



Prevalence and Pattern of Refractive Error in Patients Presenting to a Private Optical Company in Trinidad and Tobago W.I.

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Abstract

Background: Refractive errors are prevalent among the patients presenting in optical hospitals and companies and contribute to adverse health outcomes such as blindness and visual impairment. Refractive error is a global health problem with a significant number of people affected and causing blindness. Uncorrected refractive errors are also costly to the global health sector due to their negative outcomes.

Aim: To determine the prevalence and pattern of refractive error in patients presenting within ten (10) practices of a private Optical company distributed throughout Trinidad and Tobago W.I.

Method: The study adopted the quantitative method. Data were collected from 1000 records that were sampled from a private optical company representing patients who visited. The eye with the better Presenting Visual Acuity (PVA) was used for categorising the patients. The statistical method was used in data analysis.

Results: The results of the study show that there is a relatively lower prevalence of refractive error among adults and elderly persons. Children are more vulnerable to refractive error complications and are highly affected compared to adults and the elderly.

Keywords

Refractive error; Blindness; Visual impairment; Health problem

Introduction

Background information

Refractive error in hospitals is prevalent among the patients attending optical institutions, and when left uncorrected, it contributes to visual impairment and blindness globally [1]. According to Natung, et al. [2] the global estimate of the aggregate population of persons across all ages that are affected with visual impairments is approximately 253 million, out of which 36 million developed to become blind. Uncorrected refractive errors contribute to a significant portion of the visual impairment (43%), while other contributors such as cataracts follow with 33% [2]. In this regard, Natung, et al. [2] and Kaiti, et al. [1] agree that refractive errors have been identified as a significant public health problem across the world due to their contribution to the loss of sight. Visual impairments affect the welfare and wellbeing of individuals because it causes individuals to lose their right to sight thus contributing to poor access to quality education and employment opportunities, decreased participation in social and economic activities, the decline in productivity, and poor quality of life due to high dependence on others. Despite being one of the eye conditions that can easily be corrected, there is a high prevalence of uncorrected refractive errors in the eye, thus contributing to large patterns of visual impairment [3]. Additionally, Ajayi, et al. [3] noted that the complexity of the refractive errors varies in patterns across the populations associated with different ancestral origins. In this regard, it is recommended that the refractive error conditions need to be treated in advance to prevent cases of avoidable blindness [3]. Despite occurring in individuals across all ages, refractive errors are highly prevalent among the children, thus further exposing them to the dangers of visual impairment, as indicated by Natung, et al. [2]. Children are at a significantly higher risk of refractive errors that can result in negative impacts on their learning abilities as well the physical and mental growth and development. In the context of Trinidad and Tobago, Ramsewak, et al. [4] noted that refractive error contributes significantly to the high health and economic burden in the Caribbean region, with the older adults being at risk of developing the complication.

Theoretical foundations

The refractive error occurs when the rays of light that are parallel in nature pass through the refractive media of the eye but fail to focus on the fovea, thus causing blurring of the image observed by the affected eye [2,3]. Theoretically, refractive errors and their development across populations can be elaborated through the theory of refractive error development [5,6]. According to Hung and Ciuffreda [6] and Greene [5], the theory is anchored on two insights that construct the development of the refractive errors; First, the theory suggests that the local retinal-defocus plays a significant role in the emergence of environmentally induced refractive error. Second, during the ocular growth and period of maturity, the existing manipulations from the optical environment contribute to the development of the refractive error. The findings by Greene [5] show that the two insights are integrated together to sufficiently explain the development of the refractive errors.

Research problem

The majority of the current studies, such as Natung, et al. and Ajayi, et al. [2,3] focus on exploring the implications of the refractive error across different populations. Despite recognising that the refractive error is a bigger public health problem across the world, there is a research gap in relation to the prevalence and patterns of the complication in various health organisations and countries. According to Tedja, et al. [7] refractive errors such as myopia are the most common eye disorders across populations in the world and contribute to many

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cases of blindness, especially when they are left uncorrected. In this regard, given the negative outcomes of the refractive errors on people, there is a need to explore its prevalence and pattern in a given area in order to develop effective interventions to prevent outcomes such as blindness [2,7]. In this regard, this study will explore the prevalence and pattern of refractive error in patients in private optical companies in Trinidad and Tobago, W.I.

Objective

To determine the prevalence and pattern of refractive error in patients presenting within ten (10) private practice optical companies distributed throughout Trinidad and Tobago W.I.

The research will play a vital role in presenting knowledge that is central to the improvement and conservation of human vision. By determining the prevalence and pattern of the refractive error across the general population, adequate intervention measures can be employed to make corrections and prevent negative outcomes such as blindness. The research will focus on achieving the needed outcomes that address the research objective. In this regard, the research will aim to identify the rate at which refractive error affects the overall population and ascertain the pattern to which people have the capacity to access healthcare support. From this perspective, the study will focus on promoting awareness and education to the affected population and the stakeholders on the need to seek healthcare support to correct the refractive error disorders that contribute to the rise of cases of blindness and visual impairment.

