Original Article

Self-reported Myopia in Trinidad and Tobago: A Cross-sectional Study

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Abstract

Objective: The objective of this study was to determine the prevalence of self-reported myopia in Trinidad and Tobago. **Materials and Methods:** This study was a cross-sectional design, and data were collected using a validated structured questionnaire from January to April 2024. Systematic random sampling was used to select participants aged 15 and above to participate. Descriptive statistics were used to summarise the variables and the Chi-square test was used to assess for associations ($P < 0.05$). **Results:** A total of 350 participated in the study giving a response rate of 91.15%. Majority of the participants were female ($n = 197$, 56.3%), mixed race ($n = 126$, 36%), resided in urban areas ($n = 172$, 49.4%) and aged 18–35 years ($n = 168$, 48.3%). The prevalence of myopia was 40.9% and the prevalence was significantly associated with age group, ethnicity, level of education and religion ($P < 0.05$). Myopia was associated with family history, lifestyle, use of spectacles, daily use of computers, near work, outdoor activities, sleeping and having a father or mother with myopia (All $P < 0.05$). In addition, ocular diseases such as cataracts and glaucoma were among the most frequent reported conditions. **Conclusion:** The myopia prevalence observed in our study validates age-related trends, offers estimates across diverse age groups, and reveals a significant association between myopia rates and family history, with a self-reported myopia rate higher than clinical testing surveys but in line with global prevalence reports.

Keywords: Epidemiology, myopia, prevalence, self-reported, Trinidad and Tobago

Introduction

Myopia is a significant public health problem and a common cause of severe visual impairment globally.[1,2] Loss of vision due to myopia could affect the individuals' self-esteem and quality of life.[3]

Myopia could lead to debilitating diseases such as retinal detachment, macular degeneration, cataracts and glaucoma.[4] It also raises the chance of getting diabetes and cardiovascular disease among other health issues.[5] The pathogenesis of myopia is multifactorial and not entirely clear.[6,7] Genetics, outdoor activities, near-distance work, prolonged digital work, nutrition, sleep modality, urbanisation, gender and level of education were implicated as risk factors for myopia and myopia progression.[8-12] Furthermore, ethnicity was recorded as a significant risk factor of myopia, with South Asians being 9 times more likely to be myopic than others.[13] Since myopia results from a complex interplay of hereditary and environmental factors, some risk factors – such as the association between working distance and myopia – remain debatable, despite numerous studies evaluating them.[5]

Myopia prevalence tends to vary widely across different regions and populations due to factors such as genetics, lifestyle and environmental influences. Globally, the prevalence of myopia has been reported to increase continuously each year.[14] It ranged from 6.2% to 26.2% in Europe and South America, respectively, and up to 61% in Asia.[14] It is projected that by the year 2050, 50% of the world population will be myopic with the highest rates among East and Southeast Asians.[14,15]

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The prevalence of myopia in the Caribbean is not well documented, and little is known about its extent. While studies have assessed myopia prevalence in various regions, no current research has been conducted in the Caribbean, particularly in Trinidad and Tobago. Most available studies are outdated[16] or are from Caribbeans living abroad.[13] Given the ongoing global increase in myopia prevalence and its educational, social and economic consequences, it is essential to assess the prevalence of myopia within the population of Trinidad and Tobago. This assessment will help inform the development of effective strategies for myopia control and management.

Self-reporting is one of the most widely used methods for assessing the prevalence of health conditions due to its ease of use, convenience, cost-effectiveness and ability to gather data from large populations.[17-22] This approach provides valuable insights into the prevalence of specific conditions within communities or populations.[17-22] It has been proven useful in assessing the prevalence of various conditions.[17-22] Therefore, this study will utilise the self-report method to assess the prevalence of myopia and its associated factors within the population of Trinidad and Tobago. The results will be compared with global findings and will help inform strategies for the prevention, management and control of myopia.

