Prevalence, Causes, and Risk Factors of Visual Impairment in Emiratis and Non-Emiratis of Dubai: A Subnational Population-Based Cross-Sectional Survey

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Received 7 February 2022; Revised 5 April 2022; Accepted 15 April 2022; Published 30 April 2022

Abstract

Purpose. To study the prevalence, causes, and risk factors of visual impairment (VI) among the Dubai Emiratis and non-Emiratis. Methods. The survey was a population-based cross-sectional eye health study conducted 2019-2020. Cluster sampling was used to randomly select local (Emirati) and expatriate (non-Emirati) Dubai residents aged 40 years and older. Ocular examinations were conducted in selected eye clinics to determine the visual acuity (VA) and cause(s) of VI if any. Trained nurses, optometrists, and ophthalmologists did the examinations. VA was measured using ETDRS visual chart. The World Health Organization VI and blindness definitions and classifications for the cause(s) of VI were used. Results. A total of 892 participants were included in the final analysis. The mean age [SD] was 52.09 [9.48] years, with 55.8% as males. Prevalence of presenting mild, moderate, and severe VI was 4.7% (2.94–7.11%), 1.8% (0.78–3.5%), and 0% for Emiratis, and 3.6% (2.06–5.76), 1.6% (0.63–3.21), and 0% for non-Emiratis, respectively. Four Emirati participants were blind, with a prevalence of 0.9% (0.25–2.28%). Men had lower likelihood of VI than women (odds ratio [OR] (95% CI): 0.42 (0.24–0.77)) after adjustment for covariates. Diabetes (OR (95% CI): 1.91 (1.04–3.52)) was an independent risk factor for VI. Higher education level was associated with a lower likelihood of VI (OR (95% CI): 0.34 (0.13–0.89)). Leading causes of VI among Emiratis were uncorrected refractive error (52%) and cataract (17.2%). Glaucoma, optic atrophy, and absent globe were the causes of blindness. Conclusions. Prevalence of VI is comparatively low with leading causes readily treatable. An effective strategy to improve spectacle correction and cataract services would reduce the VI burden.

1. Introduction

Visual impairment (VI) and blindness are important global health problems, leading to increased mortality, reduced quality of life, and significant economic loss [1,2]. The latest Global Burden of Disease Study (GBD) estimates 43.3 million people who were blind, 295 million had moderate and severe VI, and 258 million had mild VI worldwide in 2020 [3]. The number of people with VI and blindness from 2020 to 2050 is estimated to increase by approximately 90% and 50%, respectively [3]. Although the age-adjusted prevalence of VI and blindness had decreased over the past
three decades, the absolute number of people with VI and blindness continues to increase. This suggests that progress in disease control is not keeping pace with demand, and more challenges are expected with the continued rapid global population growth and aging [4]. In 2019, the World Health Organization (WHO) launched the first “world report on vision” to draw attention to the increasing need for eye care, and called for coordinated, concerted global action toward strengthening eye care in health systems and collecting key indicators for eye health in member states [5].

Reduction in the prevalence of VI and blindness over past decades can be attributed to the VISION 2020—the Right to Sight initiative [6]. Most countries worldwide including the United Arab Emirates (UAE) have signed formal declarations of support for this global initiative, which requests countries and stakeholders to establish national eye care programs and monitor the burden of VI and blindness. The WHO has consistently emphasized the need for population-based data from all countries, to better estimate VI-related burden, and inform resource allocation and best practice patterns [5–8]. However, such studies have been conducted in less than 20 percent of countries globally [9].

There is a dearth of data on the prevalence and causes of VI in the Dubai Emirates as well as the whole country of UAE. The only existing survey regarding VI prevalence from the UAE is a hospital-based study from the city of Al-Ain, in the Emirates of Abu-Dhabi [10]. Lack of population-based data on VI and eye diseases is a serious impediment to effective national planning of eye care programs in Dubai Emirates and non-Emirates. We, therefore, conducted a population-based survey to gather population-level data on prevalence, causes, and risk factors of VI in the Dubai Emirates and non-Emirates.