In recent times, health has become a central priority aspect that should be maintained to enhance sustainable development due to its implications on economic growth. According to Tedja, et al. [7] millions of people are affected by moderate to severe loss of vision due to refractive error complications, thus causing a negative health outcome that affects the overall economy. The distant refractive errors are mostly uncorrected, thus contributing to the prevalence of the disorders in the general population. From this perspective, it is evident that refractive errors contribute to high cases of visual impairment, especially when they are left uncorrected. In this regard, this research will be key in ensuring that it creates adequate information regarding the prevalence, pattern, and the need to remedy the complication to avoid negative consequences.

Therefore, the main objective of this study is to determine the prevalence and pattern of refractive error in patients presenting within ten (10) practices of a private optical company distributed throughout Trinidad and Tobago W.I. The research objective will be addressed based on the following questions:

Research questions

1. What are the risk factors for the refractive error in patients?
2. Which age group is vulnerable to the refractive error in Trinidad and Tobago W.I.?

Thesis structure

This research is divided into five chapters. The introduction is the first chapter covered in the above section. Second, the material and methods outline the methodology adopted to achieve the set objectives through data collection and analysis. In the third chapter, the results sections present the findings of the study after the analysis of the data. Fourth, the discussion presents an in-depth analysis of the results by comparing them with the previous studies in the introduction. Last, the conclusion reiterates the success of the study by summarising the study.

Materials and Methods

This chapter outlines the various strategies adopted during the research to aid in data collection and analysis. The strategies selected will be explained widely, and justification for their adoption provided to ensure the research is undertaken appropriately. The sections covered under this chapter include the research philosophy, research approach, research design, research method, data collection, data analysis, and ethical considerations.

Research philosophy

Cazeaux [8] noted that research philosophy outlines the beliefs to be upheld during the process of knowledge development through data collection and analysis. In this study, the positivism research approach was selected. According to Žukauskas, et al. [9] the positivist research philosophy holds that the social world is explored objectively to ensure that data is collected sufficiently and analysed to provide the findings. While using this philosophy, researchers become objective analysts whereby they differentiate themselves from personal values and operate independently while creating knowledge and solving the research problem [9]. In this regard, Cazeaux and Žukauskas, et al. [8,9] concur that the positivism research philosophy ensures that during the research process, the acquisition and creation of knowledge are undertaken independently and not related to human value and moral content. Therefore, the selection of the positivism philosophy is justified due to its strength in relation to the belief in objectivity during data collection and analysis.

Research approach

In this study, the deductive research approach was selected. Pearce [10] noted that deductive reasoning is widely applied in quantitative studies and allows the researcher to develop a hypothesis based on the underlying theory. Similarly, Morsanyi, et al. [11] noted that deductive reasoning skills are used in research to examine the numerical data to draw inferences that reject or accept the hypothesis. From this perspective, the deductive approach is particularly concerned with the testing hypothesis by facilitating reasoning from a specific viewpoint to the general theory [11]. In deductive reasoning, the process consists of presenting an expected result and pattern, then testing based on various observations, and lastly, validating or rejecting the hypothesis. In the context of this research, the selection of the deductive approach is justified given that it supports the researcher to make conclusions about a given hypothesis that is formulated to address the research problem by basing on the premises or propositions.

Research design

Saunders, et al. [12] indicated that the selection of research design is important to ensure that decisions relating to strategies to be used and their implementations are carefully undertaken. In this regard, the research design outlines how the various strategies were implemented during data collection, analysis, and interpretation to address the research problem. Similarly, Freshwater [13] noted that determining an appropriate research design to address the research problem and questions is the fundamental aspect of the research process. In this study, the descriptive research design was selected and implemented. According to Singh [14], the descriptive research design focuses on addressing the research problem by making observations of a given population of subjects at a given time and describing the behaviour independently without influencing it. The research design was selected because it offers an opportunity for the researcher to identify trends, patterns, frequencies, and characteristics of refractive error and its

prevalence among patients visiting private Optical companies in Trinidad and Tobago W.I. The descriptive research design is suitable in quantitative studies and allows researchers to gather larger data volumes to analyse the patterns, trends, and frequencies of a given study population [14]. Therefore, the selection of the descriptive design was justified in this research because it focuses on describing the given population during data collection and analysis accurately and systematically.

Research method

The search methods describe the holistic steps adopted and implemented by the researcher during the process of collecting and analysing data. In this study, the quantitative research method was adopted. Apuke [15] noted that the quantitative method focuses on quantifying and making an in-depth analysis of all variables in order to attain results that effectively address the research questions and, generally, the research problem. The quantitative research method is used in social research to generate numerical data and facts by using statistical, logical, and mathematical techniques during data collection and analysis [15]. Similarly, Haviz and Maris [16] noted that the quantitative methods enable researchers to widely gather numerical data and generalise it across the various groups of subjects and use it to explain a given social problem.

Sampling

Sampling is an important process in the selection of the study population from the general or simple population. A probability sampling method was adopted in this study. According to Berndt [17], probability sampling lends an equal chance to every member of the population an opportunity to be selected to be part of the research. Berndt [17] further noted that the probability sampling technique is widely adopted in quantitative research and allows the development of results that are representative of the wider population. Simple random sampling was deemed to be the suitable probability sampling method in the selection of the record to be used in data collection. During the sampling process, a total of 1000 records belonging to patients who attended a private optical company were selected.

