the design and purpose of this study, then provided with a written informed consent form ensuring firstly that they fully understand what they are partaking in before signing. The socio-demographic parameters considered and included within the questionnaire such as age, gender and educational level, were recorded. In addition, the estimated frequency of participants' UV protective eyewear usage and their source of information regarding protective eyewear was addressed in the questionnaire. The data obtained were analyzed using SPSS for those collected in person as well as for the online questionnaires. This analysis was focused on finding the standard deviation and p-values for each question asked under the components of Knowledge, Attitudes and Practices separately.

### **3.3 Study population**

For this study, residents of Trinidad and Tobago were included in the study population. This consisted of participants who were between the ages of 18 to 71. The socioeconomic class of participants was not considered for this study however their age, gender for the in-person questionnaires and education level were included to determine if they played any statistically significant role in the variables assessed.

#### **3.3.1 Study site or Area of study**

This study was conducted both in-person within the 5 municipalities of Trinidad, those being the cities of Port-of-Spain and San Fernando, the Boroughs of Arima, Chaguanas and Point Fortin as well as through online social media platforms. The city of Port of Spain which is also the capital is located in the northwestern part of Trinidad. Port-of-Spain is considered to be urban and located here is the chief port. There are several buildings of historical interests such as the President's house, the White Hall which is the office of the country's prime minister, the Redhouse as well as the various production facilities and other governmental ministries. The city of San Fernando is located in the southwestern part of Trinidad and is considered one of the most populated municipalities second to Chaguanas. There is also another port located here. San Fernando is urban and is essentially an administrative and trading centre that has the country's largest oil refinery.

The borough of Arima is located in the north-central part of Trinidad and is known for its rich history of the 'first peoples' an indigenous group known as the Amerindians. Arima is considered urban with many business places including shopping centres and groceries.

The Borough of Chaguanas, named after the indigenous group that settled there known as the Chaguanes is the largest in Trinidad. It is located in central Trinidad. Chaguanas although it is considered urban has been known for being an agricultural centre with its thriving produce markets. There are also many business places located here. The Borough of Point Fortin is the smallest borough in Trinidad and is located in the southwestern part of Trinidad it is considered rural due to the small number of businesses existing here. Point Fortin is also known for being an oil and natural gas hub.

### **3.3.2 Inclusion criteria**

All English-speaking persons over the age of 18, who live in Trinidad and Tobago were eligible to participate in this study. Persons with visual impairments were not excluded, this includes blind and low vision persons. As long as participants understood why the research is being done and gave their consent to participate they were included to ensure that we got an accurate representation of the various groups within the country.

### **3.3.3 Exclusion criteria**

All persons who are not residents of Trinidad and Tobago were not included in this study since the study aims to collect data representative of this population. Persons under the age of 18 were not included because the questionnaire required a certain level of comprehension to be completed.

### **3.4 Sample size and sampling technique**

This study had a calculated sample size of 385 persons. These persons were chosen at random for both the online and in-person questionnaires. Once they fitted the inclusion criteria they were allowed to proceed in filling out the questionnaire. However, for any participant who fell within the exclusion criteria, being under the age of 18 and not a resident of Trinidad and Tobago, they were not allowed to participate. For the online questionnaires, if any persons within the exclusion criteria tried to partake in the study, their responses were considered invalid and thus not used in the analysis.

#### **3.4.1 Sample size determination**

An online sample size generator, Raosoft, was used to determine what the sample size for this study should be for a 95% confidence level and a 5% margin of error. A total of 385 persons from among the population of Trinidad and Tobago was estimated. However, the researchers increased the number to 430 persons to account for any lack of responses.

#### **3.4.2 Sampling technique**

We utilized a random sampling method in selecting the subjects for this study. We firstly divided the country into its respective municipalities such as the cities of Port-of-Spain and San Fernando, the Boroughs of Arima, Chaguanas and Point Fortin. We aimed to gather questionnaires from each municipality thus leading to a very diverse and broad amount of the population involved in this study.

### **3.5 Tests and instrument/equipment**

Self-administered online and in-person questionnaires were used for data collection during this study. The in-person questionnaires were distributed to the persons who were randomly selected within the 5 municipalities which the group visited and the online questionnaires were sent out via a link so that any interested persons over the age of 18 residing in Trinidad and Tobago would have been able to complete it.

### **3.6 Data collection procedure**

#### **In-person Questionnaires:**

Step 1. Persons within public locations of the 5 various municipalities were approached and asked whether they would be interested in partaking in our study. It was explained that the questionnaire would be anonymous and refusal to participate would have no consequences.

Step 2. The purpose of the study and the need for informed consent before participation as well as confidentiality was explained to interested persons after which they were given a consent form to sign.

Step 3. The questionnaires were distributed and participants were allowed to ask any questions while filling it out if they needed any clarity.

Step 4. After completing the questionnaires were placed into a separate plastic bag which was sealed and sanitized in keeping with Covid-19 protocols.

Step 5. After the collection of questionnaires from the various municipalities, they were removed from the sealed bags after 2 weeks and the data was recorded on an excel sheet which was saved in a password-protected file on a password-protected laptop.

### **Online Questionnaires:**

Step 1. A google form link to the online questionnaire was created and sent out to groups on various social media platforms such as Instagram, Facebook and WhatsApp asking residents of Trinidad and Tobago who are over the age of 18 to participate.

Step 2. A thorough description of the study explaining the purpose, aim and need for informed consent before participation was presented at the beginning of each online questionnaire.

Step 3. Since we were unable to obtain the physical signatures of those who did these questionnaires, we included an option to select within the questionnaire itself in which the participant could give their consent to participate and then proceed to fill out the questionnaire.

Step 4. After completion of the online questionnaires, the responses were recorded on an excel sheet and saved in a password-protected file on a password-protected laptop.

### **3.7 Data analysis**

The data collected was carefully checked, coded and analyzed using the Statistical Package for Social Sciences (SPSS) software version 24.0 for windows. Descriptive statistics were used to generate descriptives for continuous variables and frequencies for nominal variables. A contingency chi-square test was used to assess the association.

A  $p < 0.05$  denotes significance at a 95% confidence interval (CI). Pearson's Correlation was executed on interval or ratio scale variables and Spearman's rho was executed on ordinal variables.

The data collected for both the in-person and online questionnaires were treated separately such that two identical analyses were performed on the set of data from each source with the omittance of gender as a variable in the online medium.

## CHAPTER FOUR

### 4.0 RESULT

Age Classification	Number of respondents	
	In-person Questionnaires, n=115	Online Questionnaires, n=119
18-24	34 (29.6%)	99 (83.2%)
25-30	15 (13.0%)	8 (6.7%)
31-40	26 (22.6%)	1 (0.8%)
41-50	22 (19.1%)	4 (3.4%)
51-60	11 (9.6%)	5 (4.2%)
60+	7 (6.1%)	2 (1.7%)
<b>Average age and SD</b>	36.17 ± 14.2	24.34 ± 9.4

*Table 1: Age demographics of respondents*

Sex	In-person Questionnaires, n=115	Online Questionnaires, n=119
Male	44 (39.3%)	-
Female	68 (60.7%)	-

*Table 2: Gender demographics of respondents*

Education	Number of respondents	
	In-person Questionnaires, n=115	Online Questionnaires, n=119
Secondary or lower	43 (38.1%)	21 (17.9%)
Tertiary	60 (52.2%)	92 (78.6%)
Masters, PHD, etc.	10 (8.7%)	4 (3.4%)

*Table 3: Education demographics of respondents*

Knowledge			
No.	Question (correct answer)	In-person correct respondents (%), n=115	Online correct respondents (%), n=119
<b>What do you believe is true about sun exposure?</b>			
1	Necessary for Vitamin D production (True)	102 (89.5%)	116 (97.5%)
2	Causes growths on or near the eyes (True)	55 (49.5%)	53 (44.5%)
3	Can cause skin cancers (True)	102 (91.1%)	119 (100%)
4	Causes cataracts (True)	77 (69.4%)	69 (58%)
5	Allows UV rays to enter the eyes (True)	103 (92.8%)	106 (89.1%)

<b>6</b>	Sunglasses should be replaced every few years (True)	71 (61.7%)	57 (47.9%)
<b>What practices can help protect eyes and eyelids from sun exposure?</b>			
<b>7</b>	Wearing sunglasses, photochromic lenses or photochromic contacts (yes)	114 (99.1%)	117 (98.3%)
<b>8</b>	Wearing a hat (yes)	88 (79.3%)	84 (70.6%)
<b>9</b>	Reducing time outside from 10 a.m. to 3 p.m. (yes)	65 (58.6%)	85 (71.4%)
<b>10</b>	Staying in the shade outdoors (yes)	75 (67.6%)	86 (72.3%)
<b>Do you think the following features affect UV protection?</b>			
<b>11</b>	Size (yes)	55 (49.5%)	67 (56.3%)
<b>12</b>	Darker lenses (no)	25 (25.2%)	22 (18.5%)
<b>13</b>	100% UV filter (yes)	106 (94.6%)	115 (96.6%)
<b>14</b>	Polarisation (no)	22 (19.5%)	23 (19.3%)
<b>15</b>	Price (no)	75 (68.2%)	76 (63.9%)
<b>16</b>	Colour lenses (no)	61 (55.5%)	57 (47.9%)
<b>Knowledge score % (mean ± SD)</b>		<b>65.16 ± 14.32</b>	<b>65.76 ± 10.97</b>
<b>Knowledge Quality of Respondents</b>			

<b>Good</b>	92 (80%)	104 (87.4%)
<b>Poor</b>	23 (20%)	15 (12.6%)

*Table 4: Knowledge regarding features of sunglasses, methods of protecting the eyes and associated structures from UV effects, and general effects of sunlight exposure*

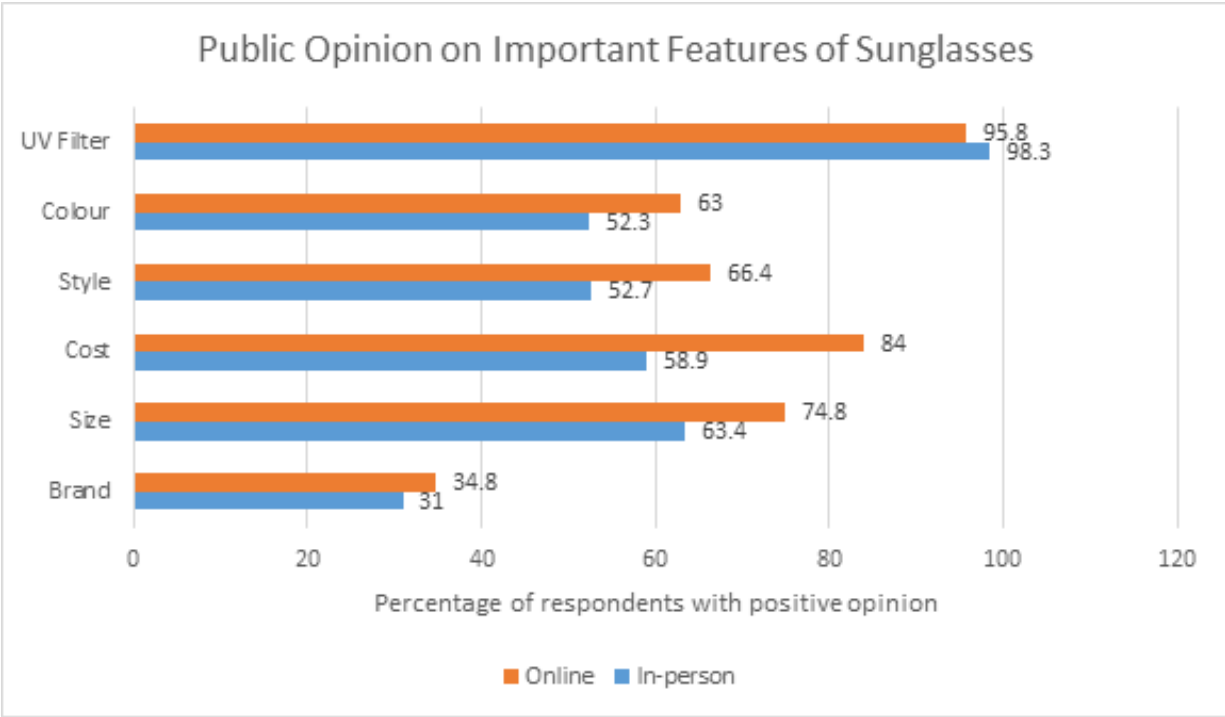
<b>How important is wearing UV protection to you?</b>	<b>Number of respondents</b>	
	<b>In -person respondents (%), n=115</b>	<b>Online respondents (%), n=119</b>
Not Important	3 (2.7%)	0 (0%)
Not very important	12 (10.6%)	15 (12.6%)
Somewhat important	35 (31.0%)	40 (33.6%)
Very important	63 (55.8%)	64 (53.8%)