2. Materials and Methods

Dubai is the second largest of the seven Emirates that make up the UAE. It occupies 4,114 square kilometers [11]. In 2016, it had an all-age estimated population of 2,504,000. Dubai’s population age and gender ratios are skewed, with approximately 75% of the population being male and 58% of the population in the 25–44 age group [12]. Dubai has a unique population structure where only 15–20% of the population in the 25–44 age group [12]. Dubai has a population of approximately 75% of the population being male and 58% of the population in the 25–44 age group [12].

2.2. Study Design. The study is a population-based cross-sectional survey of residents aged 40 years and older residing in Dubai conducted between December 2019 and March 2020. Residents were defined as persons that had lived in their household in the last six months.

The study population was divided into two main categories. The Emiratis are the nationals of UAE and non-Emiratis are expatriates. The expatriates were further stratified into three groups, namely, professionals (professional expatriates), collective households (the blue-collar expatriates), and labor camps (laborers). These strata have different demographics and accessibility to eye care services. Based on the proportion of 40 years and older and the assumed proportion of people with VI in each stratum, the sample size was shared into the 4 population strata. For each stratum, a specified number of clusters were allocated and randomly selected by probability proportional to size. All 165 clusters were selected across the four population strata. In each selected cluster, households were randomly chosen from the database of residents with the Dubai Statistics Center, to yield the needed sample size for the stratum. In each selected household, one eligible person was randomly selected. Selected individuals were contacted via phone and invited to participate in the survey by visiting the nearest of the four eye clinics selected for the survey. Civil and religious societies were involved in encouraging the selected individuals to participate in the survey.

The survey was conducted by six teams and planned to run for six months beginning from December 2019. Each survey team consisted of an ophthalmologist, an optometrist, and a nurse. Survey teams were trained for 4 days on all aspects of survey examination procedures, use of the equipment, and operational definitions. An interobserver agreement of at least 80% was achieved among teams for the measurements of visual acuity (VA), and principal cause(s) of VI.

Ethical approval for the survey was obtained from the Dubai Scientific Research Ethics Committee of the Dubai Health Authority (DSREC-05/2019_03) and conducted following the Helsinki Declaration. Written informed consent was received from each participant.

2.3. Study Examinations. Participants’ personal, demographic, and health data, including age, sex, nationality, literacy level, occupation, working status, and history of diabetes mellitus, were obtained. Random blood sugars were tested via a point-of-care BioHermes HBA1c device (Bio-Hermes; Jiangsu, China). The nurses obtained and recorded this information. The optometrists measured the VA using the ETDRS LogMar chart at 3 meters (Tumbling E-Series ETDRS-Chart 1-3cht1-3 Meter by Precision vision; La Salle, USA) in well-lit rooms. The chart was placed one meter above the ground. The participant scores the smallest visual.
acuity level when he/she indicates correctly the orientation of at least three of the four characters in the level. Each eye was first tested individually without aid and recorded as “uncorrected visual acuity.” The VA was then tested with glasses/contact lenses (distant) if normally worn, for each eye, and recorded as “presenting visual acuity” (PVA). After refraction, the best-corrected VA was also tested in each eye and recorded as “best-corrected VA.” If any of the eyes did not see any letter from the chart, then VA was assessed through counting finger down at one meter to light perception.

All participants had automated refraction performed by the optometrists using the Topcon KR1 auto-refractometer (Topcon, Tokyo, Japan). Following refraction, participants with PVA less than 6/12 in any eye received subjective refraction. Participants for whom automated refraction could not be obtained due to media opacities received subjective refraction.

Detailed anterior and posterior segment assessments of both eyes were performed for all study participants by the ophthalmologists, with slit-lamp biomicroscopy, direct and indirect ophthalmoscopy (Keeler-USA), and intraocular pressure check (Goldman applanation tonometer) to determine the cause(s) of VI in any eyes, if present.