Data collection

In this study, 1000 records were sampled and selected for data collection. The records selected belonged to the patients who presented to the private optical company within the ten (10) optical practices located in North, South, East, West, and Central Trinidad. During the data collection process, the record were reviewed widely with the aim of addressing the research problem. During this process, the eye with the better Presenting Visual Acuity (PVA) was used for categorising the patients. Data collections also involved retrieval of the patient's demographic information such as age, sex, and location backgrounds from the records.

Data analysis

The statistical method was adopted in the analysis of data collected from the record. In this method of data analysis, descriptive statistics were mainly used in creating meaning to the data collected to ensure that the quality and viable results are presented. Mishra, et al. [18] noted that descriptive statistics are widely employed in quantitative research to effectively describe the various features of the study using the collected data and to provide simple conclusions and summaries regarding the sample population and the measures. From

this perspective, the researcher used the descriptive statistics method to widely describe what the data shows and reveals in the contexts of the study problem. The method was selected because it offers an opportunity for the researcher to measure a large volume of data on any measure by helping in simplifying in a sensible way and creating relevant meaning Mishra, et al. [18]. During the data analysis process, the proportion of data was availed in tables, embracing 95% confidence intervals and P-values (significant at $P < 0.005$ level). Additionally, the age groups of patients were categorised into four, 5–19, 20–39, 40–59, and ≥ 60 years, for data analysis purposes. The independent t-test and trends were used to calculate the comparison of means between the groups, while age was analysed using the Chi-square for trend. In performing the calculations during the data analysis process, the statistical analysis program SPSSV20 (SPSS Inc, Chicago, IL, USA) was adopted. The outcomes from the data analysis process were presented in the results and findings in the next chapter.

Ethical consideration

The researcher upheld the ethical provisions that guide social research processes. For instance, the researcher sought permission to use the record for the patients in the study. The permission was sought from the management of the optical company to ensure that they received enough support while also prioritising the quality and reliability of the study. Lastly, the study was undertaken based on appropriate suitable methods while adhering to the ethical standards of the 1964 declaration of Helsinki.

Results and Findings

This chapter provides the results and analysis of the quantitative data collected from patient clinical records. In particular, the key issues answered involved examining the risk factors for the refractive error in patients and age groups vulnerable to the refractive error in Trinidad and Tobago W.I. Therefore, the extensive results are provided as follows:

In this case, 58.73% of the participants were male, whereas 41.27% were female (Figure 1). Drawing on the fact that the selection of the participants was based on the probability sampling method, the difference in gender could not affect the outcomes. Therefore, it was assumed that the information provided by female or male participants could be generalised across the entire population.

The participants were selected from different locations such as Arima, C3 Centre, Chaguanas, Frederick Street, Grand Bazaar, Gulf City, Pennywise Plaza, Trincity, and West Mall (Figure 2). The

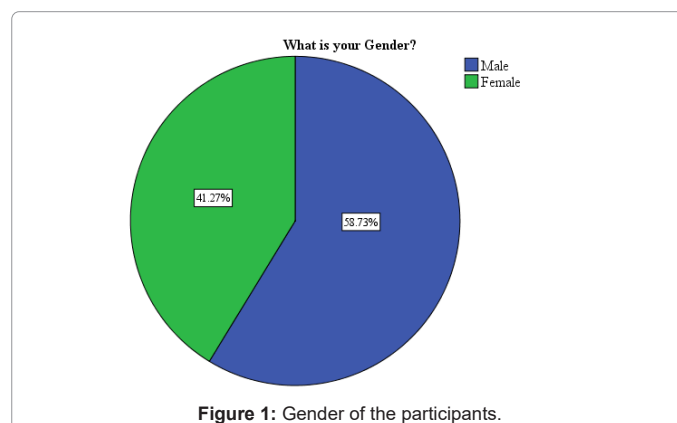


Figure 1: Gender of the participants.

participants were fairly distributed across the areas, which enhanced the generalisation of the findings concerning the vulnerable population to refractive error in Trinidad and Tobago W.I patients (see Appendix). Specifically, 18.45% of the participants were from Frederick Street, 14.91% (Trinity), and 13.82% (West Mall). Therefore, the involvement of people from different cities across age groups enhanced the generalisation of the findings.

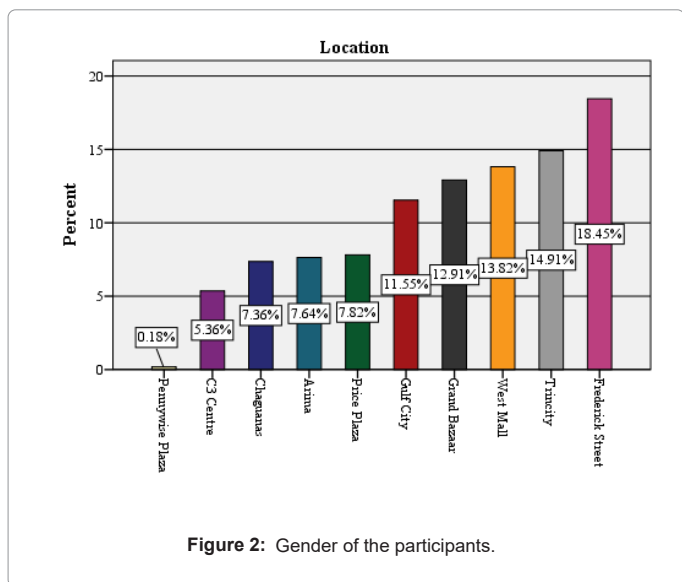


Figure 2: Gender of the participants.