*Table 5: Level of importance placed on the personal use of UV eye protection.*

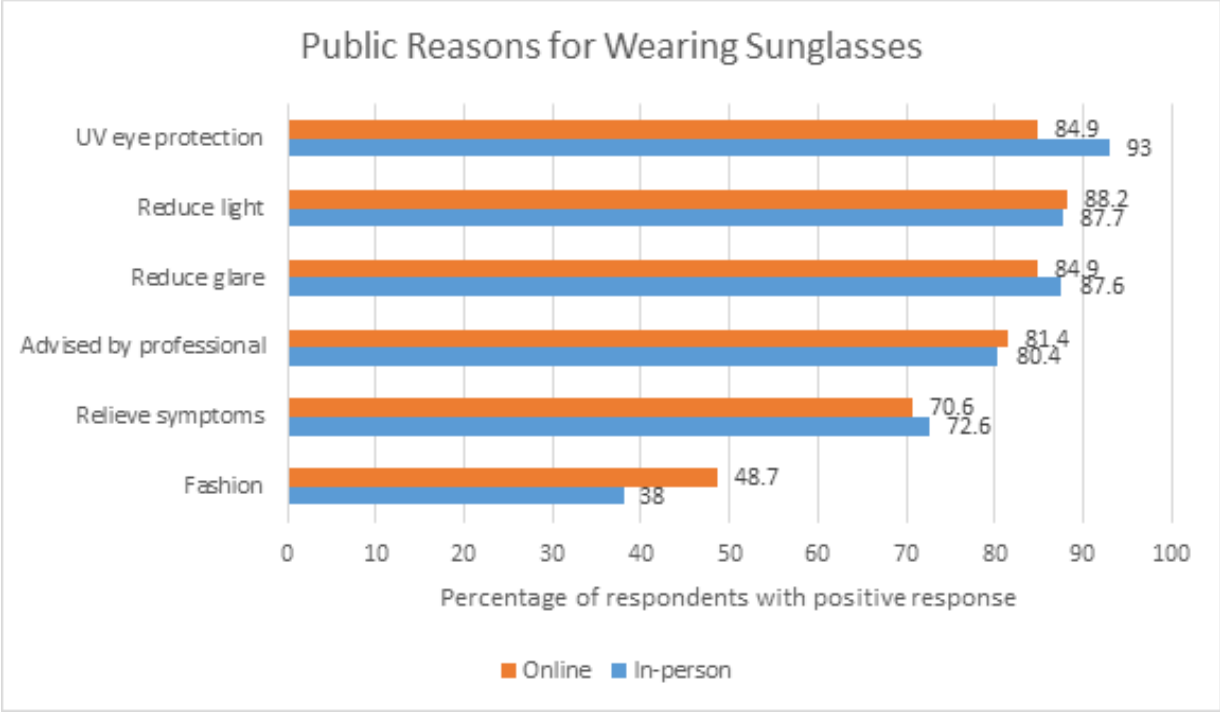
<b>Attitudes</b>			
<b>No</b>	<b>Question (correct answer)</b>	<b>In-person correct respondents (%), n=115</b>	<b>Online correct respondents (%), n=119</b>
<b>What would you consider important when selecting sunglasses?</b>			
<b>1</b>	Brand (no)	78 (69.0%)	78 (65.5%)
<b>2</b>	Size (yes)	71 (63.4%)	89 (74.8%)
<b>3</b>	Cost (no)	46 (41.1%)	19 (16.0%)
<b>4</b>	Style (no)	53 (47.3%)	40 (33.6%)
<b>5</b>	Colour (no)	52 (47.7%)	44 (37.0%)
<b>6</b>	100% UV protection filter (yes)	113 (98.3%)	114 (95.8%)
<b>What would be your main reasons for wearing sunglasses, if you were to?</b>			
<b>7</b>	Fashion (no)	75 (67.0%)	61 (51.3%)
<b>8</b>	Reduce glare (yes)	99 (87.6%)	101 (84.9%)
<b>9</b>	Reduce light intensity (yes)	100 (87.7%)	105 (88.2%)
<b>10</b>	Relieve symptoms (yes)	82 (72.6%)	84 (70.6%)

<b>11</b>	Advised by health professional (yes)	90 (80.4%)	97 (81.5%)
<b>12</b>	Eye protection from UV rays (yes)	107 (93.0%)	101 (84.9%)
<b>Attitude score % (mean ± SD)</b>		<b>70.00 ± 20.08</b>	<b>65.37 ± 15.80</b>
<b>Attitude Quality of Respondents</b>			
<b>Positive</b>		93 (80.9%)	96 (80.7%)
<b>Negative</b>		22 (19.1%)	23 (19.3%)

*Table 6: Attitudes regarding the personal importance of sunglasses features and reasons for wearing sunglasses.*



*Figure 1: Graph illustrating the percentage of respondents that stated a feature of sunglasses was important during selection.*



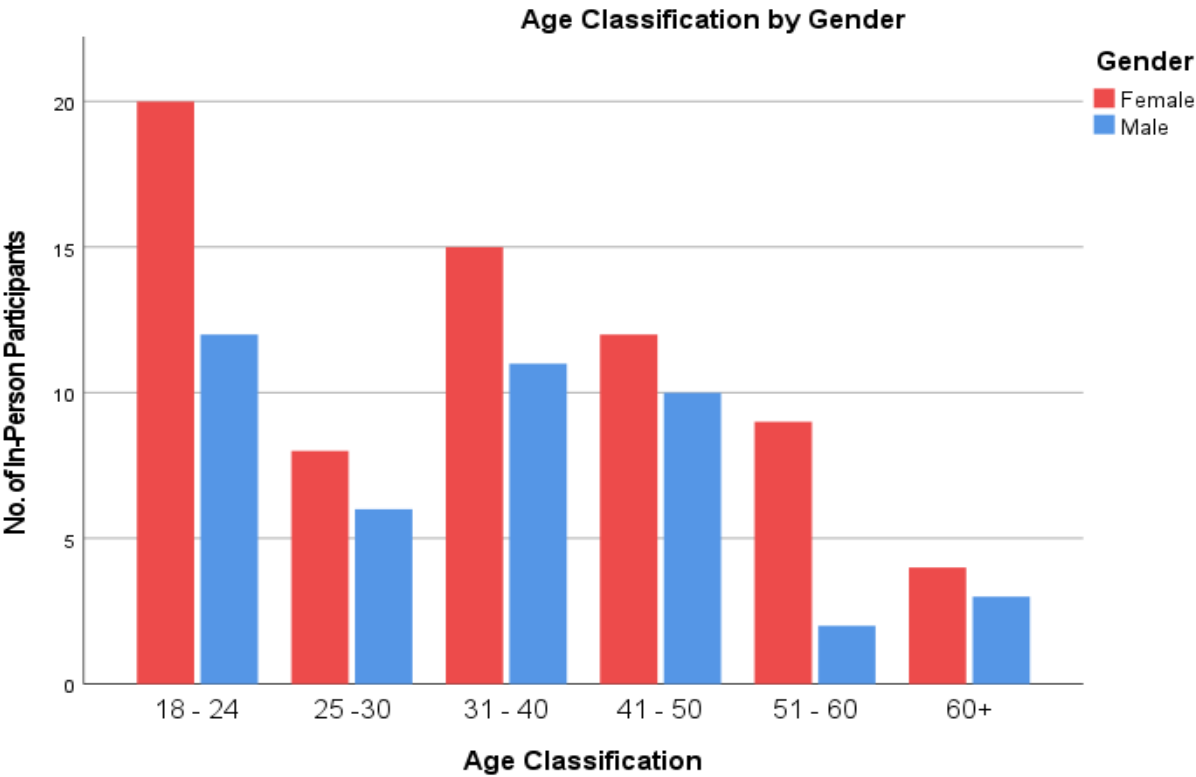
*Figure 2: Graph illustrating the percentage of respondents that started a reason for wearing sunglasses applied to them.*

<b>Practices</b>			
<b>No</b>	<b>Question (correct answer)</b>	<b>In-person Correct respondents (%), n=115</b>	<b>Online Correct respondents (%), n=119</b>
<b>1</b>	Do you use any UV eye protection? (Yes)	86 (74.8%)	72 (60.5%)
<b>2</b>	How often do you wear UV eye protection? (Often - sometimes)	70 (61.4%)	60 (50.4%)
<b>3</b>	If you were to purchase UV protective eyewear, where would you go first? (at a registered optical company)	87 (76.3%)	76 (63.9%)
<b>Practices score % (mean ± SD)</b>		<b>70.43 ± 35.26</b>	<b>58.36 ± 37.13</b>
<b>Practice Quality of Respondents</b>			
<b>Good</b>		77 (67.0%)	65 (54.6%)
<b>Poor</b>		38 (33.0%)	54 (45.4%)

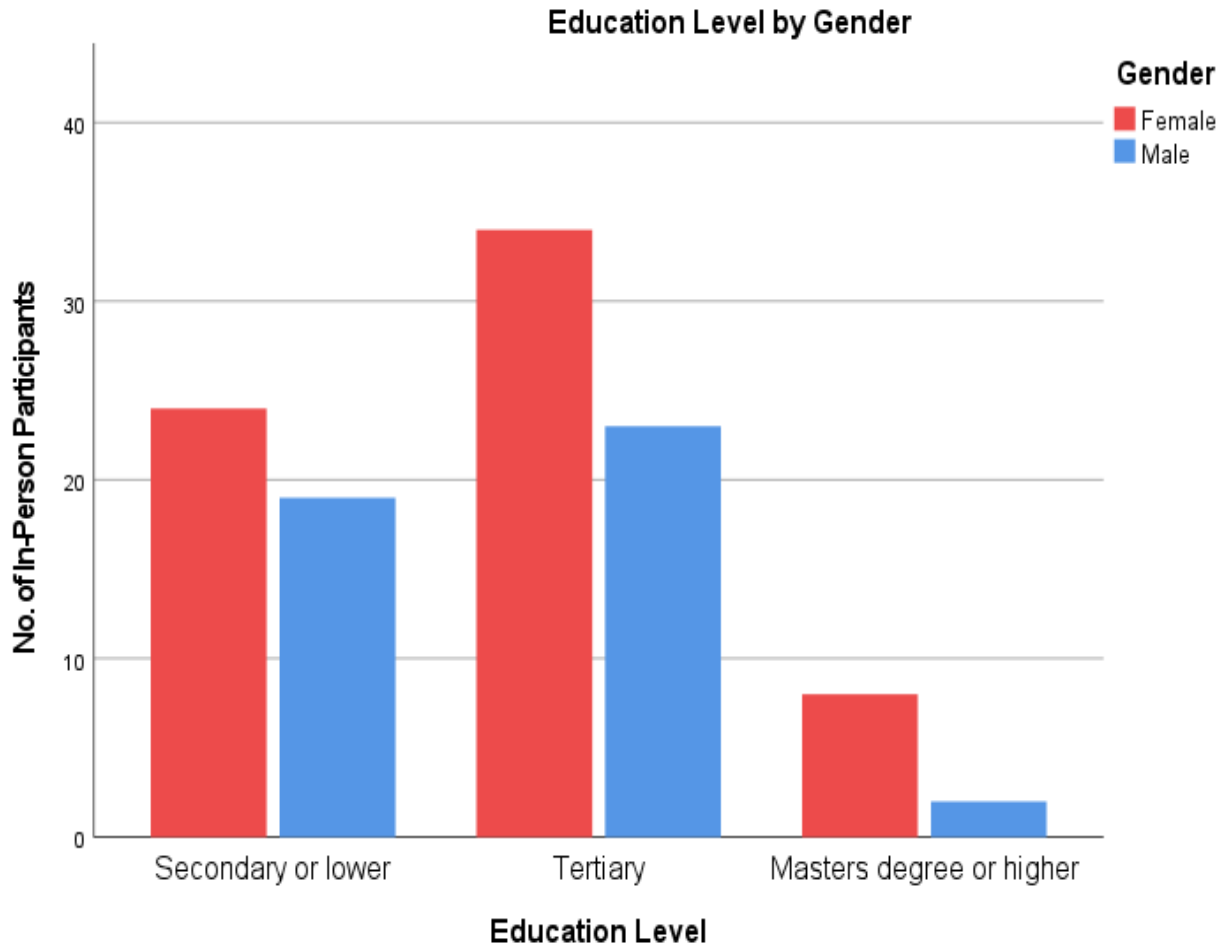
*Table 7: Practices of the respondents regarding the use, frequency of usage of forms of UV eye and selection of the outlet to purchase UV protective eyewear.*