2.4. Study Definitions

2.4.1. VI and Blindness Definition for the Eye or Person. Definitions of bilateral VI and blindness followed the WHO classification [14]: (1) normal = PVA ≥6/12 in that eye or the better eye; (2) mild VI = PVA <6/12 but ≥6/18 in that eye or the better eye; (3) moderate VI = PVA <6/18 but ≥6/60 in that eye or the better eye; (4) severe VI = PVA <6/60 but ≥3/60 in that eye or the better eye; (5) blindness = PVA <3/60 in that eye or the better eye. Unilateral VI = PVA ≥6/12 in one eye but <6/12 to ≥3/60 in the other eye. Unilateral blindness = PVA ≥6/12 in one eye but <3/60 in the other eye.

2.5. Diabetes Mellitus. Participants with diabetes mellitus history or HbA1c of 6.5% or greater were considered diabetic.

2.6. Principal Cause(s) of VI and Blindness. For all participants with VA <6/12 in either eye, the principal cause of the VI was assigned by the ophthalmologist based on all diagnostic findings. A systematic approach for determining the principal cause(s) of VI and/or blindness for each eye was established based on the WHO standardized protocol [15]. According to the protocol, the principal cause should be the pathology considered to be the most likely cause of the vision <6/12. If two different conditions in the same eye were likely to cause a degree of VI, then the condition most amenable to treatment or prevention was chosen. When more than one singular ocular disorder was present, one of which was secondary to the other, the “primary” cause was selected. For each participant with PVA less than 6/12 in one or both eyes, one single principal cause of VI or blindness was assigned for the person. If there are two different causes of VI or blindness in a person, the principal cause for the person should be the pathology most amenable to treatment or prevention.

2.7. Data Management and Analyses. Data were entered into a digital record form with check systems designed for the survey. Daily fieldwork data were reviewed by the survey supervisors. Statistical analyses were performed using SAS 9.4 for Windows (SAS Institute Inc.). Study participants were assigned to two groups (Emiratis and non-Emiratis) for data analyses. And three educational groups were as follows: low (illiterate), moderate (lower secondary/postsecondary education), and high levels (bachelor/masters/doctoral). Prevalence estimates were calculated and presented with 95% confidence intervals. Stepwise (forward selection) regression model was used to select covariates in the multivariable analysis. Statistical significance was assessed at \( p < 0.05 \) (two-tailed).

3. Results

Of 895 participants who were examined, after excluding participants with incomplete data for vision, 892 participants (mean [SD] age, 52.09 (9.48) years; 55.8% male, 50% Emiratis) were included in the final analysis. The age-sex structure of the Emirati sample population depicts a more representative sample compared with the Emirati general population (Figure 1).

Demographic characteristics for Emirat and non-Emirati participants are shown in Table 1. In comparison with Emiratis, non-Emiratis were significantly younger (49.73 vs 54.42 years, \( P < 0.001 \)), had a higher ratio of males (66.6% vs 45.1%, \( P < 0.001 \)), and were more likely to be currently working (64.8% vs 41.5%, \( P < 0.001 \)). Emiratis were more likely to be older than non-Emiratis (six age groups: 40–44, 45–49, 50–54, 55–59, 60–64, and ≥65 years). No significant difference between Emiratis and non-Emiratis (low (illiterate), moderate (lower secondary/postsecondary education), and high levels (bachelor/masters/doctoral), \( P = 0.39 \)).

Based on uncorrected VA, the prevalence of mild, moderate, severe VI, and blindness was 9.2%, 9.4%, 1.1%, and 1.8%, respectively, for Emiratis, and 9.0%, 7.0%, 0.9%, and 1.6%, respectively, for non-Emiratis (Table 2). While for PVA, the prevalence of mild, moderate, and severe VI was 4.7%, 1.8%, and 0%, respectively, for Emiratis, and 3.6%, 1.6%, and 0%, respectively, for non-Emiratis. With PVA, there were four Emirati participants blind with a prevalence of 0.9% (0.25% to 2.32%), while none among the non-Emirati (Table 2). The prevalence of all categories of presenting VI (PVI) is higher in women for Emiratis (mild VI 6.1% vs 3.0%; moderate VI 2.0% vs 1.5%), and non-Emiratis (mild VI 7.4% vs 1.7%; moderate VI 2.7% vs 1.0%) (Table 2).