From One Sample-Test, Sig.000 is below the normal confidence level of 0.005, which confirmed the significant relationship between variables (Table 1). Owing to the fact that in this study, the focus was on understanding the prevalence and patterns of refractive error in patients presenting to a private Optical company in Trinidad and Tobago W.I, the findings imply that individuals from different age groups are vulnerable to the refractive error. In this study, most of the participants were from 36-80 years. The results showed that this group is less susceptible to refractive error. However, children in Trinidad and Tobago are at a higher vulnerability of suffering from refractive error. Although blindness during childhood can be prevented, the complication contributes to high levels of child mortality factors such as measles, early birth, meningitis, and lack of vitamin A. Therefore, preventing refractive error among children is closely connected to child survival, and as a result, controlling childhood blindness should be prioritised in Trinidad and Tobago. The childhood refractive error possesses several challenges that are different from controlling the adult refractive error. In this case, children tend to have an immature sight system and yet to develop normal maturation. They have to possess a clear and focused object on the retina, which are related to the higher centres responsible for vision. In cases where they fail to have normal development of sight, correction interventions are impossible during adulthood or late childhood.

The P-values and coefficient in regression analysis show the nature of relationships in the model and the mathematical relationship between the dependent and independent variables, respectively (Table 2). The results demonstrate that refractive error in patients in Trinidad and Tobago W.I. is negatively associated with ossphere (0.66), oscylinder (0.357), osaxis (0.896), and osadd (0.697). In particular, the p. value is greater than the normal significance level of 0.005, which implies that there is a low correlation between the variables. Individuals with

relatively higher outcomes of myopia and hyperopia tend to indicate that genetic inheritance is autosomal recessive and dominance and X-linked traits. As a result of the genetic predispositions, refractive error is passed down the line as a genetic trait. Most common refractive errors in patients are passed on from parents as a significant trait, while other forms occur because of their characteristics with monogenetic changes, and specifically those belonging to the earlier development onset and others that are occupied by the various ocular and systemic anomalies. Therefore, in locating the refractive error and its associated molecular base, one is able to have adequate knowledge of various molecular mechanisms. In this regard, an appropriate therapeutic strategy can be developed to act as an intervention that can correct the refractive error complication. In reference to this finding, refractive errors and their connection with genetics offers a chance to identify and establish various molecules that are effective for the occurrence of the health problem. The molecules have a significant variation which contributes to the development of refractive errors. From this perspective, the molecules act as the main targets for refractive changes among patients, especially when affected by environmental factors. Progressive research in genomes and analysing tools in variations in the genome fosters the development of various factors associated with genetics. The conventional genetic studies, including linkage analysis, hugely relied on the examination of families that have cases of severe refractive error. However, in recent years, association with genome-wide studies are applied to analyse diverse forms of refractive errors in patients.

As shown in (Table 3), the hypothesis tested was to examine the prevalence and pattern of refractive error in patients presenting to a private optical company in Trinidad and Tobago W.I. The sig. 0.223 is greater than the normal significance of 0.005, which implies that there is a low prevalence of refractive error among the population in Trinidad and Tobago W.I. Refractive errors such as myopia, hyperopia, and astigmatism are a result of irregularly shaped corneas. Myopia is a reported attribute of many connective tissue disorders. In Myopia conditions, the focal plane of the light entering the eye is anterior to the retina, which results in reduced visual acuity for distanced objects and high visual acuity for close objects. In refractive error, nearsightedness is a result of either the refractive errors in the cornea and lens or a combination of both two. In axial myopia, nearsightedness is a result of the elongation of the eye in that the increased axial length of the eye causes myopia. In this study, the findings demonstrate that the existing cases of refractive errors experienced among people in Trinidad and Tobago W.I. are associated with other factors rather than OSsphere, OSCylinder, OSaxis, and OSadd.

As shown in (Table 4), Sig. 0.95, 0.673 and 0.94 indicate that there is a low prevalence of myopia, hyperopia, and astigmatism among the adults and elderly people in Trinidad and Tobago W.I. Astigmatism is a common refractive error of the eye that is characterised by a variation in the degrees of refractions in different meridians of the cornea and the lens. Lens astigmatism in Trinidad and Tobago is prevalent in older people. Astigmatism results in problems with seeing objects clearly, and in certain circumstances, vertical objects and lines are seen by patients to be leaning over. Increased astigmatism causes blurred vision, squinting, headaches, fatigue, and asthenopia to the patient. The extreme astigmatic component becomes prevalent after the age of 70 years, while on the other hand, the various components that are oblique remain constant. Significant anisometropia is prevalent in older people in Trinidad and Tobago as a consequence of the failure of the emmetropization mechanisms that fall with age. Astigmatism can be classified based on the axis of the principal meridian as regular

and where the principal meridian is perpendicular. The continuing variation in various components associated with refractive error among the elderly and the prevalence of significant levels of astigmatism and anisometropia emphasise the need for continuous evaluations to identify such complications in Trinidad and Tobago.

