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Original Research

Prevalence of Refractive Errors Among Patients Attending Al-Wahdah Teaching Hospital, Ophthalmic Clinic in Dhamar Governorate, Yemen

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Abstract

Background: Refractive errors (REs) are one of the major causes of visual impairment and health problem worldwide particularly in developing countries including Yemen.
Aim: This study was aimed to estimate the prevalence of refractive errors among patients attending the ophthalmic clinic at Thamar University Al-Wahdah Teaching Hospital (TUWTH), Yemen.
Methods: A cross sectional descriptive study was conducted on 534 patients (aged 6- 40 years) attending the ophthalmology out-patient clinic at TUWTH during the period of 1st February to 1st May 2019. For each patient, detailed Ophthalmology examination including visual acuity (VA) assessment, objective and subjective refraction were done. The data were collected using a pretested and structured questionnaire included demographic characteristics, present medical history and clinical investigations.
Results: The results showed that the overall prevalence rate of REs was 32.02% (171/534). The rates of different types of RE were 10.67%, 7.87%, 7.30%, 3.37% and 2.81 % for Myopia, Myopic astigmatism, Hyperopic astigmatism, Mixed astigmatism and Hyperopia respectively. The overall prevalence of RE was significantly higher among females than males (36.96% *vs* 26.74%., *P*= 0.012). The highest rate of RE significantly observed among who having primary education followed by ≥ secondary education, and illiterates (37.80%;29.79% and 24.49 %. respectively, *P*=0.019).
Conclusion: This study provides hospital-based information on the prevalence rate of RE among patients in Dhamar governorate, Yemen. The results demonstrate that females and educated patients have higher prevalence rate of REs.

Keywords: Prevalence, Refractive errors, Myopia, Astigmatism, Yemen

1. Introduction

Refractive errors (REs) are defined as a condition in which the optical system of the eye (at rest) fails to bring parallel rays of light to focus on the retinal fovea resulting in formation of a blurred image [1]. In case of Myopia (short sightedness) the optical system of the eye brings parallel rays of light entering the eye into a focus anterior to the retina while in Hypermetropia (hyperopia) the optical system of the eye brings parallel rays of light into a focus behind the fovea, both conditions resulting in formation of blurry image. In case of astigmatism the optical system of the eye forms a focal line instead of focal point resulting in image distortion. [2-4]. Astigmatism is classified into regular and irregular. Various types of regular astigmatism have been identified on the basis of the refractive power and position of the two principal meridians termed as; myopic astigmatism (simple or compound), hyperopic astigmatism (simple or compound) and mixed astigmatism [5].

RE represent an established problem worldwide. It is estimated that 2.3 billion individuals live with these errors [6]. WHO reports and recent studies carried on prevalence of RE indicate that these errors of the eye are the first cause of visual impairment and ranks second to cataracts as a cause of treatable and preventable blindness [7,8]. It has reported that 43% of visual loss worldwide are caused by

REs. REs considered one of the WHO five priorities of global initiatives for vision 2020 (the right to sight) because uncorrected REs have a huge socioeconomic and physiological impacts and accounts for visual impairment in 153 million people all over the world [7].

In addition, uncorrected RE is a public health concern which hampers performance, reduces productivity and affect quality of life. Lack of knowledge, stigma and erroneous beliefs towards REs plays a major role in uptake of refractive services [9-10]. REs can be effectively corrected with many ways as spectacles, contact lenses and refractive surgery such as LASIK, PRK or Intraocular Lens Implantation. Correction with spectacles is the simplest, most common and cost-effective form of treatment [11]. The international cost of visual impairment correction caused by uncorrected RE has been estimated to be 2800 million US dollars and the global burden of uncorrected RE resulting from productivity loss costs about 121.4 billion US dollars [12,13].

Knowledge about the prevalence and pattern of REs and their visual impacts is essential to set programs, policies and priorities and to evaluate global eye health [14]. This study was done in Republic of Yemen which is located in the south west part of the Arab Peninsula with an area of 555,000 square kilometres. Yemen's population is around 25.3 Million distributed in 21 Governorates in addition to the capital city of Sana'a. About 68.2% of the population lives in rural areas. Yemen is one of the WHO Eastern Mediterranean Region countries; the estimated prevalence of blindness in this region is 0.7%, and Yemen is regarded as one of the countries with high prevalence rate of blindness [15]. In Yemen there is no sufficient data regarding the prevalence of RE. Therefore, a hospital based-study was conducted to find out the magnitude of REs in different age groups.