Projecting the prevalence values to the population of Emiratis’ in Dubai, it is estimated that there could be 4174 Emiratis with all categories of VI and another 578 people blind. However, without existing/available optical
corrections the number of Emiratis with VI would be almost tripled (prevalence 21.5% vs 7.4%) (Table 3).

The most common principal cause of VI among Emiratis and non-Emiratis was uncorrected refractive error (URE), followed by cataract for bilateral VI (Tables 3). URE is responsible for over 52% of the causes of bilateral VI among Emiratis. All of the VI is in the mild and moderate VI categories. Other less common causes included diabetic retinopathy, optic atrophy, and corneal opacity. For the four blind persons, the causes were glaucoma, optic atrophy, and absent globes (2 persons), all among the Emiratis (Table 3).

Thirty-six Emiratis had unilateral VI, with a prevalence of 8.1% (CI: 5.6–10.7). For the non-Emiratis, it was 27 people, with a prevalence of 6.0% (CI 3.5–8.5), with the major causes being URE and cataract; others were amblyopia, glaucoma, diabetic retinopathy, and keratoconus (Table 3).

Univariate logistic regression analysis showed that participants aged 60+ years had a significantly higher risk of VI than those aged 40–49 years (odds ratio [OR] 4.37 (2.35–8.15)), and participants with higher education level had a lower likelihood of VI (moderate vs low education: OR 0.39 (0.22–0.69); high vs low education: OR 0.23

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**Table 1: Characteristics of examined study participants.**

| Study variables                  | Total (N = 892) | Emiratis (N = 446, 50.0%) | Non-Emiratis (N = 446, 50.0%) | P value* |
|----------------------------------|----------------|---------------------------|-----------------------------|----------|
| Age, years (mean ± SD)           | 52.09 (9.48)   | 54.45 (9.56)              | 49.73 (8.80)                | <0.001   |
| Age group, years†                |                |                           |                             | <0.001   |
| 40–44                            | 226 (25.3)     | 69 (15.5)                 | 157 (35.2)                  |          |
| 45–49                            | 195 (21.9)     | 86 (19.3)                 | 109 (24.4)                  |          |
| 50–54                            | 167 (18.7)     | 100 (22.4)                | 67 (15.0)                   |          |
| 55–59                            | 111 (12.4)     | 67 (15.0)                 | 44 (9.9)                    |          |
| 60–64                            | 76 (8.5)       | 47 (10.5)                 | 29 (6.5)                    |          |
| ≥65                              | 117 (13.1)     | 77 (17.3)                 | 40 (9.0)                    |          |
| Gender                           |                |                           |                             | <0.001   |
| Female                           | 394 (44.2)     | 245 (54.9)                | 149 (33.4)                  |          |
| Male                             | 498 (55.8)     | 201 (45.1)                | 297 (66.6)                  |          |
| Education level                  |                |                           |                             | 0.39     |
| Illiterate                       | 58 (6.5)       | 39 (8.7)                  | 19 (4.3)                    |          |
| Lower secondary/postsecondary    | 639 (71.6)     | 315 (70.6)                | 324 (72.6)                  |          |
| Bachelor/masters/doctoral        | 195 (21.9)     | 92 (20.6)                 | 103 (23.1)                  |          |
| Working status                   |                |                           |                             | <0.001   |
| Currently working                | 474 (53.1)     | 185 (41.5)                | 289 (64.8)                  |          |
| Not working                      | 418 (46.9)     | 261 (58.5)                | 157 (35.2)                  |          |
| Diabetes                         |                |                           |                             | <0.001   |
| No                               | 632 (70.9)     | 285 (63.9)                | 347 (77.8)                  |          |
| Yes                              | 260 (29.1)     | 161 (36.1)                | 99 (22.2)                   |          |

* T-test was used to test the difference in continuous variable between Emiratis and non-Emiratis and the chi-squared test for categorical variables. † All these data are frequency (percentage).
with diabetes have a higher risk of PVI than those without OR 2.81 (1.63–4.85). In multivariable analysis, age, gender, educational levels, or diabetes status were all significantly associated with PVI (Table 4).