Preferred Method of Purchasing UV Protective Eyewear	In-person Response, n=115	Online Response, n=119
At a registered optical company	87 (76.3%)	76 (63.9%)
At a sunglasses retailer	8 (7.0%)	10 (8.4%)
Online	9 (7.9%)	15 (12.6%)
It does not matter	10 (8.8%)	18 (15.1%)

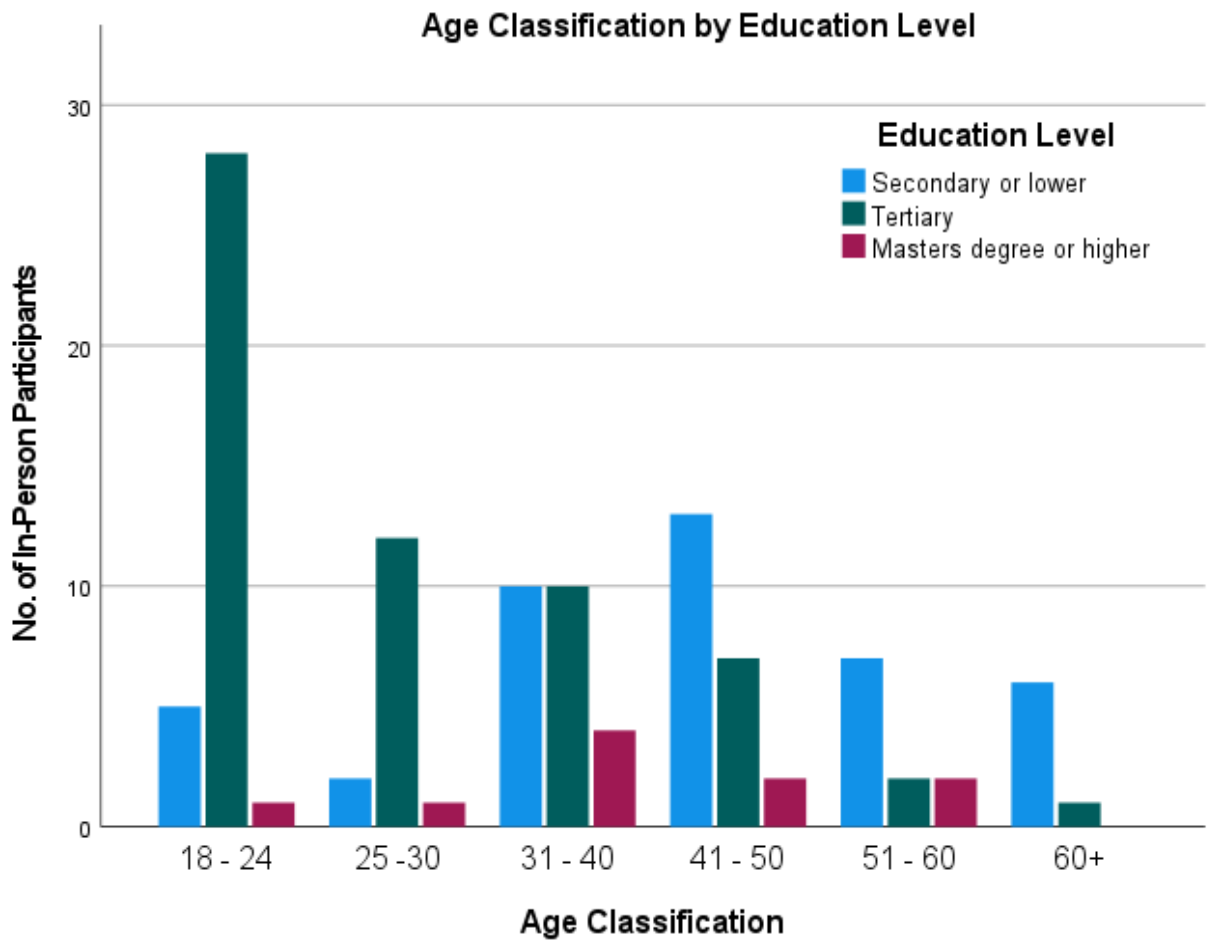
*Table 8: Preferred means of purchasing UV eye protection.*



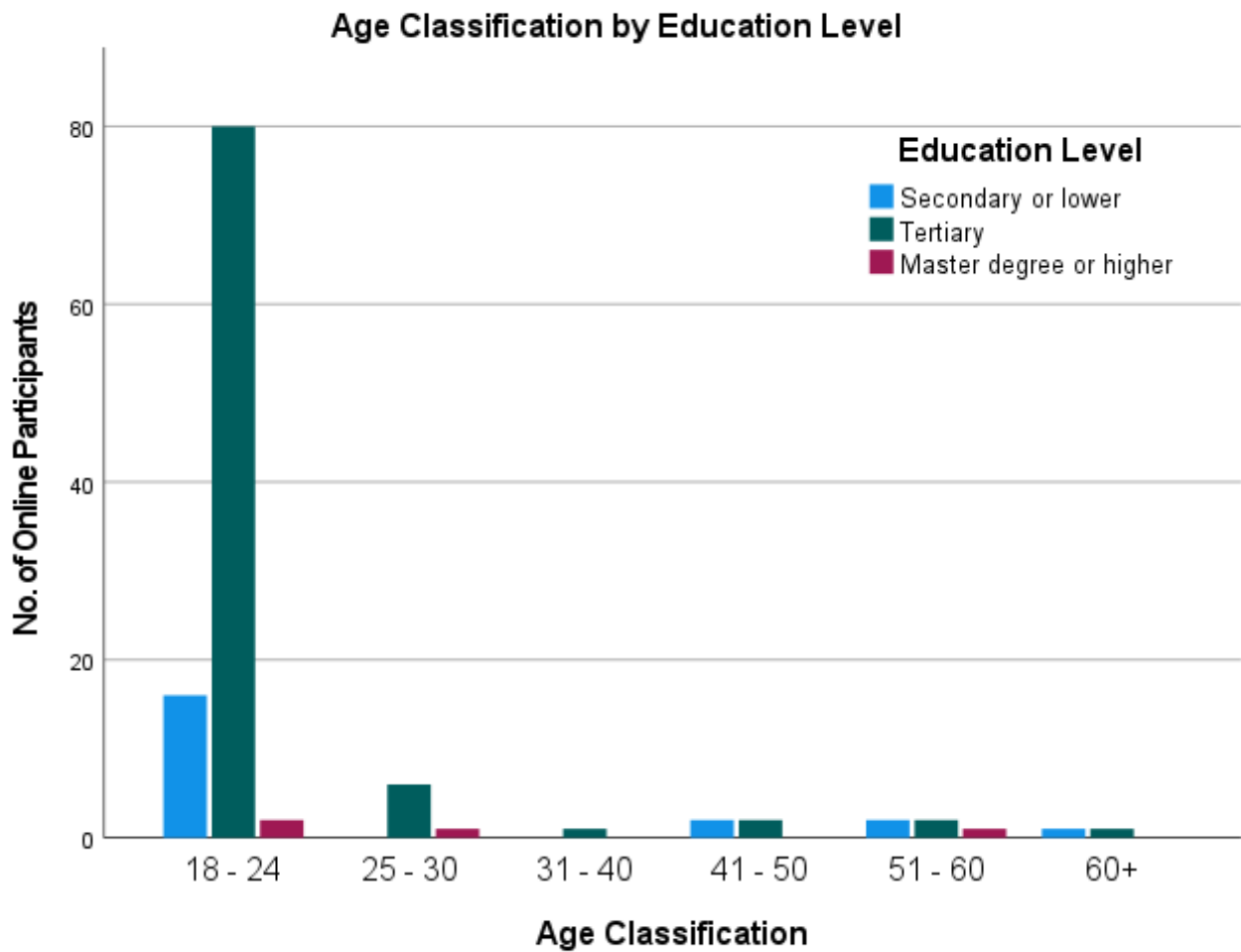
*Figure 3: Graph showing age demographics with respect to gender.*



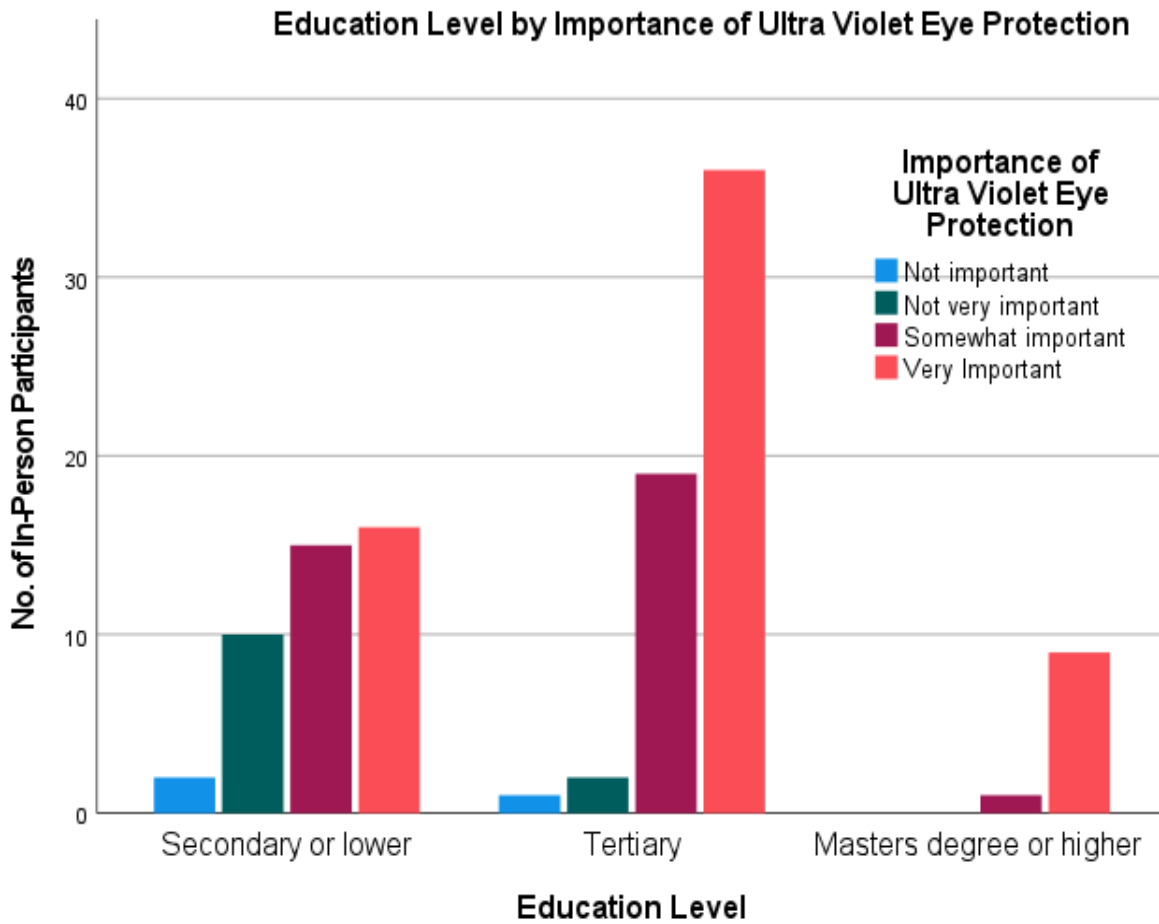
*Figure 4: Graph showing education demographics with respect to gender.*