2. Methods

Study area

The study was conducted at Thamar University Al-Wahdah Teaching Hospital (TUWTH) which is located in Dhamar Governorate, Yemen.

Study design

A cross sectional descriptive study was conducted on 534 patients attending the ophthalmology out-patient clinic during the period of 1st February to 1st May 2019. All Patients aged 6 to 40 years who were phakic and whose unaided visual acuities were worse than 6/6 in one or both eyes but improved with pinhole were included in the study. Any patient had a previous history of eye surgery or eye trauma was excluded from the study. Assessment of visual acuity (VA) using a standard illuminated Snellen's VA chart or E chart with and without pinhole was done for all the patients. Automated refraction with Kerato-Refractometer (Topcon) were done by an ophthalmologist. Cycloplegic refraction using three drops of cyclopentolate 1% 10 minutes apart was done for children up to 16 years of age. Subjective refraction was performed for all the patients. The anterior and posterior segments of these patients were examined in detail using slit lamp and Volk 90D non-contact lens. Normal patients and patients having organic lesions in anterior segment or posterior segment impairing the vision were considered as other diagnosis. REs were defined as: myopia <−0.50 diopters (D), hyperopia > +0.50 diopters for adults and > +2.0 diopters for children (up to 16 years; after cycloplegic refraction) and astigmatism > 0.50 cylinder diopters.

Data collection

Patients data were collected using a pretested structured questionnaire included Demographic data (age, gender, education level, etc.), Present medical history, and Clinical investigations.

Statistical analysis

Data were analysed by Statistical Package for the Social Sciences SPSS, version 25, Windows 8. For the analysis purpose, the age groups were divided into three groups, namely; 6–16, 17–28 and 29–40 years. Associations between categorical variables were analysed using the Chi-square test or Extract fisher test. *P* value ≤ 0.05 was considered statistically significant.

Ethical consideration

Ethical approval was obtained from Thamar University Medical Ethics Committee (TUMEC-19010). Verbal consents were taken from the patients and the parents of children prior to questionnaire filling. All of the information was collected and kept strictly confidential.

3. Results

Patients' Characteristics

Table 1 shows the general characteristics of studied patients. Out of 534 patients included in the study, 276 (51.69%) were females, and 258 (48.31%) males. Most of the patients (47.75%) were in age group of (28-40) years, 153 (28.65%) aged 6-16 years, and (23.60%) aged 17-27 years. Most of the patients had primary education (46.07%).

Table 1: General characteristics of studied patients (n=534)

Variable	Frequency (%)
Age/year	
6-16	153(28.65)
17-27	126(23.60)
28-40	255(47.75)
Gender	
Male	258(48.31)
Female	276(51.69)
Education level	
Illiterate	147(27.53)
Primary	246(46.07)
≥ Secondary	141(26.40)

Overall Prevalence of RE

The results of this study showed that the overall prevalence rate of REs among studied patients during the

study period was 32.02% (171/534). While, the rest of studied patients 67.98% (363/534) had other diagnosis (Normal, cataract, glaucoma, conjunctivitis, pterygium, diabetic retinopathy etc.).

Demographic Distribution of RE

The prevalence of RE was higher among females 36.96% than males 26.74%. The highest prevalence of RE 37.80% observed among primary educated patients followed by patients having secondary education or above 29.79% (42/141).

Table 2: Prevalence of RE among the studied patients (n=534) according to demographic characteristics

Variable	Refractive Error n(%)	X^2	*P*
Gender		6.39 [a]	0.012
Male	69(26.74)		
Female	102(36.96)		
Age/year		2.08	0.353
6-16	42(27.45)		
17-27	42(33.33)		
28-40	87(34.12)		
Education level		7.93	0.019
Illiterate	36(24.49)		
Primary	93(37.80)		
≥ Secondary	42(29.79)		
Total	171(32.02)		

[a] Extract fisher test.

Distribution of RE according to gender and education level were associated with statistical significance (P <0.05). The prevalence of RE increased with patients' age groups of study group (Table 2).

Demographic Distribution of RE Types

Figure 1 shows the overall prevalence of different types of RE among the studied patients. Myopia was the most prevalent error recorded 10.67% (57) followed by Myopic astigmatism, Hyperopic astigmatism, Mixed astigmatism and Hyperopia respectively. However, the prevalence rate of Astigmatism (all types) 18.54% (99) was higher in comparison to Myopia, or Hyperopia, or both of them.