Materials and Methods

Study design and setting

The study was a cross-sectional population-based study. This study was done in Trinidad and Tobago, a twin island located near Venezuela in the Caribbean archipelago with a population of 1,538,200.[23] The capital of Trinidad and Tobago is Port of Spain. Trinidad and Tobago has different ethnic groups with majority being East Indian and African.[24] Trinidad is the larger of the two islands and thus is more populated. It has nine counties, three boroughs and two cities.[23]

Study population

Individuals in Trinidad and Tobago who were 15 years old and above made up the study population.

Sample size

The sample size was determined using a sample size formula for cross-sectional study as suggested by Bolarinwa[25] as shown in the formular below. This calculation was based on a population of more than 20,000, with a confidence level of 95% and a margin of error of 5%. The estimated prevalence of uncorrected refractive error in the Caribbean was 44.6% as of 2015,[26] with expectations of an increase. Therefore, we projected the prevalence to 50% for this study:

$n = (Z^2 \cdot P\,q)/d^2$[27] $= ([1.96]^2 \times [0.5] \times [0.5])/(0.05)^2 = 384$

n: The required sample size.

Z: Z-score, $Z = 1.96$.

P: The estimated proportion of the population: 50%

q: The complement of P, or $q = 1 - P$

d: The margin of error = 0.05

Sampling technique

Systematic random sampling was used to select participants to participate in the study. Since Trinidad makes up most of the population between the two islands, six counties including Couva, Tunapuna/Piarco, Arima, Port of Spain, San Fernando city and Chaguanas Borough were randomly selected for data collection.

Inclusion and exclusion criteria

Participants 15 years or older who consented to participate were eligible to participate. Persons whose first language is not English and those who could not understand written English were excluded from the study.

Operational definition

"Myopia was defined as the need to use spectacles or contact lens for distant vision."[15,17]

Data collection tool and procedure

The data for this research were collected using a validated structured questionnaire, adapted from previous studies on similar topics.[15,17] The questionnaire evaluated the participants' behavioural traits, history of parental myopia and demographic data. The behavioural variables previously linked to myopia in earlier research[15,28,29] were investigated to guarantee the validity of the questionnaire. The average lengths of daily computer or smartphone use (games, videos and chatting), sleep, near work (studying, reading and writing) and outdoor activity were the behavioural characteristics evaluated.

Specific locations, including parks, shopping malls and marketplaces in the counties, were identified and used for data collection. Participants were recruited from those that visited the locations during the period of the study from January 2024 to April 2024. The data were collected by two optometry students who stood by the entrance of the chosen locations at different times of the day during the week. Every 3rd person who enters these locations was approached and invited to participate in the study. A structured questionnaire was given to them to complete. Where the selected participants declined or did not meet the inclusion criteria to participate in the study, the next person to enter the mall was selected as a participant to participate in the study. Consent was obtained from all participants before completing the questionnaire. The participants were assisted in completing the questionnaire where necessary.

Ethical consideration

Ethics approval was obtained from the University of the West Indies Saint Augustine Campus Trinidad and Tobago Research and Ethics Committee (Re: CREC-SA.2386/11/2023). Information about the study and the reason to participate in the study were explained to the participants before data collection. Written or verbal consent and accent were obtained from all participants. To ensure confidentiality, no personal information

was collected from the participants. The study adhered to the Declaration of Helsinki.

Data processing and analysis

The data were entered into an Excel sheet and then exported to Statistical Package for Social Sciences (SPSS) version 29 for analysis (SPSS Inc, Chicago, IL, USA). Descriptive statistics, such as frequency and percentage, were used to summarise the data. The Chi-square test was used to check for correlations and associations between the variables. $P<0.05$ was considered statistically significant.