Myopia is the major factor that contributes to a refractive error in children and the older in Trinidad and Tobago. The patterns of age-

related rates of myopia vary, whereby the myopia prevalence increases with age in low-income households and decreases with age in high-income settings in Trinidad and Tobago. The environmental risk factors, high education, spending less time outdoors, and near work activities have been established as the risk factors for myopia which makes the old to be at a high risk of suffering from the refractive error in Trinidad and Tobago.

	Test value = 0					
	t	df	Sig. (2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
Age	161.488	1099	0	56.305	55.62	56.99

Table 1: One sample-test.

Model		Unstandardised coefficients		Standardised coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.438	0.078		18.506	0
	Ossphere	-0.014	0.008	-0.063	-1.84	0.066
	oscyylinder	-0.019	0.02	-0.03	-0.921	0.357
	osaxis	-5.32E-05	0	-0.004	-0.131	0.896
	osadd	-0.012	0.032	-0.013	-0.389	0.697

Note: Dependent variable: What is your gender?

Table 2: Coefficient analysis.

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	1.388	4	0.347	1.425	0.223
	Residual	239.808	985	0.243		
	Total	241.196	989			

Note: a. Dependent variable: What is your gender?

b. Predictors: (Constant), OSadd, OSaxis, OSylinder, OSSphere.

Table 3: Hypothesis test (ANOVA).

		Sum of squares	df	Mean square	F	Sig.
Myopia	Between Groups	14.403	1	14.403	2.796	0.095
	Within Groups	5129.662	996	5.15		
	Total	5144.065	997			
Hyperopia	Between Groups	0.115	1	0.115	0.178	0.673
	Within Groups	708.145	1098	0.645		
	Total	708.26	1099			
Astigmatism	Between Groups	4186.166	1	4186.166	2.813	0.094
	Within Groups	1633722.033	1098	1487.907		
	Total	1637908.199	1099			

Table 4: ANOVA analysis of prevalence of refractive error.

Discussion

This chapter focuses on presenting an in-depth discussion of the results. In this context, the results are widely discussed by comparing them with the previous literature used in the introduction to identify consistency and differences. Additionally, the discussion section will ensure that the findings address the research questions and objectives to achieve the main goals of the study.

The risk factors for the refractive error in patients

In this research, a variety of actions were taken to fulfil this objective. During the process of data collection and analysis, the patient's records were widely explored to determine the causative factors for the refractive errors, thus creating sufficient knowledge to attain the main objective. This research aimed at determining the prevalence and pattern of refractive error in patients presenting within ten (10) practices of a private optical company distributed throughout Trinidad and Tobago W.I. To achieve the main objective of the study, an in-depth

exploration of the risk factors for refractive errors was undertaken. The findings of the study reveal that refractive errors are prevalent across the population among people from different age groups. Refractive error is considered the main contributor to the high prevalence of visual impairment and subsequent blindness, especially when they are left uncorrected. The findings from this study further reveal that refractive error is prevalent among children and young adults while the adults remain less susceptible to the disorder. The results of this study are based on records of patients where most of them were aged 36-80 years of age. The findings of the study reveal that the prevalence of refractive error is relatively lower in populations across Trinidad and Tobago W.I. because the significance value is 0.223, which is fairly greater than the normal significance of 0.005. The findings of this study agree with Natung, et al. and Ramsewak, et al. [2,4] that there is a high prevalence of refractive errors among children due to the exposure to numerous risk factors compared to the adults and older populations. The findings from this study further indicate that myopia prevalence is relatively lower in Trinidad and Tobago W.I. based on the records

reviewed for the older patients. The study demonstrates that population attributable risk contributes to the prevalence of refractive error among adults and children. Therefore, this study found that the refractive error disorder is common among children and contributes to early childhood blindness, and it also affects the older populations and contributes to poor life quality among the elderly.

There is an association between gender and refractive error based on the record of the patients reviewed during data collection. The results from the analysis reveal that the majority of the patients who visited the private optical company were men at 58.73% while women were 41.27%. In addition, the findings reveal that refractive error shifts are common among the elderly groups, thus showing that age is a significant risk factor for the disorder. For instance, children and elderly people are vulnerable to refractive error complications, thus indicating that age contributes to the occurrence of the disorder. Despite the study findings being based on patient records where many men reported a refractive error in the private optical company, the results do not show the close linkage between gender and refractive error. Contrary to the findings from this study, Kaiti, et al. [1] noted that the linkage between refractive error and gender had not been developed widely, with available evidence showing that myopia and hyperopia are relatively higher among women than men. The findings of the study further revealed that the prevalence of myopia as a refractive error decreased and then increased with the rise in the age of a person, thus implying the refractive error is common among children and elderly persons across all genders. Therefore, age is associated with the refractive error occurrence as revealed in the study.