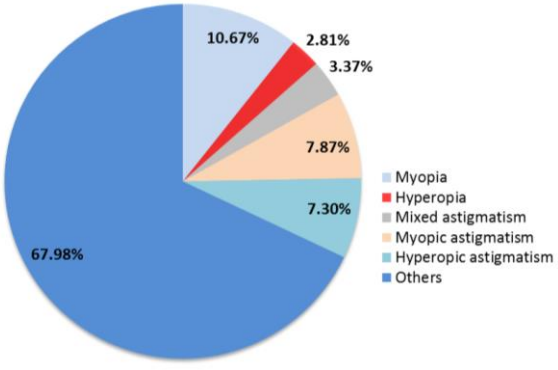

Figure 1: Prevalence of different types of RE among the studied patients (n=534)

Table 3 shows that the prevalence of Myopia, Hyperopic astigmatism, and Myopic astigmatism (10.87%, 9.78%, and 8.70% respectively) were higher among females compared to males (9.47%, 4.21%, and 6.32% respectively). Distribution of RE types according to gender was associated with statistical significance (P <0.05).

Table 3: Prevalence of different types of REs according to gender of patients (n=534)

Refractive Errors	Gender: Male (n=258) n(%)	Gender: Female (n=276) n(%)	Total	X^2	*P*
Myopia	27(9.47)	30(10.87)	57	11.78	0.04
Hyperopia	12(4.21)	3(1.09)	15		
Mixed astigmatism	0(0.00)	18(6.52)	18		
Myopic astigmatism	18(6.32)	24(8.70)	42		
Hyperopic astigmatism	12 (4.21)	27(9.78)	39		
Other [a]	189(66.32)	174(63.04)	363		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Table 4 shows distribution of types of RE according to education level. Myopic astigmatism had the highest prevalence rate among primary educated patients (13.41%) followed by myopia (12.20%). Among patients who had higher education level (≥ secondary level), Myopia was the highest prevalence error (14.89%). While, Prevalence of Myopia increased with education level of patients: 4.08%,12.20% and 14.89% for illiterate, primary education and secondary education or above patients, respectively. The prevalence of Mixed astigmatism and Hyperopic astigmatism decreased with education level of patients. Distribution of RE types according to education level was associated with statistical significance (*P* <0.05).

Table 4: Prevalence of the different types of REs according to education level of patients (n=534)

Refractive Errors	Education level: Illiterate (n=147) n(%)	Primary (n=246) n(%)	≥Secondary (n=141) n(%)	X^2	*P*
Myopia	6(4.08)	30(12.20)	21(14.89)	34.97	<0.001
Hyperopia	6(4.08)	3(1.22)	6(4.26)		
Mixed astigmatism	6(4.08)	9(3.66)	3(2.13)		
Myopic astigmatism	6(4.08)	33(13.41)	3(2.13)		
Hyperopic astigmatism	12(8.16)	18(7.32)	9(6.38)		
Other [a]	111(75.51)	153(62.20)	99(70.21)		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Table 5 shows distribution of types of RE according to age. Myopia was the highest prevalent error among patients aged 6-16 years and patients aged 17-27 years (13.73% and 11.90%, respectively). For older patients (28-40 years), the most prevalent REs were Myopic astigmatism and Hyperopic astigmatism (9.41% for each). Distribution of RE types according to age categories was not associated with statistical significance (*P* < 0.05).

Table 5: Prevalence of the different types of REs according to age groups of patients (n=534)

Refractive Errors	Age/year 6-16 (n=153) N(%)	17-27 (n=126) N(%)	28-40 (n=255) N(%)	X^2	*P*
Myopia	21(13.73)	15(11.90)	21(8.24)	11.87	0.29
Hyperopia	3(1.96)	0(0.00)	12(4.71)		
Mixed astigmatism	0(0.00)	12(9.52)	6(2.35)		
Myopic astigmatism	9(5.88)	9(7.14)	24(9.41)		
Hyperopic astigmatism	9(5.88)	6(4.76)	24(9.41)		
Other [a]	111(72.55)	84(66.67)	168(65.88)		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Figure 2 shows the proportion of different types of REs among affected patients with RE. Most of them had Myopia (33.33%) and Myopic astigmatism (24.56%), while Hyperopia was the least recorded error (8.77%). Out of 171 affected patients with RE, 19% had positive family history of RE.