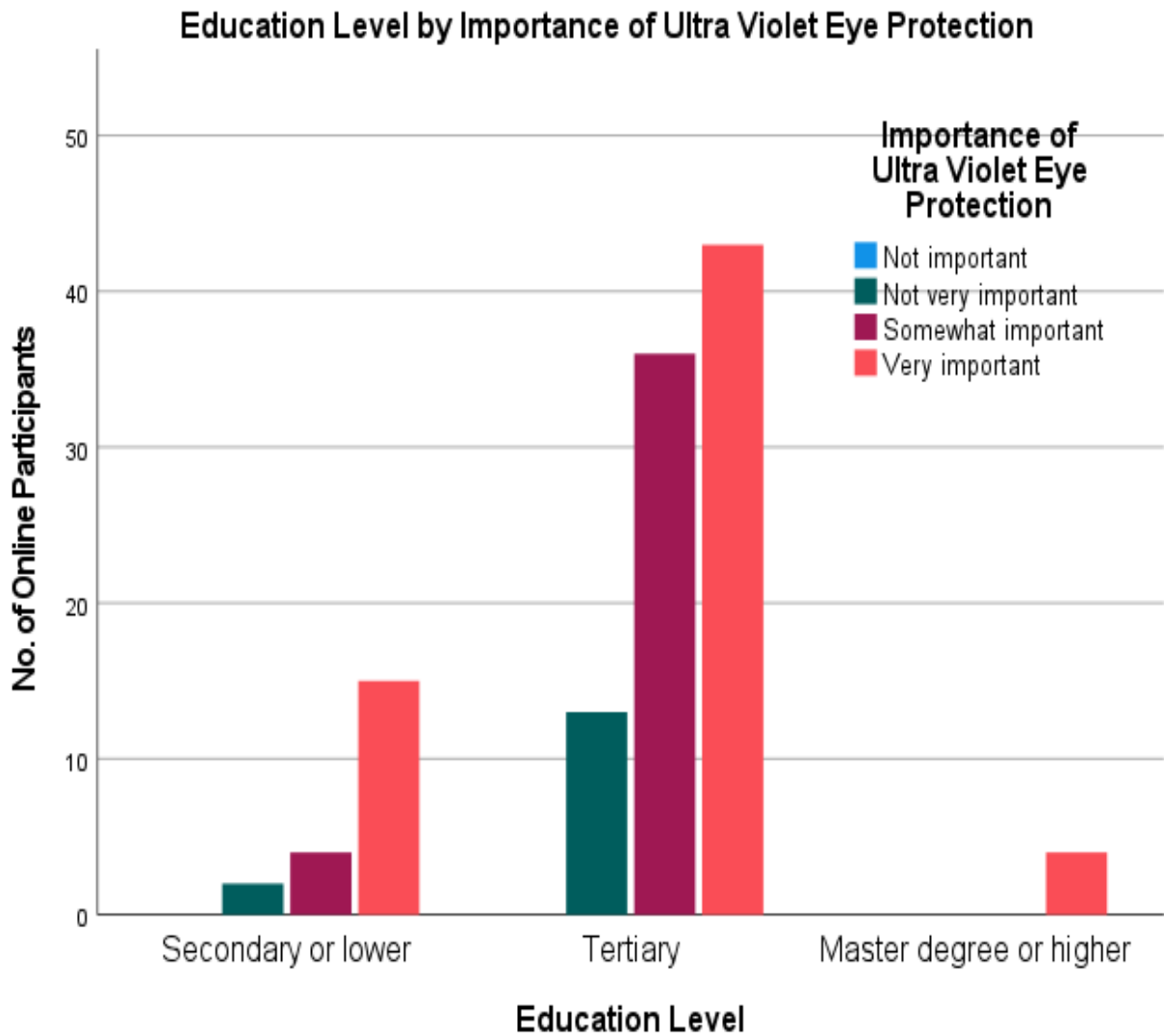
*Figure 5: Graph showing age demographics with respect to education level for in-person respondents.*



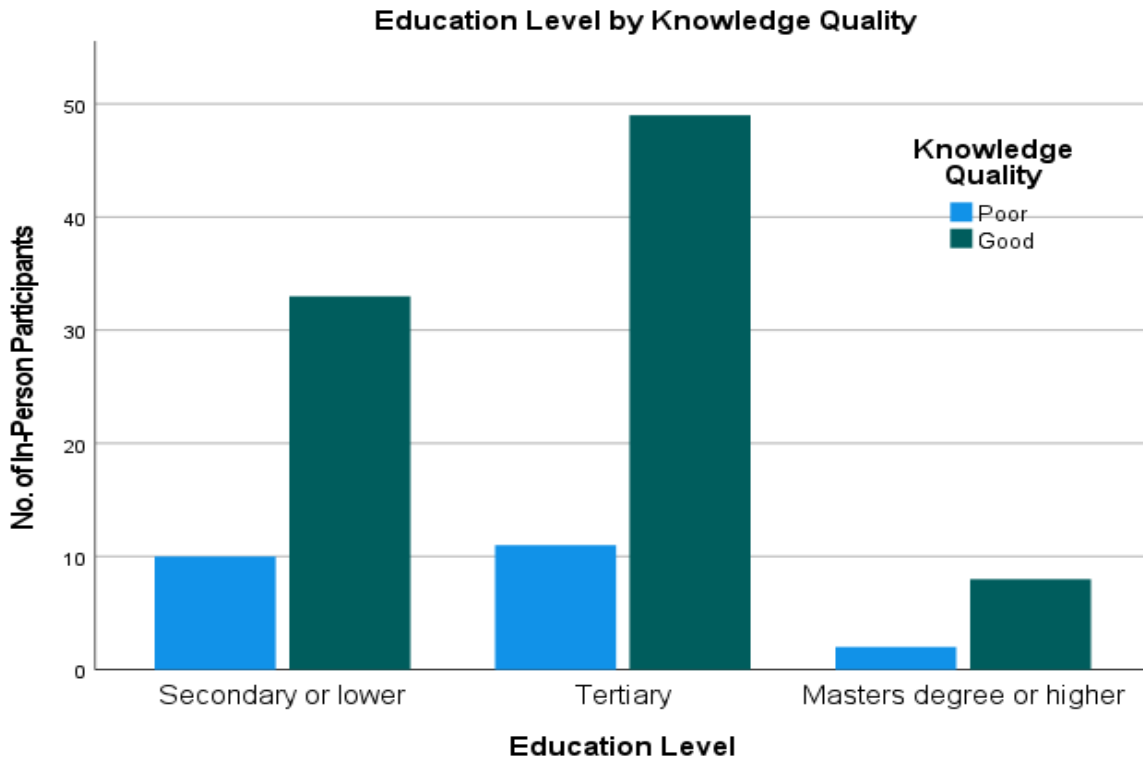
*Figure 6: Graph showing age demographics with respect to education level for online respondents.*



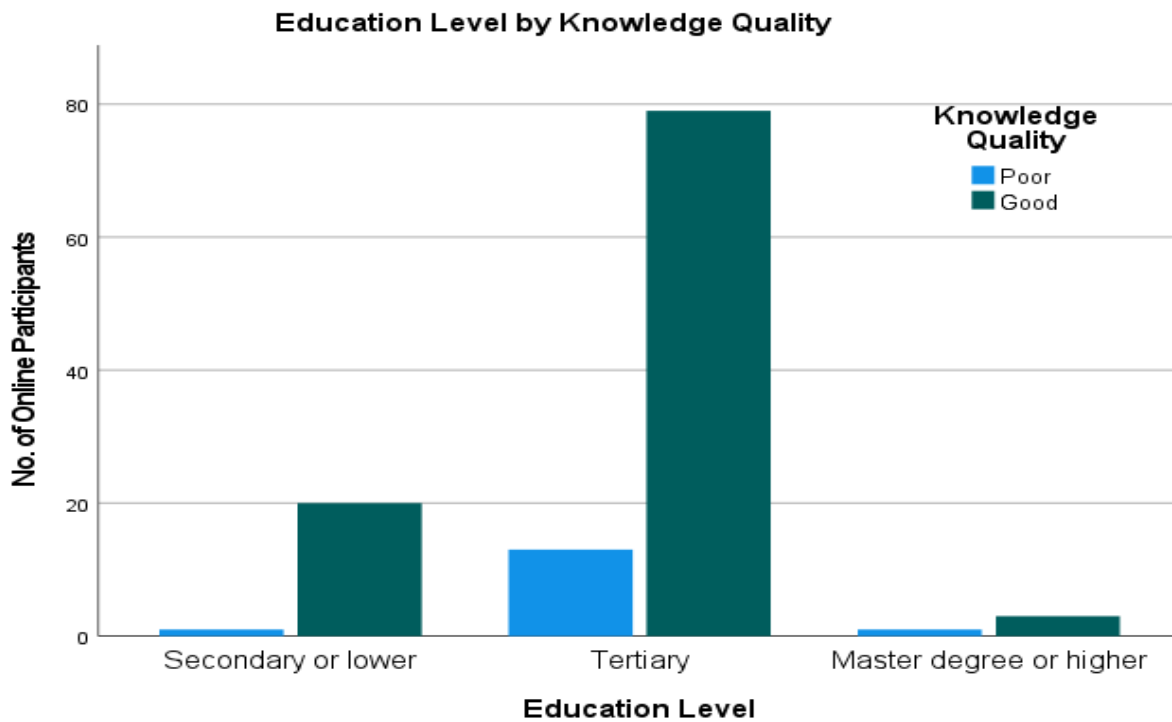
*Figure 7: Graph of education level with respect to level of importance placed on the personal use of UV eye protection for in-person respondents.*