The main strength of this study is that it used a relatively large sample size from different locations in Trinidad and Tobago W.I, thus enhancing the quality of outcomes regarding the prevalence and patterns of refractive error. Additionally, the refractive error results from this study can be generalised significantly due to the fair distribution of participants. Findings from this study revealed that refractive error complication is a genetic problem that can be passed from parents to their siblings. The majority of the patients with cases of high myopia and hyperopia acquired complications as a result of the inheritance factor. From this perspective, refractive error is widely caused by genetic traits, among other contributory factors. In this regard, the study demonstrated that the high prevalence of refractive errors among children is explained by the genetic factor that results in the inheritance of the defects from the parent. Further findings from the study indicate that other risk factors for myopia besides the genetic implications include time spent on near-work activities and astigmatism. In this regard, refractive error is caused by a variety of contributory factors that result in visual impairment among the general population in Trinidad and Tobago W.I. Similar to these findings Greene and Hung, et al. [5,6] noted that the refractive error complications are caused by environmental and genetic factors that occur during the ocular growth and the period of maturity. Therefore, the findings of this study reveal that the risk factors associated with the prevalence and pattern of refractive error affect the general population and contribute to lower life quality and visual impairment problems. From this perspective, the findings from the current and previous studies are consistent in pointing out the risk factors, thus setting up a suitable platform to develop interventions to correct the refractive errors to avoid cases of visual impairment, blindness, and low-quality life.

The age group vulnerable to the refractive error in Trinidad and Tobago W.I.

This study also examined the prevalence of refractive error in

Trinidad and Tobago W.I. The findings from this study demonstrate that there is a low prevalence of refractive error among adults and elderly people due to the lower risk exposure and strong interventions implemented to correct the complications during childhood. This result is consistent with Ramsewak, et al. [4], who argued that there was a low prevalence of myopia, hyperopia, and astigmatism in adults and the elderly. In this context, the findings imply that the prevalence of refractive error is high in children. In this regard, there is a need for further research to investigate the potential causes of refractive error among children and the elderly population. In children, most cases of refractive errors are caused by myopia. With such exploration, more insight concerning the potential intervention strategies would be developed. However, this study is inconsistent with Natung, et al. and Ajayi, et al. [2,3] who argued that refractive error is the primary cause of visual impairment. In their studies, the findings showed the high prevalence of myopia and astigmatism among the elderly compared with children. This shows that this study and the past literature have a significant variation regarding the degree to which refractive error contributes to visual impairment. However, in both studies, findings show that refractive errors contribute to the occurrence of visual impairment and blindness. In this research, variations in the findings could be associated with the use of populations from different settings. Among children, lack of time spent outdoors, myopia, and parental education are perceived as crucial risk factors that influence the progression of refractive error.

Although the findings of this study showed that there is a low prevalence of astigmatism among the population, this result is inconsistent with Kaiti, et al. [1]. In their study, the findings showed that astigmatism is prevalent among older people. The inconsistencies between the results can be attributed to the fact that participants were affected on a different level, thus resulting in differences in results. In particular, astigmatism causes blurry vision, fatigue, and headaches. Despite this study showing that there is a low prevalence of refractive error in Trinidad and Tobago W.I., Tedja, et al. [7] stated that the magnitude of refractive error could not be reliably established. In other studies such as Greene [5], the prevalence of refractive errors differs depending on multiple variables such as ethnic groups and age. From this perspective, studies such as with Kaiti, et al. and Tedja, et al. [1,7] are consistent with the current research, whereby the prevalence of refractive error among the population differs between Trinidad and Tobago W.I and other settings. Refractive errors are documented differently across the world; however, hyperopia and myopia is the common problem experienced in these areas. Although the findings demonstrate that refractive error varies among the different ages, further investigation is required concerning sex variation of refractive error. Therefore, further investigation on this perspective would enhance the development of the most appropriate intervention strategy to minimise individual's susceptibility to the condition.

The results showed that there is a low prevalence of myopia among people in Trinidad and Tobago W.I. However, this result is inconsistent with Natung, et al. [2], who found that myopia tends to increase with age. The inconsistency is attributed to the fact that the research was undertaken based on patients who visited the private optical company rather than the general population. In this regard, myopia is the common type of refractive error experienced by elderly people. Additionally, astigmatism is also believed to increase with age; thereby, it causes visual impairment in old people compared to children. In developed economies, astigmatism and myopia are mostly experienced in children, especially during school years which might be similar to the findings established in this study. Despite a plausible connection

between myopia and astigmatism with age, knowledge gaps exist concerning social, economic and environmental influence on the risk factors of refractive errors among people. Therefore, to address the issue of refractive error among people in Trinidad and Tobago W.I, further investigation on distributions of the condition would enhance efficient planning and improve access to care by people of different groups.