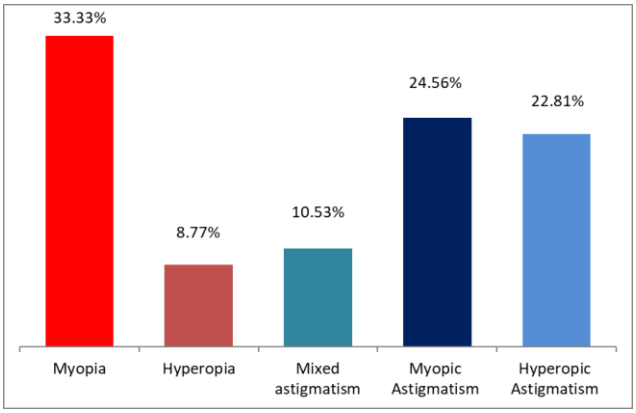

Figure 2: Proportion of different types of REs among affected patients (n=171)

4. Discussion

Refractive error (RE) is an established and significant public health problem. Uncorrected RE can lead to the development of unwanted complications such as squint and amblyopia which are difficult to treat once developed. Therefore, it is important that these are diagnosed and treated early. The present study provides a hospital-based data on the prevalence of REs among patients presenting to the ophthalmology OPD of TUWTH. Since different methods have been used to determine prevalence of REs in different studies, comparison of the results must be done with caution.

The overall prevalence of REs in the present study was 32% which is less than that found by Parrey et al. study which was conducted in Saudi Arabia for adults aged 16-39 years [16] and Sheeladevi et al study [17]. A hospital based study done in the North-East India by Natung et al [18] found that the over prevalence of RE was 55.56% which is much higher to that found in the present study. Another study done in Nigeria found that the prevalence of RE was 44.6% [19], which is incomparable to the present study. Many factors can explain these variances such as different number of patients included in the study and used methods, race differences, life style, different developmental levels and access to health services. Many patients in our society consider glass wearing as a shame and many other patients do not aware that they have visual impairment specially those illiterates. These false beliefs prevent them to seek health services.

The most affected age group in this study was (28–40 years) which represent the working and productive individuals. If these errors are not corrected or the correction is inadequate, they can have immediate and long-term consequence such as lost educational and employment opportunities, lost economic gain for individuals, families and societies, and impaired quality of life.

The prevalence of REs correlated significantly with educational level in the present study indicating that an increase in studying activity could lead to increases in myopia and astigmatism occurrences. In this study the prevalence of REs among females was significantly higher than that among males which is similar to different studies done in other countries like Iran, Egypt, Saudi Arabia, Nigeria and India [20-24]. Dissimilar to this study gender did not correlate with the prevalence of REs in studies conducted in Chile [25] and Japan [26].

In the present study more than one third of patients aged 28-40 years (34.12%) had RE while the prevalence of RE among children (aged 6-16 years) was 27.45%. Several studies in different countries addressed the prevalence of RE among children. Some studies recorded prevalence rate close to that found in the present study as those studies conducted in Saudi Arabia (22%) and Egypt (24%) [27-28]. On the other hand, the prevalence of RE among children in Qatar (19.7%), Nepal (8.6%), India (13.09%), Ethiopia (3.5%), Uganda (11.6%) and Taiwan were lower than that of our study [29-34].

Similar to some other studies [35-38], Myopia was the predominant RE observed in this study, it represented about one third of all recorded errors. Although Myopia was the most prevalent RE among children (6-16 years) in the present study and other studies done in many countries for RE among schoolchildren aged 6-14 years such as Saudi Arabia, Malaysia , India , Jordan , and Qatar [39-43], some researchers found that the most prevalent RE among this age group was hyperopia [27].

5. Conclusion

This study provides the hospital-based data on the prevalence rate of REs of patients attending the ophthalmology OPD at TUWTH in Dhamar Governorate, Yemen. REs are common and significant cause of visual impairment. About one third of patients have REs causing treatable visual impairment. Distribution of RE correlated significantly with gender and education level of patients, where females affected by RE more than males and

educated patients affected by RE more than uneducated patients. The preschool vision test should be considered, and periodic vision examination should be applied to detect vision problems as early as possible. Population based study is recommended to further estimate the magnitude of REs in Yemen.

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Conflicts of interest
The authors declare that there are no conflicts of interest.

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