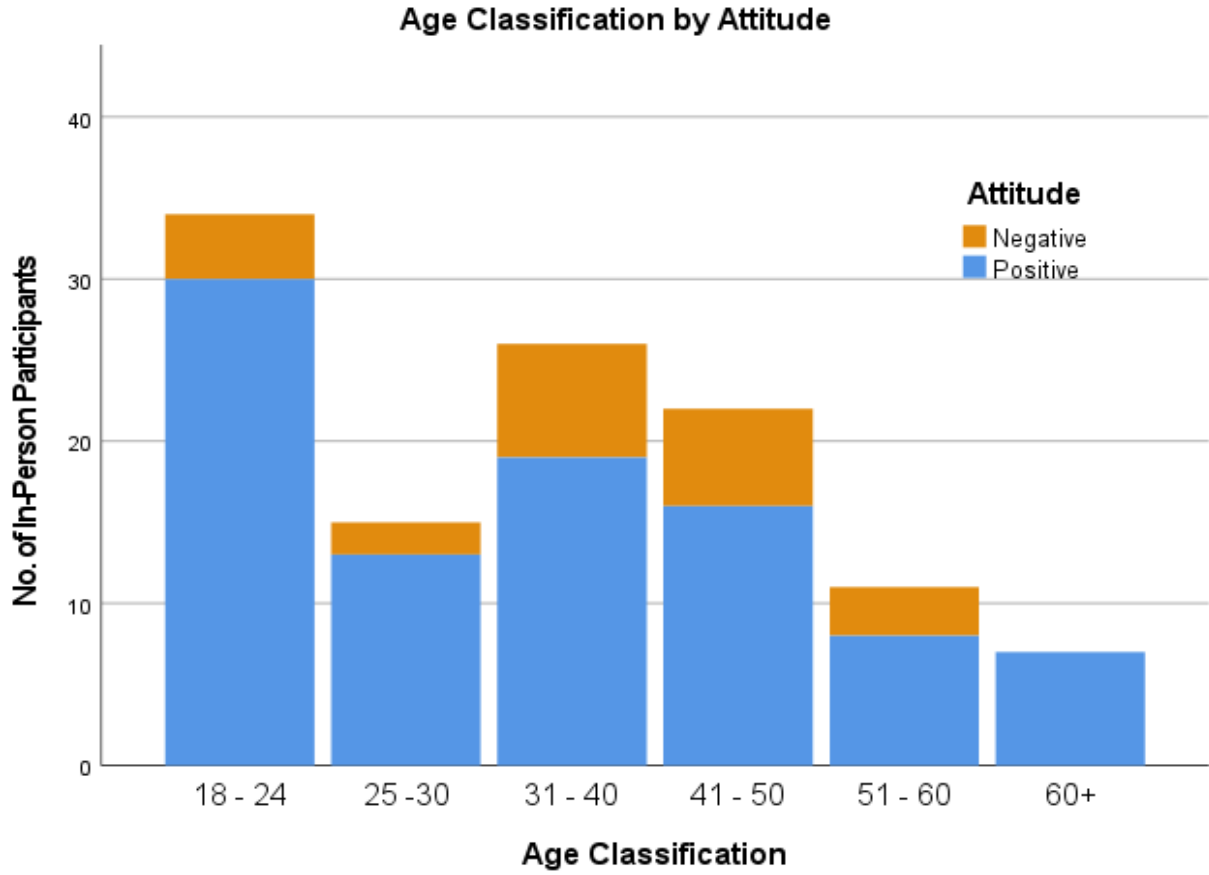
*Figure 8: Graph of education level with respect to level of importance placed on the personal use of UV eye protection for online respondents.*



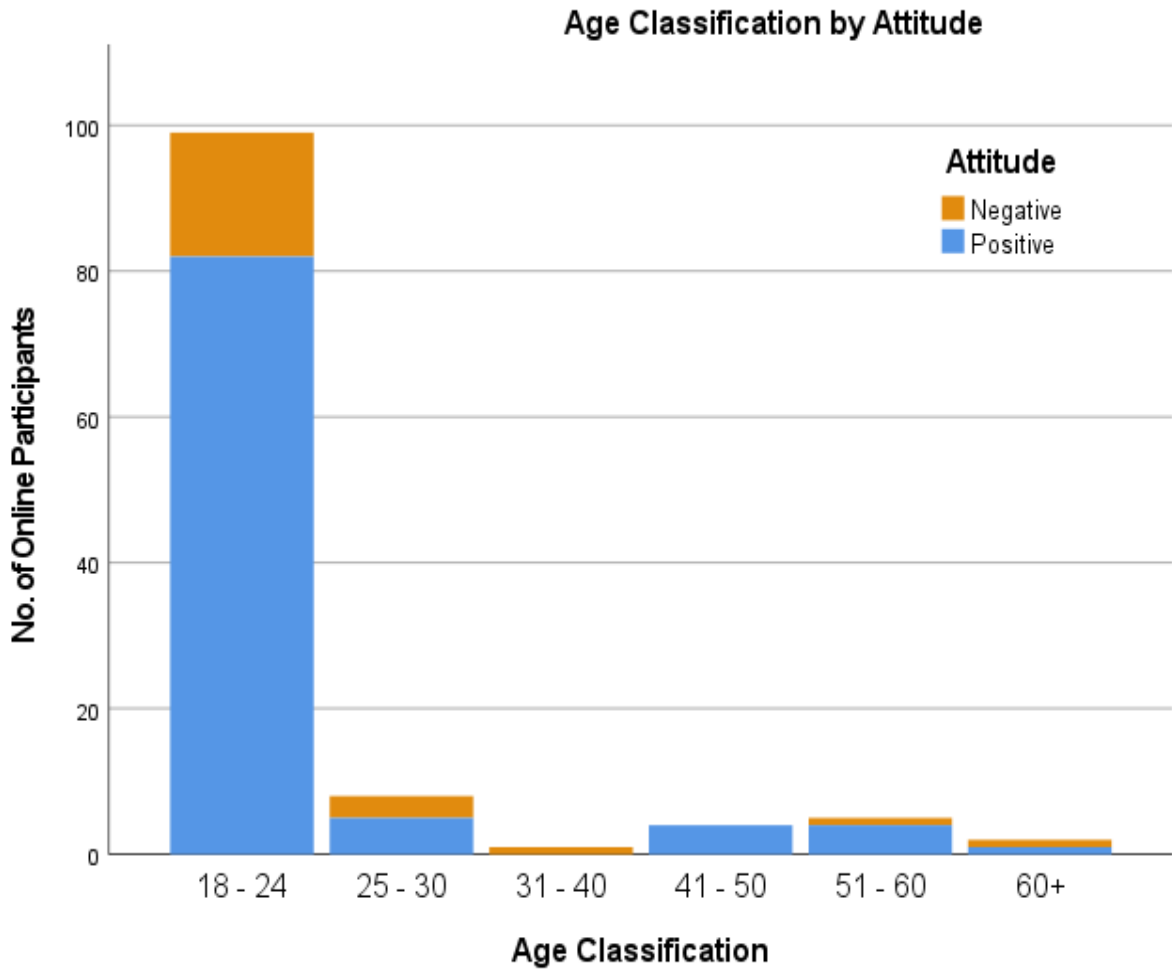
*Figure 9: Graph of education with respect to knowledge quality, for in-person respondents.*



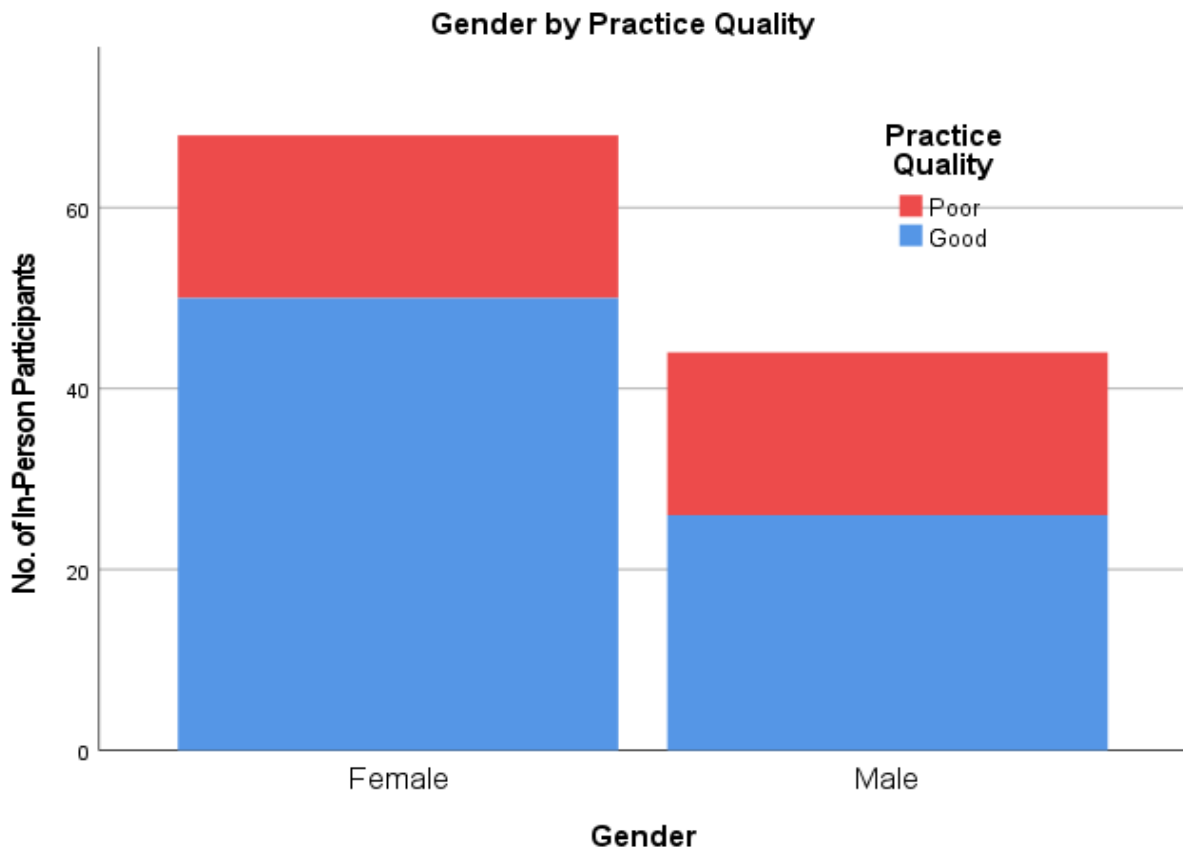
*Figure 10: Graph of education with respect to knowledge quality, for online respondents.*



*Figure 11: Graph of age demographics with respect to attitude, for in-person respondents.*



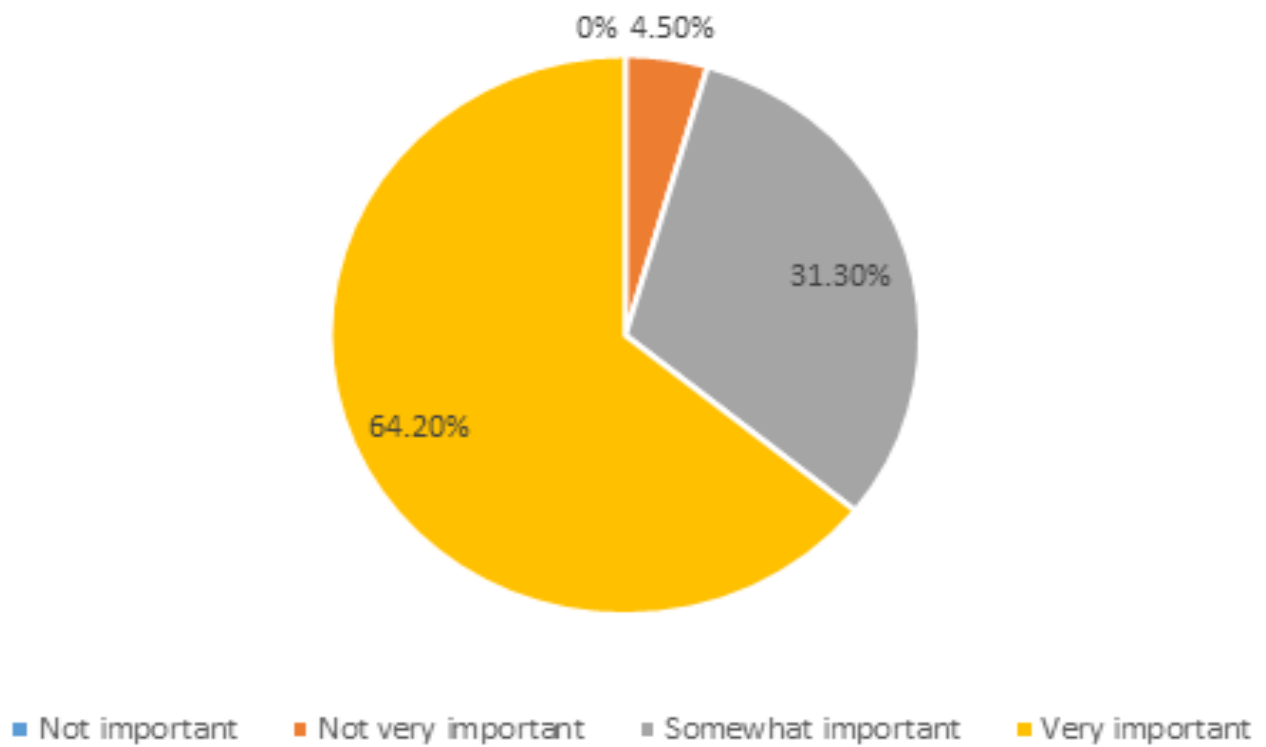
*Figure 12: Graph of age demographics with respect to attitude, for online respondents.*