Blindness associated with refractive errors among people presents multiple problems in terms of morbidity, social and economic burden. Although this study found a low prevalence of refractive errors among the study population, significant intervention measures are imperative in correcting the condition among different population groups. This recommendation is inconsistent with Tedja, et al. [7], who claimed that poor distribution of statistics concerning the prevalence of refractive errors in children and the elderly population has culminated in inaccessible care services. From this perspective, the inconsistency between the results of this study and the previous research is an indication of different parameters used in respective studies. In Trinidad and Tobago W.I, the low prevalence among adults and the elderly population could not reflect the effectiveness of the intervention strategies. With this result, it is crucial to advocate for increased accessibility to refractive error care services for people of different age groups in both urban and rural settings to minimise the mortality and economic burden associated with the problem.

Refractive errors are widely recognised through a clinical examination of the patients who avail themselves to the optical professionals. In ophthalmologic clinics, the professionals conduct screening activities to determine the degree of refractive errors and provide suitable interventions for correcting the complications. In this regard, the optical clinics and companies are essential in determining the prevalence and pattern of the refractive errors with the population. Additionally, visual screening for masses can be implemented over a large population to determine the rate at which refractive errors prevail. The visual screening strategy and patient presentation in clinics are vital in recognising the existing visual challenges and determining the appropriate intervention strategies that can be adopted. The findings from this present study demonstrate that the prevalence and pattern of refractive errors are determined by monitoring the patients who present themselves to the optical company. From this study, findings illustrate that the refractive error problem contributes to the development of visual impairments and blindness if left uncorrected. Therefore, refractive errors can be corrected at an early stage if appropriate measures are developed for screening and early detection. In this regard, correction of refractive errors is an important strategy that can be used globally to counter poor vision and blindness among young adults and children. Similar to these findings, Kaiti, et al. and Natung, et al. [1,2] noted that despite contributing to high cases of visual impairment, refractive errors are considered a significant health problem whose main intervention is to improve vision screening among the general population, specifically for children and young adults. From this perspective, understanding the prevalence and pattern of refractive errors is significant and contributes to the development of interventions that correct the complication to change the current situation.

In conclusion, the findings of this study show that there is a low prevalence of refractive errors among the study population, who were mainly adults and elderly people, while it remains high among the children. The refractive error problems among children are prevalent because they are caused by risk factors such as genetic connections and other sight-related risks that affect the immature visual system among children. The refractive error results in visual impairment and

blindness; thus, they are supposed to be corrected at an early stage. Therefore, correction interventions are important in the treatment of the refractive error.

Conclusion and Recommendations

Conclusion

This study examined the prevalence and pattern of refractive error in patients presenting within ten (10) practices of a private optical company in Trinidad and Tobago W.I. The research questions were answered based on the quantitative method whereby the data were collected from one thousand (1000) clinical records and further analysed through the use of statistical methods and tools. The study focused on answering the research objective as well as the questions to create additional knowledge and information regarding the prevalence and pattern of refractive error. This study was undertaken in Trinidad and Tobago W.I. by focusing on exploring the records of patients who visited a private optical company. From this perspective, the findings of the study are important to develop interventions to correct the refractive error among patients as well as determine the overall health problem caused by the visual complication.

The study findings demonstrate that refractive errors are a significant problem to the general population, with many people being affected by Myopia, Hyperopia, and Astigmatism. The refractive error problems are common among people across age groups and result in partial or complete blindness among the affected group. In this regard, the findings of the study indicate that refractive errors are a major health problem and can result in the suffering of people due to lower life quality, blindness, and other visual impairment problems. The study results found a significantly lower prevalence of refractive errors among the study population because it was based on self-presentation in the private optical clinics. However, previous studies explored in the present study indicate that there are many cases of refractive error cases across the world and are mainly prevalent among the young children and elderly population. Refractive errors are high and can be corrected through clinical interventions to reduce severe visual impairment. Visual impairment and blindness are outlined in the study as the main outcomes of the uncorrected refractive errors that have a negative impact on the quality of life of people and their participation in various activities. In this regard, refractive error is the main and common causative factor of visual impairment, and myopia, hyperopia and astigmatism are the main types that affect the general population. Patients presenting themselves to optical clinics seek appropriate screening and interventions to correct the refractive error situations.

Refractive errors are highly detected among patients visiting the optical facilities and are corrected to avoid further complications related to blindness and visual impairment. The findings from the present study demonstrate that all people are vulnerable to refractive errors regardless of age group. In this study, the majority of the participants were adults and elderly people; thus, it was less inclusive of the children and the young adults. As a result, the findings of the study point out that people between the ages of 36-80 are vulnerable to refractive error complications but are less susceptible to the disorder. Refractive error significantly affects young children and adults due to causative factors that are prevalent during childhood. As a result, the findings point out that the low prevalence of refractive errors among the study population is attributed to the implementation of correctional interventions implemented at an early stage. This study found that refractive errors among children and young adults, as well as blindness, can be prevented and corrected effectively to improve future life quality

and wellbeing. The high prevalence of refractive errors among children is attributed to factors such as measles and vitamin deficiency which can be preventable. From this perspective, failure to correct childhood refractive errors causes further development and complications that result in adulthood refractive errors that are difficult to solve. Refractive error interventions among children are effective and successful because they possess an immature visual system that can be corrected at a later stage. Therefore, this study shows that the majority of the patients who visited the private optical company in different locations were mature adults and elderly people in Trinidad and Tobago, with the results showing a relatively lower prevalence and pattern of the refractive error. Therefore, the low prevalence of myopia, hyperopia, and astigmatism among adults and elderly people is an indication of effective correction strategies for childhood visual complications.