Results

Out of a total of 384 invited to participate in the study, 350 persons/individuals gave their consent to participate in this study giving a response rate of 91.15%. The demographic data of participants were categorised by variables such as age group, ethnicity, education level, residence, occupation and religion. Across age groups, most participants fell within the 18–35 age range (48.3%), with relatively smaller proportions in older age categories. Mixed ethnicity (36.0%) was most prevalent followed by African ethnicity (28.9%). Tertiary education was the highest reported education level (57.7%). Participants predominantly resided in urban areas (49.4%), with a significant portion employed (59.4%). Christianity was the most common religion (56.6%) [Table 1].

Distribution of self-reported myopia according to demographic variables

The prevalence of myopia was 40.9% (n = 143). Among different subgroups, females had a slightly higher prevalence of self-reported myopia compared to males, although the difference was not statistically significant (P = 0.197). Age groups showed a significant variation (P = 0.040), with the 18–35 age group reporting the highest prevalence. Ethnicity showed significant differences in myopia prevalence, especially among East Indians. Education level revealed notable disparities, as individuals with tertiary education reported a higher prevalence of myopia than those with only primary or secondary education. Similarly, religion showed statistically significant differences, with individuals identifying as atheists or Hindus having higher myopia prevalence compared to those identifying as Christians. Other variables, such as residence and occupation, did not show significant associations with self-reported myopia [Table 2].

Distribution of self-reported myopia according to risk factors and lifestyle

A good number of those reporting ocular problems were due to myopia (n = 103, 29.4%) and a significant association was

Table 1: Distribution of demographics according to gender

Variables	Subgroups	Gender			Total, *n* (%)
		Female, *n* (%)	Male, *n* (%)	Non-binary, *n* (%)	
Age group	0–17	19 (5.4)	12 (3.4)	0	31 (8.9)
	18–35	97 (27.7)	71 (20.3)	1 (0.3)	169 (48.3)
	36–59	58 (16.6)	53 (15.1)	0	111 (31.7)
	60 and above	23 (6.6)	16 (4.6)	0	39 (11.1)
Ethnicity	African	50 (14.3)	50 (14.3)	1 (0.3)	101 (28.9)
	Caucasian	8 (2.3)	7 (2.0)	0	15 (4.3)
	East Asian	5 (1.4)	5 (1.4)	0	10 (2.9)
	East Indian	62 (17.7)	36 (10.3)	0	98 (28.0)
	Mixed	72 (20.6)	54 (15.4)	0	126 (36.0)
Education	None	5 (1.4)	7 (2.0)	0	12 (3.4)
	Primary	13 (3.7)	9 (2.6)	0	22 (6.3)
	Secondary	66 (18.9)	47 (13.4)	1 (0.3)	114 (32.6)
	Tertiary	113 (32.3)	89 (25.4)	0	202 (57.7)
Residence	Peri-urban	71 (20.3)	59 (16.9)	0	130 (37.1)
	Rural	23 (6.6)	24 (6.9)	0	47 (13.4)
	Urban	103 (29.4)	69 (19.7)	1 (0.3)	173 (49.4)
Occupation	Employed	105 (30.0)	102 (29.1)	1 (0.3)	208 (59.4)
	Retired	13 (3.7)	12 (3.4)	0	25 (7.1)
	Self-employed	22 (6.3)	14 (4.0)	0	36 (10.3)
	Student	44 (12.6)	23 (6.6)	0	67 (19.1)
	Unemployed	13 (3.7)	1 (0.3)	0	14 (4.0)
Religion	Atheist	19 (5.4)	37 (10.6)	0	56 (16.0)
	Christianity	118 (33.7)	79 (22.6)	1 (0.3)	198 (56.6)
	Hinduism	36 (10.3)	21 (6.0)	0	57 (16.3)
	Islam	18 (5.1)	10 (2.9)	0	28 (8.0)
	Other	6 (1.7)	5 (1.4)	0	11 (3.1)
Total		197 (56.3)	152 (43.4)	1 (0.3)	350 (100)