*Figure 13: Graph of gender demographics with respect to practice quality.*

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## Importance of Wearing UV Eye Protection for Females

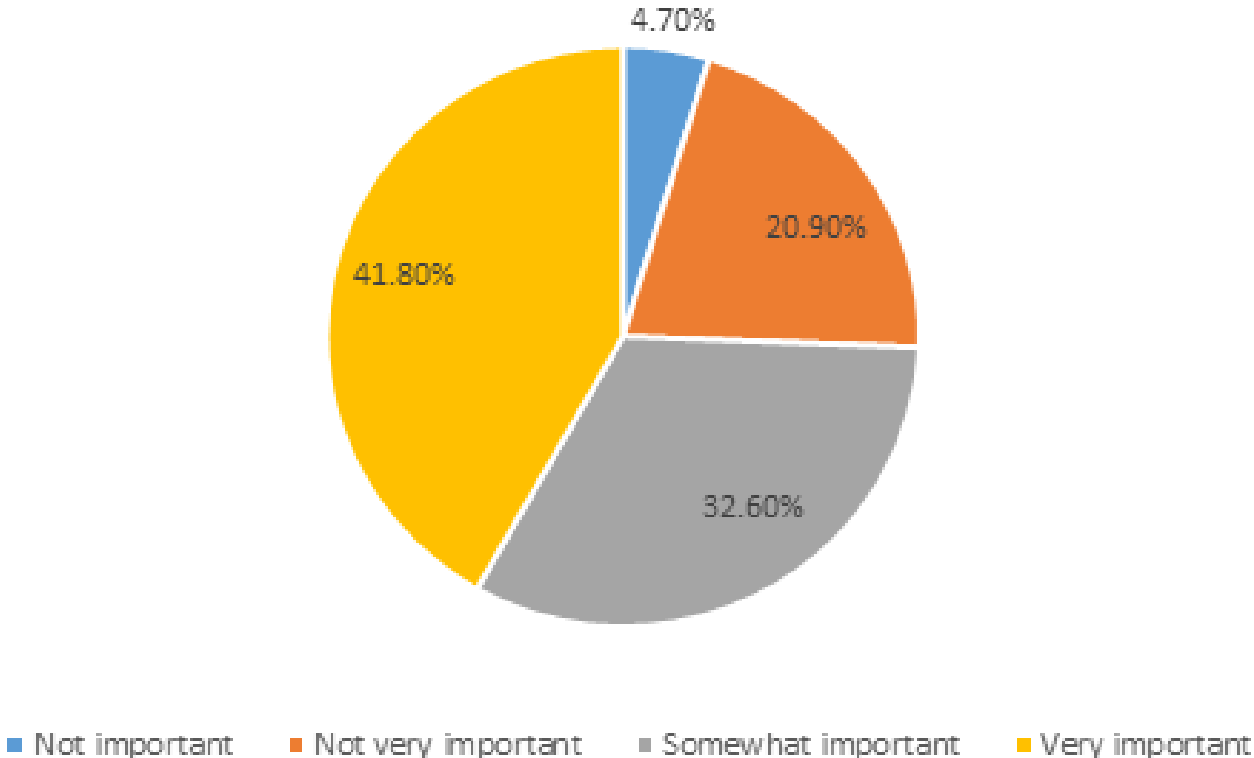


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*Figure 14: Graph showing the proportions of levels of importance for females.*

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## Importance of Wearing UV Eye Protection for Males



*Figure 15: Graph showing the proportions of levels of importance for males.*

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Practice Quality	Importance of UltraViolet Eye Protection			
	Not important	Not very important	Somewhat important	Very important
<b>In-person, n=115</b>				
Good	0.0%	2.7% (2)	32% (24)	65.3% (49)
Poor	8.0% (3)	26.3% (10)	28.9% (11)	36.8% (14)
<b>Online, n=119</b>				
Good	0%	3.4% (4)	11.8% (14)	39.5% (47)
Poor	0%	9.2% (11)	21.8% (26)	14.3% (17)

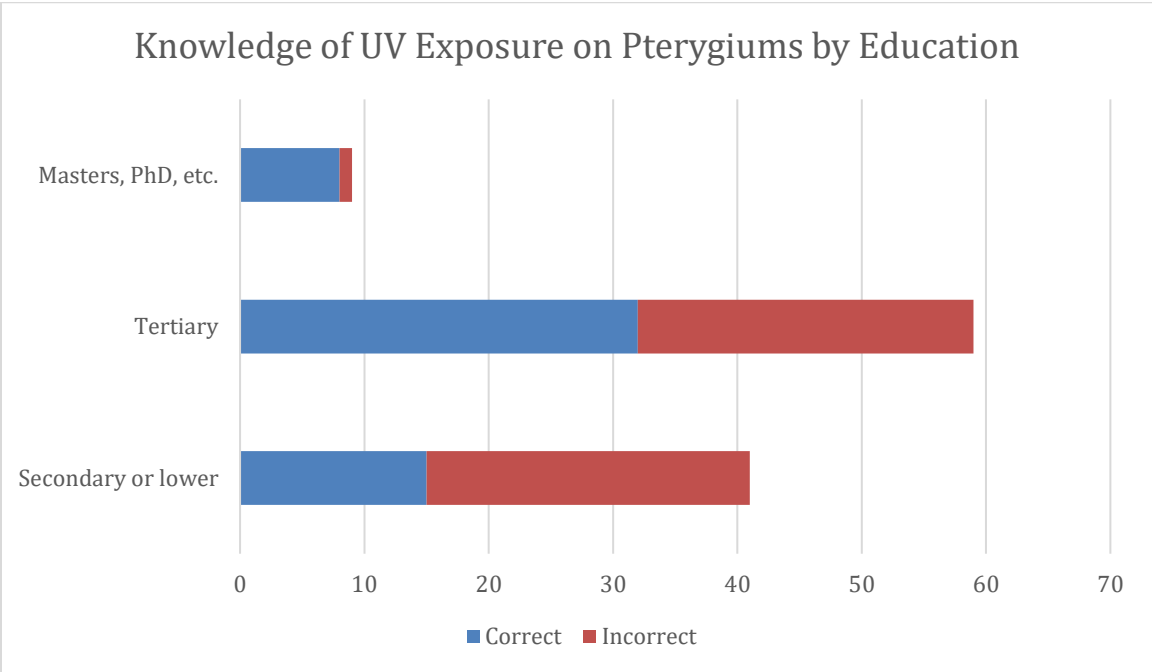
*Table 9: Relationship of practice quality with personal level of importance regarding UV protective eyewear.*

Do you use any UV eye protection?	Reasons for Using UV Protective Eyewear				
	Fashion	Reduce glare	Reduce light intensity	Relieve symptoms	Advised by health professional
<b>Yes (In person, n=84)</b>	29 (34.5%)	76 (90.5%)	76 (89.4%)	64 (75.3%)	71(84.5%)
<b>Yes (Online, n=72)</b>	35 (48.6%)	56 (77.8%)	59 (81.9%)	47 (65.3%)	54 (75%)

*Table 10: Reasons for wearing UV eye protection among respondents that use it.*

	Reasons for Not Using UV Protective Eyewear			
Do you use any UV eye protection?	Feels uncomfortable	Too expensive	Looks unappealing	Never really thought about it
No (In-person, N=29)	10 (34.5%)	14 (48.3%)	3 (10.3%)	8 (62.1%)
No (Online, N=47)	12 (25.5%)	22 (46.5%)	6 (12.8%)	36 (76.6%)

*Table 11: Reasons for not using UV eye protection.*



*Figure 16: Graph showing knowledge of respondents eye growths due to UV exposure, with respect to UV exposure.*

## **CHAPTER FIVE**

### **5.0 DISCUSSION, CONCLUSION AND RECOMMENDATION**

#### **5.1 Discussion**

This study aimed to investigate the knowledge, attitudes and practices of people who live within Trinidad towards UV eye protection. The process of gathering such information was done by structured questionnaires which explored our objectives thoroughly. In total, this study included 234 eligible respondents, n=115 in-person, and n=119 online, who filled out the questionnaire completely and submitted it. The questionnaires were distributed both in-person and using a Google form link online. Both methods were used to ensure that a wide range of demographics was able to participate, with the assumption that the online questionnaires were more easily accessible to a younger demographic. The socio-demographic information regarding gender was unintentionally removed before distribution of the online medium and therefore no data on this section was recorded. Thus two separate analyses were conducted to accommodate each method. Each factor in this study had a scoring system implemented to test whether participants had an overall “good/positive” (>50.0%) or “poor/negative” (< 50.0%) score for knowledge, attitudes and practices. These values can be seen at the end of *Tables 4, 6 and 7* respectively.

## Characteristics of the Participants

Most of the study respondents were within the age range of 18–24 years for both in-person (29.6%) and online (83.2%) mediums. The mean age of the respondents in this study was  $36.17 \pm 14.2$  years for the in-person method which is not statistically different from the general population of Trinidad and Tobago, 36.2 years, ( $p=.984$ ).<sup>38,39</sup> Thus the inference can be made that the responses based on age were representative of the total population. The oldest respondent was 71 years old. Regarding the online method, the mean age of the respondents was  $24.34 \pm 9.4$  years which is statistically different from the general population ( $p<.001$ ) and weakly skews towards a younger perspective. The mode of gender was Female (60.7%), which greatly outnumbered the Male (39.3%) perspective for the in-person questionnaires. The mode of Education Level was Tertiary for both in-person (52.2%) and online (78.6%), followed by Secondary (38.1%) in-person and (17.9%) online, as the top two most represented. *Tables 1, 2 and 3* display the frequencies of each socio-demographic in percentages.

## **Knowledge**

Most respondents had an acceptable level of knowledge, as can be seen by the Knowledge Score average ( $65.16 \pm 14.32$  %) in-person and ( $65.76 \pm 10.97$ %) online. These average knowledge scores are sufficient enough to pass a test but not enough to be completely protected from UV when applied. Firstly, assessing what correct information participants knew concerning the effects of UV exposure, it is evident that current public awareness is lacking concerning the ocular related questions according to the findings in *Table 4*. Almost all respondents understood that sun exposure can cause skin cancer which is different from the findings of the study conducted by Alghamdi, AlAklabi and AlQantini in 2016,<sup>25</sup> where nearly 50% of the Saudi population had insufficient knowledge on the effects of sun exposure and its link to skin cancer. It is assumed that the reason for (91.1%) in person and (100% ) online respondents in the current study answering correctly, maybe due to the increased attention cancers have received in recent years as climate change has escalated UV exposure. Interestingly, however, less than half of respondents of this current study (49.5%) in-person and (44.5% ) online respondents knew that it can also cause growths on or near the eyes even though it also involves the skin. The finding is comparable to Gao, Liu and Liu <sup>29</sup> where respondents were aware of the risk of skin cancer but only 3.1% were aware of pterygium.

When a logistic regression model was applied to the in-person data it was found that respondents who knew about UV exposure contributing to growths on or near the eyes showed that those with a masters degree or higher were 13 times more likely to have chosen the correct answer, as seen is in *Figure 16*.

Additionally, a little more than half of the respondents in the current study were aware that UV exposure contributes to the likelihood of cataract formation (69.4%) in person and (58%) online. This was similar in nature to a UK study<sup>30</sup> where the population was not completely aware of the role of UV in eye pathologies. When asked about what features of sunglasses affect UV protection only about half the respondents (49.5%) in-person and (56.3%) online were aware that size affects UV protection.<sup>37</sup> However for the in-person questionnaires, it was shown that there was a strong relationship ( $p < 0.001$ ) between those who knew about UV exposure causing growths on or near the eyes and those who knew that size affects UV protection, with these respondents being 2.6 times more likely to get this correct.

Many people also thought that polarisation had an impact on the UV protectiveness of sunglasses when they do not, only (19.5%) in-person and (19.3%) online respondents got this correct which would mean that almost 80% of persons are under the impression that polarized lenses have some role to play in UV protection. Similarly only (25.2 %) in-person and (18.5%) online respondents knew that darker lenses also do not contribute to UV protection. Concerning the colour of lenses not contributing to UV protection, there was a strong relationship with education ( $p = 0.003$ ), where respondents with tertiary level education were 0.3 times more likely to choose the right answer and masters or higher level was 0.1 times more likely.