This study demonstrates that there is a low prevalence of myopia, hyperopia, and astigmatism among the adults and elderly, while it remains high among the children due to causative factors such as genetic inheritance of the complication and exposure to risk factors that compromise with normal vision. In this regard, appropriate interventions are required to ensure that refractive errors are corrected at an early stage during childhood to improve the quality of life and participation in various activities. Despite the findings of the study showing relatively lower prevalence rates of refractive error among the patients who presented in private optical companies, which were mainly adults and the elderly, there is a need for further research regarding this subject to ascertain the pattern of the visual problem, given that it contradicts some previous studies and agrees with others.

Recommendations

For practice

Refractive errors are considered a significant health problem across the world, as presented in this study, especially when they are left uncorrected. They are associated with causing negative outcomes such as blindness and visual impairment. In this regard, the following recommendations should be applied to correct the current situation. Firstly, refractive errors are prevalent among children and affect their reading and educational activities. In this regard, mass screening of the children in schools should be implemented as an intervention to identify those affected for correctional measures. Secondly, public and private optical companies should be developed to improve the screening and provision of corrective interventions that ensure that the prevalence of refractive errors is kept at a relatively lower rate for all age groups. Lastly, awareness campaigns should be carried out to educate people on the need for visual screening to ensure that those with refractive errors are corrected at an early stage.

Future research

Future research should focus on exploring the various intervention strategies that can be implemented to correct refractive error complications as in screening in a larger population. This is because, in the current world, numerous technological innovations have been developed to detect visual impairments and are not widely covered.

Statement of competing interests

The author reports no competing interests.

References

1. Kaiti R, Pradhan A, Dahal HN, Shrestha P (2018) Pattern and prevalence of refractive error and secondary visual impairment in patients attending a tertiary hospital in Dhulikhel, Nepal. *Kathmandu Univ Med J* 62: 114-119.
2. Natung T, Taye T, Lyngdoh LA, Dkhar B, Hajong R (2017) Refractive errors among patients attending the ophthalmology department of a medical college in North-East India. *J Family Med Prim Care* 6: 543-548.
3. Ajayi IA, Omotoye OJ, Omotoso-Olagoke O (2018) Profile of refractive error in Ekiti, south western Nigeria. *Afr Vision Eye Health* 77: 1-5.
4. Ramsewak SSA, Verlander N, Deomansingh F, Fraser A, Maharaj V, et al. (2016) National eye survey of Trinidad and Tobago: The prevalence and risk factors for refractive error. *Investigative Ophthalmology & Visual Science* 57: 3976.
5. Greene PR (2019) Time course of nearwork myopia. *EC Ophthalmology* 10: 337-341.
6. Hung GK, Ciuffreda KJ (2000) A unifying theory of refractive error development. *Bull Math Biol* 62: 1087-1108.
7. Tedja MS, Wojciechowski R, Hysi PG, Eriksson N, Furlotte NA, et al. (2018) Genome-wide association meta-analysis highlights light-induced signaling as a driver for refractive error. *Nat Genet* 50: 834-848.
8. Cazeaux C (2017) *Art, research, philosophy*. (1st edn). London, Taylor & Francis, UK: 202.
9. Žukauskas P, Vveinhardt J, Andriukaitienė R (2018) *Philosophy and paradigm of scientific research*. (1st edn). Žukauskas P, Vveinhardt J, Andriukaitienė R, (ed's). London, Management culture and corporate social responsibility, IntechOpen, UK: 121-140.
10. Pearse N (2019) *An illustration of deductive analysis in qualitative research*. Stacey A, (ed). England, Academic Conferences and Publishing Limited, UK: 264.
11. Morsanyi K, McCormack T, O'Mahony E (2018) The link between deductive reasoning and mathematics. *Think Reason* 24: 234-257.
12. Saunders MN, Lewis P, Thornhill A, Bristow A (2015) *Understanding research philosophy and approaches to theory development*. (7th edn). Saunders MN, Lewis P, Thornhill A, (ed's). London, Research methods for business students, Pearson Education, UK: 122-161.
13. Freshwater D (2020) *Commentary: An overview of the qualitative descriptive design within nursing research*. *J Res Nurs* 25: 456-457.
14. Singh R (2019) *A beginner's guide to descriptive research: Dilemmas expected while researching women entrepreneurship in an Indian context*. SAGE Research Methods.
15. Apuke OD (2017) *Quantitative research methods: A synopsis approach*. *Arabian J Bus Manag Review (Kuwait Chapter)* 33: 1-8.
16. Haviz M, Maris IM (2018) *Teaching quantitative research method with three methods of learning*. *Al-Ta'lim Journal* 25: 234-247.
17. Berndt AE (2020) *Sampling methods*. *J Hum Lact* 36: 224-226.
18. Mishra P, Pandey CM, Singh U, Gupta A, Sahu C, et al. (2019) *Descriptive statistics and normality tests for statistical data*. *Ann Card Anaesth* 22: 67-72.