Table 2: Distribution of self-reported myopia according to demographic variables

Variables	Subgroups	Self-reported myopia		Total, *n* (%)	*P*
		No, *n* (%)	Yes, *n* (%)		
Gender	Female	109 (31.3)	88 (25.1)	197 (56.3)	0.197
	Male	97 (27.7)	55 (15.7)	152 (43.4)	
	Non-binary	1 (0.3)	0	1 (0.3)	
Age group	0–17	24 (6.9)	7 (2.0)	31 (8.9)	0.040
	18–35	89 (25.4)	80 (22.9)	169 (48.3)	
	36–59	71 (20.3)	40 (11.4)	111 (31.7)	
	60 and above	23 (6.6)	16 (4.6)	39 (11.1)	
Ethnicity	African	72 (20.6)	29 (8.3)	101 (28.9)	0.022
	Caucasian	9 (2.6)	6 (1.7)	15 (4.3)	
	East Asian	3 (0.9)	7 (2.0)	10 (2.9)	
	East Indian	53 (15.1)	45 (12.9)	98 (28.0)	
	Mixed	70 (20.0)	56 (16.0)	126 (36.0)	
Education	None	11 (3.1)	1 (0.3)	12 (3.4)	0.013
	Primary	15 (4.3)	7 (2.0)	22 (6.3)	
	Secondary	74 (21.1)	40 (11.4)	114 (32.6)	
	Tertiary	107 (30.6)	95 (27.1)	202 (57.7)	
Residence	Peri-urban	107 (20.3)	95 (16.9)	130 (37.1)	0.391
	Rural	28 (8.0)	19 (5.4)	47 (13.4)	
	Urban	108 (30.9)	65 (18.6)	173 (49.4)	
Occupation	Employed	122 (34.9)	86 (24.6)	208 (59.4)	0.657
	Retired	13 (3.7)	12 (3.4)	25 (7.1)	
	Self-employed	24 (6.9)	12 (3.4)	36 (10.3)	
	Student	38 (10.9)	29 (8.3)	67 (19.1)	
	Unemployed	10 (2.9)	4 (1.1)	14 (4.0)	
Religion	Atheist	35 (10.0)	21 (6.0)	56 (16.0)	0.021
	Christianity	128 (36.6)	70 (20.0)	198 (56.6)	
	Hinduism	27 (7.7)	30 (8.6)	57 (16.3)	
	Islam	14 (4.0)	14 (4.0)	28 (8.0)	
	Other	3 (0.9)	8 (2.3)	11 (3.1)	
Total		207 (59.1)	143 (40.9)	350 (100)	

found between wearing spectacles and myopia ($P < 0.001$). Furthermore, the presence of systemic diseases did not show a significant association with myopia ($P = 0.863$). Having a biologically near-sighted father was significantly associated with self-reported myopia ($P = 0.001$). Among individuals with a near-sighted mother, 63 (18.0%) reported myopia, whereas 80 (22.9%) of those without a near-sighted mother reported the condition.

In addition, the amount of daily near-work hours showed a significant association with myopia ($P = 0.022$), with higher proportions of individuals reporting myopia as the number of daily near-work hours increased. In addition, the amount of daily near-work hours, computer use, outdoor time and sleeping hours showed a significant association with myopia ($P < 0.05$). However, daily use of smartphones did not show a significant association with self-reported myopia [Table 3].

Frequency distribution of ocular disease among participants

The most frequent ocular diseases among the participants were cataracts only followed by glaucoma, among others as shown in Figure 1.

Discussion

Our study aims to address gaps in understanding myopia prevalence in Trinidad and Tobago by examining a broader age range than the National Eye Survey conducted in the country. While the National Eye Survey of Trinidad and Tobago (2013–2014) reported a myopia prevalence of approximately 19.2% among adults aged 40 and older,[30] our study found a notably higher prevalence of myopia (40.9%) across the population. The use of self-reporting may have influenced our findings, and the discrepancy between these results could also be attributed to the earlier survey's focus solely on adults over 40, which may have underestimated myopia prevalence, particularly among younger adults. A similar study in Taiwan[17] reported an overall self-reported myopia rate of 46.7%, closely aligning with our findings and further emphasising the importance of our research in elucidating myopia trends across diverse populations.