While Polarised lenses and darker tints are meant to reduce light intensity and glare, which happen to be part of the top three reasons for wearing sunglasses, *Figure 2*, the general public may be misled into thinking that because darker lenses reduce light intensity, it also reduces UV transmission, when UV is actually beyond the visible spectrum and cannot be seen.

A moderately strong relationship was also found for the in-person questionnaires between higher education level and knowing that size of sunglasses plays a role in UV protection ( $p < 0.001$ ), where tertiary level respondents were 2.7 times more likely to choose the right answer and masters or higher level was 7.3 times more likely. This is illustrated in *Figure 9* and *10*.

An open-ended question that asked respondents to elaborate on whether or not they believe all sunglasses were the same, a typical response of “if the tint or colour was dark enough, it would protect the eyes from UV” was brought forward. These statements add to the evidence that the public may not fully understand the filters and tints applied to sunglasses and photochromic lenses. The heavy commercialisation and advertisement of polarised lenses with sunglasses may have led to a false connection between UV protection and polarisation.

The possible outcome of increasing awareness of the lack of protection provided by polarised lenses against UV and improving knowledge of UV exposure can increase the use of UV eye protection overall as the effects and eye conditions caused will be brought to public attention.

## Attitude

Where attitude was assessed, most respondents had an average score of  $(70.0 \pm 20.08\%)$  in-person and  $(65.37 \pm 15.8\%)$  online which indicated that while more than half the respondents expressed a positive attitude, there is a concern for why some respondents may have a negative outlook concerning UV eye protection. Some attitudes that can be addressed, for example, are the public opinion on colour and style of sunglasses being important features, *Figure 1*, when they do not provide any increase in protection but the lesser appreciated factor of size does. Mid-sized to large sunglasses are more effective at protecting the eyes and associated structures from UV exposure than smaller ones. Just recently in 2018 as reported in “*The Cut*”<sup>40</sup> the trend of very small sunglasses came into fashion amongst celebrities; many examples offered little to no protection. A point to take note of is that even though fashion is of a low priority for just above half (67.0%) in-person and (51.3%) online respondents, the fashion scene influences the styles that are more easily available which is a possible reason for the remaining half of the population to consider it an important factor when selecting sunglasses.

In *Table 5*, only (55.8%) of in-person respondents found UV eye protection to be very important to them and (31.0%) found it somewhat important. Similarly in the online questionnaire, (53.8%) found it very important whereas (33.6%) found it somewhat important. With regards to those who did not find UV protection to be important to them, the open-ended questions provided some insight.

Many typical responses would be that they do not spend much time in the sun, which itself does not prevent UV exposure; standing in the shade can still expose you to reflected UV, as some studies have shown.<sup>25,37</sup> Another typical response is that they believe that they are immune to the effects of UV possibly due to darker skin or a healthy lifestyle, which both do not completely spare the anatomy from the effects of UV. It was also found that for the in-person questionnaire, there was an extremely strong relationship between education levels and the importance of UV eye protection ( $p=0.006$ ). In *Figure 7* and *8*, it can be seen that for both in-person and online respondents that tertiary level reported the highest importance of UV eye protection to them. A strong relationship between gender and the importance of UV eye protection was found for females ( $p=0.007$ ) whereby they found it more important than males This is illustrated in *Figure 14* and *15*.

### **Practices**

Upon assessing practices, average scores of ( $70.43 \pm 35.26\%$ ) in-person and ( $58.36 \pm 37.13\%$ ) online were seen which implied that just above half of the population had good UV protective eyewear practices. The large standard deviations of these results are due to the assessment of practices is based on only three questions, where a total of two correct answers was weighted as being “good practice”. Using more questions to ascertain the quality of practices, comparable to the method applied to knowledge and attitude quality, may have given more detailed information about the respondents. It was found that only ( $74.8\%$ ) in-person and ( $60.5\%$ ) online respondents used UV protective eyewear.

A weak relationship ( $p= 0.047$ ) was found when investigating the likelihood of females using UV protective eyewear more than males. It was also found that females were only 0.4 times more likely to use UV protective eyewear more often than males which were similar to the findings of Yurtseven E. and colleagues<sup>27</sup> where the protective measures taken by females were slightly higher than that of males. Concerning higher education levels and frequency of UV protection use, a moderately strong relationship ( $p=0.019$ ) was found where the tertiary level was 2.2 times more likely to use UV eyewear often and masters or higher level was 10.4 times more likely.

Regarding the question about the practice of not using UV eye protection in some form, a few options were provided to elaborate the reasons why. Of those respondents who stated that they do not use UV protective eyewear, the most popular reason, shown in *Table 11*, was that respondents simply never think about why they need it, (62.1%) in-person and (76.6%) online, followed by expense, (48.3%) in-person and (46.8%) online. Sunglasses may not be seen as functional necessities by all but rather stylish luxuries that are heavily advertised as such. This was found where (34.5%) in-person and (48.6%) online respondents reported in *Table 10* that Fashion was one of the reasons why they use sunglasses. Optometrists and optical companies are directly at fault on this part, because these bodies are responsible for the way the public sees their products. Similar to this finding, Kirk and Greenfield<sup>28</sup> found that body image was a primary motivator for using sun protection.

Further evidence to the public trust placed on these bodies, is that registered optical companies were the number one choice for respondents to purchase UV eye protection, *Table 8*, (76.3%) in-person and (63.9%) online which can also be due to heavy advertising; a very prevalent but unmeasured occurrence in Trinidad. This was followed by the choice “it does not matter” (8.8%) in-person and (15.1%) online, again showing that the public makes less than adequate decisions when selecting UV eyewear. Some open-ended responses regarding this stated popular optical companies such as Ferreira Optical, Optometrists Today, Courts Optical and Value Optical. The online responses were typically Amazon and no specifications were made for sunglasses retailers.

### **Correlation Between Knowledge, Attitudes and Practices**

#### Knowledge and Attitude

After the data was collected, an analysis was conducted using Spearman’s rho test. Concerning the in-person data, a weak but positive correlation between higher Knowledge scores and higher Attitude scores was found, which was statistically significant ( $r_s(8)=0.353$ ,  $p<0.001$ ). The less than the optimal result of the public’s knowledge regarding the association between UV exposure and cataracts and pterygiums is cause for concern. Public awareness should be increased about these conditions and this may lead to improved attitudes towards features of protective eyewear, for example, larger sized sunglasses are more protective, and the infectivity of polarisation on the transmission of UV rays into the eyes.

### Knowledge and Practices

A moderate relationship was found in the in-person questionnaires between those who were aware of UV exposure contributing to growths on or near the eyes and more frequent use of eye protection ( $p=0.032$ ) and were 2.4 times more likely to use UV eyewear often. This may indicate possible success in improving practices by improving public awareness of UV-induced eye conditions.

### Attitude and Practices

A correlation using Spearman's rho test done using the in-person data found a weak but positive correlation between higher Attitude scores and higher Practice scores ( $r_s(8)=0.228$ ,  $p=0.014$ ).

An extremely strong relationship was found in both the in-person and online questionnaires between a higher reported personal importance of UV eyewear and good practice scores ( $p<0.001$ ). In a logistic regression model, of importance level and practice quality, with "not very important" as the reference, for the online questionnaires it was found that those who said that UV protection was somewhat important to them were 1.5 times more likely to have good practices, while those who said that protection was very important to them were 7.6 times more likely to have good practices. This adds weight to the previously mentioned relationship between females and higher education to better practices, in that efforts aimed to improve attitudes of males and secondary education level persons can improve practices as well.

Also based on the findings shown in *Table 9* which reported importance level with practice quality a professional can make a general assumption that when a patient seems adamant about UV protection they are earnestly practising it; an assumption the researchers believed to be the opposite. Regardless, the correlation is not strong and the previously mentioned situation can't be assumed in practice without some doubt.

As discussed in the previous points, addressing the knowledge about eyewear features rather than solely eyewear habits may increase positive habits as well as knowledge and attitudes. As seen in previous studies, knowledge-based programmes and campaigns have been shown to increase the frequency of positive practices over a few years.<sup>25,26</sup> These campaigns and programmes can therefore be implemented and distributed to the general population of Trinidad and Tobago.

## **5.2 Conclusion**

More than half of the respondents from both in-person and online sources had acceptable levels of knowledge regarding the effects of UV exposure and the features of sunglasses, however less than half knew about its role in pterygium formation and half knew of its role in cataract formation. The majority of respondents incorrectly thought that polarised lenses contributed to UV protection as well as darker tints and the colour of lenses. A significant number also thought that the size of lenses did not contribute to UV protection. Better quality of knowledge was associated with higher levels of education. Similarly, more than half of respondents reported positive attitudes towards features of sunglasses and considered UV protective eyewear to be of high personal importance. Again, size was less appreciated than colour and style. Reasons for a lack of personal importance towards UV eyewear include minimal time spent in direct sun, darker skin tone and healthy lifestyle habits. Positive attitudes were associated with higher education levels and the female gender, with males placing less importance on the use of UV protective eyewear. About half of respondents reported good practices concerning the frequency of usage and methods of purchasing UV protective eyewear. A substantial number of respondents reported no use of UV protective eyewear of any form, with the primary reason being that they simply never thought about the subject. Females were more likely to use eye protection than males, and higher education was linked to more frequent usage of eyewear. A link between knowledge and attitudes was found suggesting that attitudes can be improved by emphasising facts about UV exposure and eyewear features. A link was also found between attitudes and practices, suggesting that improved attitudes can increase the incidence of beneficial practices.

Overall, public knowledge, attitudes and practices are not at satisfactory levels. Educational campaigns implemented both in private practice and public programmes can make use of the relationships found.

### **5.3 Recommendation**

There were many limitations for this study regarding the distribution of questionnaires for both in-person and online mediums, that have affected the quality and depth of the findings discussed. A fixed number of each socio-demographic should have been standardised across both mediums so that age, gender and education level were equally represented to eliminate bias. Additionally, questionnaires from each municipality should have been collected to determine whether geographical location plays a part in whether the perspectives and practices of persons from urban and rural areas differ. This could have given insight for the implementation of educational outreach programmes to be conducted most effectively. The number of respondents from Tobago could have also been recorded to understand if the perspectives and practices of persons differed from Trinidad.

Bias was greatly seen in the online medium where one demographic dominated the responses. An improvement of this study would be to diversify the use of social media platforms to reach the older populations as most of our participants were young in this form of the questionnaire. To fully assess any relationships between knowledge, attitudes and practices with the socio-demographics of the online sample, gender should have been included.

This study failed to realise that the distributed version of the Google form lacked the gender question, thus any correlations between gender and the questions asked were unattainable, whereas the in-person sample was able to find some relationships concerning it. Another consideration is that a time limit could have been implemented to discourage any participants who may have tried researching the responses to any of the questions online.

The method of assessing the quality of practices was also lacking in detail as compared to knowledge and attitudes. Questions about hours of sun exposure and frequency of secondary sun-protective measures could have also been asked to better describe the needs of the population and reasons for not using UV protective eyewear.

Investigations on the information spread by optical companies through advertisements about Sunwear can also be analysed and statistically described to support the claims presented by this study of their role in shaping the perspectives of the general population. How the population receives information about UV effects and features of UV eye protection should also be assessed in future research.

An additional improvement on this study would be to carry out educational campaigns to improve public knowledge about UV effects and awareness of eye pathologies, and then assessing how the new information would influence individual practices.

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## APPENDIX I



*Figure 1: Exemption letter provided by the U.W.I Ethics Committee.*

## APPENDIX II



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: [campusetics@sta.uwi.edu](mailto:campusetics@sta.uwi.edu)

### CONSENT TO PARTICIPATE IN RESEARCH

**Complete Protocol Title:** Knowledge, attitudes and practices of Trinidad and Tobago's population towards Ultraviolet eye Protection.