### 4. Discussion

This study has presented the first population-based data on the prevalence and causes of VI amongst Emiratis and non-Emiratis in Dubai, a region with a peculiar demographic structure characterized by a high proportion of the young male expatriate population. Generally, the prevalence in all categories of VI was lower in non-Emiratis than Emiratis, possibly due to the younger demographic characteristics of the non-Emiratis.

Even when comparing our Emirati strata only (mild VI: 4.1%, moderate VI: 1.7%, and blindness: 0.4%) was lower than that reported in several other population-based studies of similar age ranges. These include the China Nine Province Survey (mild VI: 20.4%, moderate to severe VI: 10.3%, and blindness: 1.66%), [16] the National Eye Health Survey in Australia (VI: 6.6%), [17] and the Tripura Eye Survey (VI: 8.7% and blindness: 1.5%) [18]. This could be due to the demographic of our study population, with over 70% of the population being younger than 60 years due to a large number of young expatriates. This study has shown that the prevalence of VI and blindness was lower in non-Emiratis than Emiratis, possibly due to the younger demographic characteristics of the non-Emiratis.

Participants with diabetes have a higher risk of PVI than those without OR 2.81 (1.63–4.85). In multivariable analysis, age, gender, educational levels, or diabetes status were all significantly associated with PVI (Table 4).

### Table 2: Prevalence of uncorrected and presenting visual impairment/blindness among Emiratis and non-Emiratis by sex.

| Category         | Uncorrected VI, no. (%) | Presenting VI, no. (%) | Magnitude among Emirati population | Uncorrected VI, no. (%) | Presenting VI, no. (%) | Total Presenting VI, percentage (95% CI) |
|------------------|-------------------------|------------------------|-------------------------------------|-------------------------|------------------------|------------------------------------------|
|                  | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total |
| Mild VI (≤6/12.6/18) | 14 (7.0) | 27 (11.0) | 41 (9.2) | 6 (3.0) | 15 (6.1) | 21 (4.7) | 3018 | 15 (8.4) | 40 (9.0) | 5 (1.7) | 11 (7.4) | 16 (3.6) | 4.1 (2.9–5.7) |
| Moderate VI (≤6/18.6/60) | 22 (10.9) | 20 (8.2) | 42 (9.4) | 3 (1.5) | 5 (2.0) | 8 (1.8) | 1156 | 16 (5.4) | 31 (7.0) | 3 (1.0) | 4 (2.7) | 7 (1.6) | 1.7 (0.9–2.8) |
| Severe VI (≤6/60,3/60) | 0 (0.0) | 5 (2.0) | 5 (1.1) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 3 (1.0) | 1 (0.7) | 4 (0.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| All VI (≤6/12,3-60) | 36 (17.9) | 52 (21.2) | 88 (19.7) | 9 (4.5) | 20 (8.2) | 29 (6.5) | 4174 | 44 (14.8) | 75 (16.8) | 8 (2.7) | 15 (10.1) | 23 (5.1) | 5.8 (4.3–7.4) |
| Blindness (<3/60) | 5 (2.5) | 3 (1.2) | 8 (1.8) | 3 (1.5) | 1 (0.4) | 4 (0.9) | 578 | 7 (2.4) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0.4 (0.1–1.1) |
| Total (VI and blindness) | 41 (20.4) | 55 (22.4) | 96 (21.3) | 12 (6.0) | 21 (8.6) | 33 (7.4) | 4752 | 51 (17.2) | 82 (18.4) | 8 (2.7) | 15 (10.1) | 23 (5.2) | 6.3 (4.7–7.9) |