Our study identified age-related trend in myopia prevalence, with peak rates observed among young adults aged 18–35 years. This finding is consistent with global trends

Table 3: Distribution of self-reported myopia according to family history and lifestyle

Variables	Subgroups	Self-reported myopia		Total, *n* (%)	*P*
		No, *n* (%)	Yes, *n* (%)		
Ocular problems	No	161 (46.0)	103 (29.4)	264 (75.4)	0.219
	Yes	46 (13.1)	40 (11.4)	86 (24.6)	
Systemic disease	No	158 (45.1)	108 (30.9)	266 (76.0)	0.863
	Yes	49 (14.0)	35 (10.0)	84 (24.0)	
Wearing of optical devices	No	133 (38.0)	1 (0.3)	134 (38.3)	<0.001
	Yes	74 (21.1)	142 (40.6)	216 (61.7)	
Near-sighted biological father	No	150 (42.9)	80 (22.9)	230 (65.7)	0.001
	Yes	57 (16.3)	63 (18.0)	120 (34.3)	
Near-sighted biological mother	No	131 (37.4)	70 (20.0)	201 (57.4)	0.008
	Yes	76 (21.7)	73 (20.9)	149 (42.6)	
Daily use of computer/h	0–5	170 (48.6)	100 (28.6)	270 (77.1)	0.027
	6–10	32 (9.1)	38 (10.9)	70 (20.0)	
	11 and above	5 (1.4)	5 (1.4)	10 (2.9)	
Daily use of smartphone/hour	0–5	110 (31.4)	78 (22.3)	188 (53.7)	0.882
	6–10	83 (23.7)	54 (15.4)	137 (39.1)	
	11 and above	14 (4.0)	11 (3.1)	25 (7.1)	
Daily outdoor/h	0–5	184 (52.6)	141 (40.3)	325 (92.9)	<0.001
	6–10	23 (6.6)	1 (0.3)	24 (6.9)	
	11 and above	0	1 (0.3)	1 (0.3)	
Sleeping hours/h	0–5	40 (11.4)	44 (12.6)	84 (24.0)	0.045
	6–10	166 (47.4)	98 (28.0)	264 (75.4)	
	11 and above	1 (0.3)	1 (0.3)	2 (0.6)	
Daily near work/h	0–5	107 (30.6)	65 (18.6)	172 (49.1)	0.022
	6–10	97 (27.7)	68 (19.4)	165 (47.1)	
	11 and above	3 (0.9)	10 (2.9)	13 (3.7)	
Total		207 (59.1)	143 (40.9)	350 (100)	

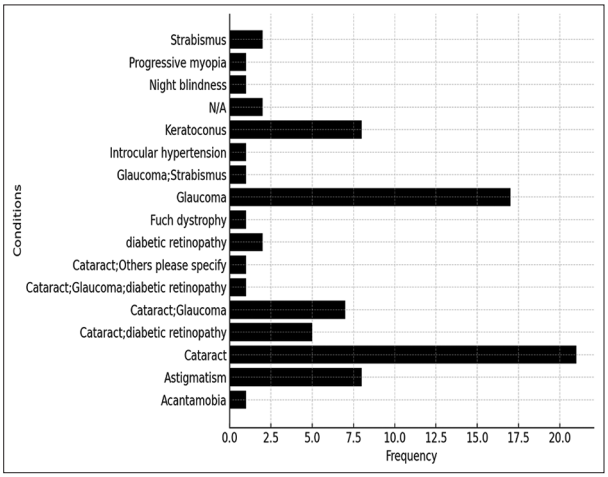

Figure 1: Frequency distribution of ocular disease among participants. Authors own creation

indicating a rise in myopia prevalence among younger age groups.[14] The observed decline in myopia rates among older adults aged 60 and above could be attributed to decreased near-work activities and changes in lifestyle habits over time.[31] Previous researches on myopia rates in Taiwan indicated peak prevalence estimates for ages 15–39 overall.[13,17,32] Despite the differing ethnic compositions among the studies, Lin *et al*.'s[32] study predominantly involved Asian participants, whereas our study in Trinidad and Tobago included primarily individuals of African and East Indian descent while the age-related myopia trend remained consistent in our findings.