**Principal Investigator:** Niall Farnon

**Co Investigator(s):** Ariel Niles, Dana Rambadan, Keeshev Rambachan, .....

#### 1. Identification of project

**a. What is the purpose of this research?**

The project being done involves the gathering of information from a sample size of Trinidad and Tobago's population on the knowledge, attitudes, and practices of the population related to the use of Ultraviolet protective eyewear since no such data exists with reference to the country. The study forms part of the researchers' academic project thus your participation would be greatly appreciated.

**b. How long it will take to complete this project?**

The purpose of this research is to assess what knowledge, attitudes, and practices Trinidad and Tobago's population has pertaining to Ultraviolet eye protection. The duration of this project is approximately 3 months.

**c. Why am I selected for this research?**

You are invited to participate in this questionnaire as your response will be greatly appreciated in order to generate a scientific report on the knowledge, feelings, and behaviour of Trinidad and Tobago's population towards UV protective eyewear.

**d. Why is this document for obtaining informed consent important?**

This document is to provide sufficient information to you the responder so that a voluntary decision can be made to participate in this study.

#### 2. Description of Procedures

**a. What am I expected to do in this study?**

You are kindly asked to complete this questionnaire as thoroughly as possible and to the best of your ability.

**b. Which procedures are investigational, which are routine? What is the expected duration, how frequently I have to participate and where will the activities take place?**

This is a one-time voluntary survey with no follow-ups required. Participants are expected to complete the survey within 5 to 7 minutes. No extensive, investigational, or invasive procedures are involved. The questionnaires will be conducted online and in-person at various public locations.

**c. How many participants are involved in the study approximately?**

There will be 430 participants involved in this study.

#### 3. Risks and Discomforts

**a. What are the risks or discomforts that may result from my participation in the study?**

There are no known physical or emotional risks associated with this type of research and its procedures. However, there is the inconvenience of having to fill out the form which some may find time-consuming.

*Figure 1: Consent form generated by the U.W.I. Ethics Committee which was provided to participants, part 1.*

**b. What help and treatments are available if any adverse reactions occur? How can I access them? Is there any compensation available if serious adverse effects occur?**  
No adverse reactions will occur during this study.

**c. Are there any potentially beneficial treatments or procedures that are withheld for the purpose of the study?**  
No potentially beneficial treatments or procedures will be withheld for the purpose of the study.

#### **4. Termination of Research**

**a. Are there any anticipated circumstances under which the study/participation may be terminated by the researchers without regard my consent?**  
The subject can choose to terminate their participation in this study at any point in time without penalization regardless of if consent was given prior to the study.

#### **5. Benefits**

**a. What are the benefits to me (and the wider society) by this study?**  
There are no direct benefits to the participant however, the data obtained will be implemented into the advancement of medical and academic endeavors related to eye care.

#### **6. Alternatives**

**a. Does this study involve more than minimal risk? Are there any appropriate alternative procedures or courses of treatment that might be advantageous to me?**  
This study does not involve more than minimal risks.

**b. Do I have the right to pursue the alternatives?**  
There is no need for alternatives since the study does not involve more than minimal risk.

#### **7. Confidentiality**

**a. How will confidentiality be maintained regarding my data? Who will have access to the data, how the data will be reported and /or published?**  
The data will be stored in a password-protected file on a password-protected laptop only accessible to the researchers directly involved. All questionnaire responses will be kept anonymous and data will be presented collectively to maintain individual confidentiality.

#### **8. Cost and Payments**

**a. Are there any costs involved and are there any compensations provided?**  
There are no costs involved nor compensations provided.

#### **9. Freedom to Withdraw**

**a. Do I have the freedom to withdraw from the study anytime?**  
Participation is completely voluntary thus, the participants have the freedom to withdraw at any time without penalty.

**b. Will withdrawing from the study have any impact on my treatment?**  
Participants may withdraw from the study without consequence. Their decision to do so will be duly respected.

#### **10. Opportunity to ask questions**

**a. Do I have to right to ask questions anytime during the study? Whom should I contact?**  
Yes, participants have the right to ask questions anytime during the study, for which an answer will be provided. Name- Ariel Niles  
Contact number:(1 868) 225 1014 Name-Prof. Jerome DeLisle Email: campusethics@sta.uwi.edu

#### **CONSENT**

I have read and understood this explanation. The researcher has also explained the study to me. I have had a chance to ask questions and have them answered to my satisfaction. I agree to take part in this study. I have not been forced or made to feel like I had to take part.

By signing this document, I agree that I have read and received a copy of this document.

**I must sign this Consent Form. I will be given a signed copy of the form to keep.**

Print Name of Subject

*Figure 3: Consent form generated by the U.W.I. Ethics Committee which was provided to participants, part 2.*

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Signature of Subject \_\_\_\_\_ Date \_\_\_\_\_

---

**INVESTIGATOR'S STATEMENT AND SIGNATURE**  
 I have explained the purpose of the research, the study procedures, including those that are investigational, the possible risks and discomforts, and the potential benefits, and have answered all questions regarding the study to the best of my ability. In my opinion, the participant understands these issues and has voluntarily agreed to participate in the study.

Signature of Person conducting the informed consent discussion \_\_\_\_\_ Date \_\_\_\_\_

---

Role of person named above in the research project \_\_\_\_\_

---

Signature of Second Witness \_\_\_\_\_ Date \_\_\_\_\_

---

By Chairman:  


This document was approved by Campus Ethics Committee on:  
 January, 12 2021  
 This document expires on:  
 January, 12 2022



*Figure 4: Consent form generated by the U.W.I. Ethics Committee which was provided to participants, part 3.*

## APPENDIX III

### K.A.P Study questionnaire on Ultraviolet eye protection.

This K.A.P (knowledge, attitudes and practices) study questionnaire has been designed to collect data on public opinion of UV eyewear. No other study has been done on this topic in Trinidad and Tobago before therefore this data will be very insightful to the optometric profession. In general, this questionnaire aims to gather information on your knowledge, attitudes, and practices concerning Ultraviolet protective eyewear. This questionnaire is completely voluntary and requires consent to be completed. This questionnaire is completely anonymous. Confidentiality will be maintained during and after the data collection period. You will not be financially rewarded for your participation in this study nor will you be penalised for your refusal to participate. Do note you MUST be a resident of Trinidad and Tobago as well as over the age of 18 to participate in this study. Please respond thoughtfully to the best of your ability. Thank You!

\* Required

1. Selecting the option below indicates that you have read the above description and give consent to participate in the study . \*

Mark only one oval.

I have read the above description and agreed to participate in this study.

2. Are you a resident of Trinidad and Tobago? \*

Mark only one oval.

Yes

No

*Figure 1: Questionnaire which was distributed both in-person and online, part 1.*

3. Gender

Mark only one oval.

- Female
- Male
- Prefer not to say

4. Age \*

\_\_\_\_\_

5. Please indicate your level of education \*

Mark only one oval.

- Primary
- Secondary
- Tertiary
- Masters degree , Doctorate ,Professional Degree ,PhD etc

6. What do you believe to be true about sun exposure? \*

Mark only one oval per row.

	True	False
Necessary for Vitamin D production	<input type="radio"/>	<input type="radio"/>
Causes growths on or near the eyes (pterygium)	<input type="radio"/>	<input type="radio"/>
Can cause skin cancers	<input type="radio"/>	<input type="radio"/>
Causes cataracts	<input type="radio"/>	<input type="radio"/>
Allows UV rays to enter the eyes	<input type="radio"/>	<input type="radio"/>

Figure 2: Questionnaire which was distributed both in-person and online, part 2.

7. How often do you believe sunglasses should be replaced? \*

Mark only one oval.

- Never or not necessary
- Every year
- Every few years
- Every ten years

8. What practices do you believe can help protect eyes and eyelids from sun exposure? \*

Mark only one oval per row.

	Yes it protects	No it does not protect
Wearing sunglasses	<input type="radio"/>	<input type="radio"/>
Wearing photochromic lenses e.g. Transitions® Light Intelligent Lenses™	<input type="radio"/>	<input type="radio"/>
Photochromic contact lenses e.g. ACUVUE® OASYS with Transitions™ contact lenses	<input type="radio"/>	<input type="radio"/>
Wearing a hat	<input type="radio"/>	<input type="radio"/>
Reducing time outside from 10 a.m. to 3 p.m.	<input type="radio"/>	<input type="radio"/>
Staying in the shade outdoors	<input type="radio"/>	<input type="radio"/>

9. Do you believe that all sunglasses provide the same protection from UV rays. \*

Mark only one oval.

- Yes
- No

*Figure 3: Questionnaire which was distributed both in-person and online, part 3.*

10. With respect to the previous question explain BRIEFLY \*

\_\_\_\_\_

11. Indicate whether you think each of the following sunglasses features affect UV protection: \*

*Mark only one oval per row.*

	Yes	No
Size	<input type="radio"/>	<input type="radio"/>
Darker lenses	<input type="radio"/>	<input type="radio"/>
100% UV Filter protection	<input type="radio"/>	<input type="radio"/>
Polarisation	<input type="radio"/>	<input type="radio"/>
Price	<input type="radio"/>	<input type="radio"/>
Colour of lenses	<input type="radio"/>	<input type="radio"/>

12. How important would you say wearing Ultraviolet eye protection is for you? (e.g.Sunglasses, Transitions® Light Intelligent Lenses etc) \*

*Mark only one oval.*

- Very important
- Somewhat important
- Not very important
- Not important

13. With regards to the previous question, state why. \*

\_\_\_\_\_

Figure 4: Questionnaire which was distributed both in-person and online, part 4.

14. What would you consider important when selecting sunglasses? \*

Mark only one oval per row.

	Important	Not important
Brand	<input type="radio"/>	<input type="radio"/>
Size	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>
Style	<input type="radio"/>	<input type="radio"/>
Colour	<input type="radio"/>	<input type="radio"/>
100% UV protection filter	<input type="radio"/>	<input type="radio"/>
Quality	<input type="radio"/>	<input type="radio"/>

15. What would be your main reason(s) for wearing sunglasses, if you were to? \*

Mark only one oval per row.

	Low priority	High priority
Fashion	<input type="radio"/>	<input type="radio"/>
Reduce glare	<input type="radio"/>	<input type="radio"/>
Reduce light intensity	<input type="radio"/>	<input type="radio"/>
Relieve symptoms (e.g. watery eyes, dry eyes, itchy eyes)	<input type="radio"/>	<input type="radio"/>
Advised by health professional (e.g. optometrist, doctor, nurse)	<input type="radio"/>	<input type="radio"/>
Eye protection from UV rays	<input type="radio"/>	<input type="radio"/>

*Figure 5: Questionnaire which was distributed both in-person and online, part 5.*

16. Indicate which of the following Ultraviolet eye protection you use, if any. \*

Mark only one oval per row.

	Yes	No
Transitions® Light Intelligent Lenses™	<input type="radio"/>	<input type="radio"/>
Sunglasses	<input type="radio"/>	<input type="radio"/>
ACUVUE® OASYS with Transitions™ contact lenses	<input type="radio"/>	<input type="radio"/>
I don't use any eye protection	<input type="radio"/>	<input type="radio"/>

17. If you selected that you "don't use eye protection", select the reasons that apply to you:

Mark only one oval per row.

	Applies	Does not apply
Feels uncomfortable	<input type="radio"/>	<input type="radio"/>
Too expensive	<input type="radio"/>	<input type="radio"/>
Looks unappealing	<input type="radio"/>	<input type="radio"/>
Never really thought about it	<input type="radio"/>	<input type="radio"/>

18. How often do you wear Ultraviolet eye protection? \*

Mark only one oval.

- Often
- Sometimes (When you remember)
- Rarely
- Never

Figure 6: Questionnaire which was distributed both in-person and online, part 6.

19. If you were to purchase Ultraviolet protective eyewear, where would you go first? \*

Mark only one oval.

- At a registered optical company
- At a sunglasses retailer
- Online
- It does not matter

20. With respect to the previous question please specify where:

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*Figure 7: Questionnaire which was distributed both in-person and online, part 2.*