VI = visual impairment; CI = confidence interval.
| Principal cause                        | Emiratis (n = 446) | Non-Emiratis (n = 446) |
|---------------------------------------|--------------------|------------------------|
|                                       | No. (%) of persons by level of VI/blindness | No. (%) of persons by level of VI/blindness |
|                                       | Mild VI | Moderate VI | Severe VI | Total VI<6/12-3/60 | Blindness | Mild VI | Moderate VI | Severe VI | Total VI<6/12-3/60 | Blindness |
| Cataract                              | 1       | 4           | 0         | 5 (17.2)          | 0         | 10      | 27.8       | 0         | 5                  | 1         | 6 (26)          | 0         | 7 (25.9)       | 0         |
| Refractive error                      | 12      | 3           | 0         | 15 (52)           | 0         | 14      | 46.7       | 0         | 10                 | 5         | 15 (65)         | 0         | 7 (25.9)       | 0         |
| Age-related macular degeneration      | 0       | 0           | 0         | 0                 | 0         | 1       | 4.8        | 0         | 1                  | 1         | 2 (8.7)         | 0         | 0              | 0         |
| Post capsule opacification            | 0       | 1           | 0         | 1 (3.4)           | 0         | 1       | 2.8        | 0         | 0                  | 0         | 0              | 0         | 0              | 0         |
| Corneal opacity                       | 2       | 0           | 0         | 2 (6.9)           | 0         | 1       | 2.8        | 0         | 0                  | 0         | 0              | 0         | 1 (3.7)       | 1 (33.3) |
| Keratoconus                           | 1       | 0           | 0         | 1 (3.4)           | 0         | 0       | 0         | 0         | 0                  | 0         | 0              | 0         | 2 (7.4)       | 0         |
| Glaucoma                              | 0       | 0           | 0         | 0                 | 1 (25)    | 2       | 5.5        | 0         | 0                  | 0         | 0              | 0         | 0              | 0         |
| Optic atrophy                         | 2       | 0           | 0         | 2 (6.9)           | 1 (25)    | 1       | 2.8        | 0         | 0                  | 0         | 0              | 0         | 0              | 0         |
| Diabetic retinopathy                  | 2       | 0           | 0         | 2 (6.9)           | 0         | 2       | 5.5        | 0         | 0                  | 0         | 0              | 0         | 1 (3.7)       | 0         |
| Macular degeneration                  | 0       | 0           | 0         | 0                 | 0         | 1       | 2.8        | 1 (100)   | 0                  | 0         | 0              | 0         | 0              | 0         |
| Amblyopia                             | 0       | 0           | 0         | 0                 | 0         | 3       | 8.3        | 0         | 0                  | 0         | 0              | 0         | 5 (18.5)      | 0         |
| Absent globe                          | 0       | 0           | 0         | 2 (50)            | 0         | 0       | 0         | 0         | 0                  | 0         | 0              | 0         | 0              | 0         |
| Anterior uveitis                      | 0       | 0           | 0         | 0                 | 0         | 0       | 0         | 0         | 0                  | 0         | 0              | 0         | 0              | 0         |
| Others                                | 1       | 0           | 0         | 1 (3.4)           | 0         | 0       | 0         | 0         | 0                  | 0         | 0              | 0         | 4 (14.8)      | 1 (33.3) |
| All                                   | 21      | 8           | 0         | 29 (100)          | 4 (100)   | 36      | 100        | 1 (100)   | 16                 | 7         | 23 (100)        | 0         | 27 (100)       | 3 (100)   |

VI = visual impairment.
the Emiratis. The factors contributing to this disparity are complex and can be attributed to both biological and social factors [27]. Major eye problems are associated with aging, with women generally having longer life expectancies, and more likely to survive to develop vision problems [28]. Life expectancy of UAE women (79.2) is higher than that of men (77.1) [29]. Gender inequalities in access to health care may also contribute to a higher prevalence of VI in females [30–32].