In line with similar studies, our findings also corroborate the association between higher education and myopia prevalence.[33-37] Participants with tertiary education exhibited the highest myopia rates (57%), likely due to increase near-work and indoor activities associated with higher education. This confirms the notion that people with higher education most likely engage in lots of near work and indoor activity and less outdoor activities. In addition, our data highlighted a sex disparity in myopia prevalence, with females exhibiting higher rates compared to males. While the exact reasons for this difference remain to be fully elucidated, it may be influenced by factors such as hormonal differences, variations in eye growth patterns, or differential engagement in near-work activities between sexes.[38,39] This result is consistent with the results in the National Eye Survey, showing that females are more prone to developing myopia than males.[40] As suggested by Wong *et al*.,[36] this gender disparity perhaps arises from the disparities in emmetropisation between sexes.

Religion emerged a significant determinant of myopia prevalence, with Christians constituting the largest group

among those affected. This trend may reflect the predominantly Christian demographic of Trinidad and Tobago.[23] However, the association of myopia with religion has not been previously assessed. Therefore, there is a need for a large population-based study in Trinidad and Tobago to further explore this relationship and compare it with our findings.

In line with reports on genetic and environmental influences on myopia, we observed significant associations between parental glasses use and participant myopia prevalence, suggesting a role for hereditary factors contributing to myopia susceptibility among participants in our study.[15,41-43] In addition, our findings emphasised the impact of environmental factors on myopia development, with participants engaging in extensive near work, as evidenced by significant associations between myopia rates and daily computer use as well as daily outdoor activities.[15,44] Surprisingly, there was no association between daily smartphone use and myopia rates, possibly due to older participants' preference for computers over smartphones.

Moreover, cataracts emerged as the most prevalent eye disease among our participants, potentially linked to myopic shifts, particularly among the elderly, which may explain the elevated myopia rates observed in this survey.[45,46] These findings highlight the complex interplay between genetic predisposition, environmental factors and age-related changes in ocular health, highlighting the multifactorial nature of myopia development. Further investigation is necessary to clarify the fundamental processes and pinpoint focused therapies to lessen the increasing number of myopia-related problems and associated eye conditions in Trinidad and Tobago.

It is crucial to interpret our study findings within the context of the study's limitations. While our sample size was robust, it fell short of the calculated target, and the cross-sectional design limits our ability to establish causality or temporal relationships between variables. In addition, conducting the study solely outdoors may have excluded individuals who were indoors or at home or work, further constraining our findings. The reliance on self-reported data for certain variables, such as daily activities, also introduces the potential for recall bias. Despite these limitations, our investigation provides valuable insights into the epidemiology of myopia in Trinidad and Tobago, highlighting the need for targeted interventions and further research on this growing public health issue.

Conclusion

In summary, our study validates the age-related myopia trend observed in previous research and offers myopia estimates across diverse age groups. We identified a significant association between myopia rates and family history, with an overall self-reported myopia rate higher than clinical testing surveys but in line with global prevalence reports.

Authors contributions

Concept and study design: N.E.E; Manuscript preparation: D.E.A.J, N.E.E, M.A.K and S.T; Data acquisition: D.E and A.J; Statistical analysis: M.A.K; Manuscript editing and review: N.E.E, M.A.K and S.T.

Data availability statement

The data are available upon a reasonable request from the corresponding author.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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