In line with global and regional studies, [7,8,17–22,33] URE and cataracts were the main causes of vision loss in both Emiratis and non-Emiratis in Dubai. Priority should be given to these two conditions given the reversibility and ease in treatment especially for URE, which constitutes about 50% of the causes of VI in this study. With recent increasing myopia prevalence globally, especially among younger individuals, [34] the risk of VI caused by URE may increase correspondingly in this young demographic population. In addition, the burden of cataracts and the need for effective cataract surgery are projected to increase due to increasing aging populations [35]. Government and public health agencies should therefore plan and implement strategies to address these likely future health challenges, especially the increasing health access disparity for some categories of expatriates like the laborers, a common feature for affluent communities like Dubai. However, this study could not adequately demonstrate this inequity because the study stopped before the inclusion of the large number of laborers planned to be studied.

This survey is the first population-based cross-sectional study of VI in the UAE. The cluster sampling design used ensured appropriate sampling of Dubai residents from different population groups. In addition, trained ophthalmologists, optometrists, and nurses carried out standardized examinations. The prevalence, principal cause(s), and risk factors of VI were reported for both Emiratis and non-Emiratis though the Emirati data are more reliable.

Several limitations of this current study should be noted. Firstly, due to the COVID-19 pandemic, the study had to be terminated earlier; therefore, only 895 participants (41% of the originally planned sample size) were examined. This could lead to bias in our estimates of VI prevalence. However, a comparison of the demographics of the sampled Emirati population and the general Emiratis population showed a similar pattern, which suggests estimates for the Emirati may not be biased despite the relatively low response rate. Secondly, the sample size was calculated to detect the prevalence of VI in general, so the study may not be accurate in the estimates of the principal causes of VI. The absolute number of causes of VI was small.

In conclusion, our study is the first to provide the prevalence of VI in Dubai, a highly urbanized population with skewed demographic structure and unique challenges for conducting a population-based clinical survey. Our estimates are more reliably applied to the Emirati population, which shows a lower burden of VI, with the causes of VI being mainly avoidable. Further efforts are required to improve eye care within the community especially focused on improving refractive error services and targeted at those disproportionately affected people such as women, the elderly, and lowly educated individuals.

**Data Availability**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.
Ethical Approval

Ethical approval for the survey was obtained from the Dubai Scientific Research Ethics Committee of the Dubai Health Authority (DSREC-05/2019_03) and conducted in accordance with the Helsinki Declaration.

Consent

Written informed consent was received from each participant.

Conflicts of Interest

The authors have no financial or other conflicts of interest concerning this study.

Authors’ Contributions

MOT performed concept for the survey, development of survey protocol, supervision, and manuscript development. MMR involved in survey design, training, supervision, data analysis, and manuscript development. SA involved in survey training, supervision, administration, and manuscript review. NAS, BK, HK, SC, PR, SP, GS, MMS, and LTS collected the data and reviewed the manuscript. WKA and HYH supervised survey and trained survey teams, analyzed the data, and involved in manuscript development. All authors have read and approved the manuscript.

Acknowledgments

The authors are grateful to Noor Dubai Foundation for initiating the survey concept, providing funding, human and material resources, developing, organizing, and supervising the whole conduct of the survey. The authors are indebted to Dubai Statistic center for their enormous support in guiding the study design, selection, and invitation of the participants and provision of several resources to support the survey. The authors are indebted to Dubai Health Authority, Medicare Hospital and Clinics, Dubai, and Al Zahra Hospital, Dubai, for providing their eye clinics and personnel for the survey. The authors express their deep appreciation to the optometrists and nurses from these institutions for their active participation in collecting the survey data. Rivoli Eye Zone supported the survey with spectacles. The authors are grateful to the Center for eye research Australia for the technical support in the design, training of the survey teams, and analysis of the data. The Data Analysis, Research and Studies Department of the Dubai Health Authority was helpful in the supervision of the fieldwork and inputs to the development of the manuscript. The authors are most grateful to the participants for their participation. This study was funded by Noor Dubai Foundation, Dubai, UAE.

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