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Characterization of visual impairment and refractive status of administrative workers of the UNAN - Managua in the year 2020

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ABSTRACT

The purpose of this research was to characterize the visual impairment and refractive status of administrative workers of the UNAN - Managua in the year 2020. The study is descriptive and correlational; according to the time of occurrence of the facts and recording of information, the study is retrospective, for the period and sequence of the study is cross-sectional, 220 clinical records of administrative workers from five faculties including the IPS, attended at the vision care clinic of the UNAN - Managua, descriptive, were analyzed. Among the main results, 48.12% of the population presented some degree of visual acuity impairment, where Hypermetropia with 29%, and Hypermetropic Astigmatism with 25%, are the most prevalent refractive errors. The least prevalent refractive error was Myopia with 10%, while the most prevalent associated refractive condition was Presbyopia with 71%. Hyperopia, Hyperopic Astigmatism, and Presbyopia lead to an important affectation on the work processes in near vision, on the part of the administrative workers of the UNAN - Managua; The

diagnosis and adequate treatment of refractive conditions and associated refractive conditions, can significantly influence the improvement of the visual function of the population under study, work activities and better quality of life.

INTRODUCTION

Visual acuity is the ability of the visual system to identify objects clearly, at distant (> 6 meters), intermediate (1 meter), or near (< 0.5 meters) distances; according to (Garcia et al, 2016), the most commonly used visual acuity measurement scales are the decimal, Snellen and LogMAR.

According to the World Health Organization, WHO (2018), the International Classification of Diseases 11 - (ICD 11), categorizes vision impairment into two groups: distance of presentation and near of presentation. Normal vision: 6/4.8 up to 6/12 equivalent to (1.25 - 0.50) decimal; Mild vision impairment: 6/12 up to 6/18 equivalent to (0.50 - 0.32); Moderate vision impairment: 6/18 up to 6/60 equivalent to (0.32 - 0.10). Severe visual impairment: 6/60 or equal to 3/60 equivalent to (0.10 - 0.05) and Blindness: visual acuity less than 3/60 or 0.05; being for near visual acuity less than N6 or M.08 at 40 centimeters with the existing correction.

The case of Ametropias or Refractive Errors, are among the most frequent visual problems, which can affect all age groups. They are considered a challenge in public health worldwide, where recent studies and WHO reports indicate that refractive errors are the first cause of visual impairment and the second cause of visual loss worldwide 43% of visual (Hashemi et al H. , 2018).

Ametropias can be refractively classified into Myopia, Hyperopia, and Astigmatism. In the case of Myopia, according to its clinical form, it can be presented in simple and degenerative Myopia, where its refractive condition, is mainly based on an excessive axial length of the ocular axis or by an increased value in the ocular diopters, in this defect the rays that reach the eye from infinity form the focus in front of the retina (Castiella, 1998), either by increased corneal curvature, by the increased refractive index of the refractive media or by an increased axial length of the eyeball (Lapido et al, 2012).

For Nickels, Pfeiffee, & Schuster (2019), Myopia is a complex condition that simply described, leads to poor visual quality in distance vision, and studies suggest that this condition may constitute a risk factor for more serious ocular problems such as cataracts, retinal detachment, glaucoma among others (Leske et al, 1991). (Marcus et al, 2011).

Hyperopia is known to be a condition of the ocular refractive state where the light beams entering the eye focus the post-retinal segment when there is no accommodative activity, this condition induces a poor perception of the image in near vision, and relatively good distance

vision provided it is not an ametropia greater than 3.00D or is not associated with other pathologies that compromise visual acuity (Borras, 1998).

According to the clinical types, hyperopia is classified into manifest hyperopia and latent hyperopia, where the symptomatology is expressed according to the patient's accommodative condition. Hyperopia, due to factors such as age, accommodation, convergence, and the demand of the visual system, has a particular effect on each patient being most evident in the difficulty to see clearly in the near vision (Moore, Lyons & Walline, 1999), (Mártinez, Robaie, & Kiffley, 2007).

Guerrero (2012) defines astigmatism as the refractive state in which there are two main foci corresponding to the main refractive meridians of the eye, from which other intermediate foci are generated that constitute the astigmatic interval; it can be classified according to the regularities of the surfaces, resulting in regular astigmatism and irregular astigmatism; and according to the combination of the focal points originated by the convergence of the light beams incident on the eye, it can be classified into Simple Hypermetropic Astigmatism, Compound Hypermetropic Astigmatism, Simple Myopic Astigmatism, Compound Myopic Astigmatism, and Mixed Astigmatism.

Regarding the classification of the refractive powers of both spherical and as expressed by Gil (1960), Myopia, according to its power is classified as mild (< 3.00 D); moderate (3.00 to 6.00 D) and severe (> 6. 00 D); Hyperopia is considered low if less than +3.00 D, medium from +3.25 D to +5.00 D and high when greater than 5.00 D. and Astigmatism according to power are classified as low: -0.25 D to -1.0 D, medium from 1.00 D to 3.00 D and high greater than 3.00 D.

MATERIAL AND METHODS

According to the *research method*, the current study is **observational**, according to the *initial level of depth of knowledge*, it is descriptive (Piura, 2006). According to the classification of Hernández & Mendoza (2018). According, to the time of occurrence of the facts and recording of the information, the study is **retrospective**, by the period and sequence of the study it is **cross-sectional**; according to the analysis and scope of the results, the study is of **correlational type** (Canales, Alvarado & Pineda, 1996), (Supo, 2015).

A sample of 220 clinical records of administrative workers from five Faculties and the I.P.S. of the UNAN - Managua, attended in 2020, determined from simple random sampling for finite populations (Munch Galindo, 1996) was determined.

From the clinical record, the general data analyzed were: age, sex, work dependence, and specific occupation; the clinical data analyzed were: visual acuity in distance vision and near vision without optical correction, visual acuity in distance vision and near vision with optical

correction, both acuities binocularly; spherical refractive value, cylindrical refractive value and astigmatism axis for each eye.

From the data obtained from the clinical records, a systematized database was constructed in the statistical analysis program SPSS version 25 for Windows; descriptive analysis was presented in tables and graphs, contingency analysis for categorical variables, correlation, association, and dependence analysis for numerical and categorical variables, using as a criterion for statistical significance a P value less than or equal to 0.05 to accept H_1 and reject H_o; having H_1 as a statistically significant correlation between the variables under study.

RESULTS

The predominant sex was female 129 patients at 59%; the male sex was 91, 41%.

The age of the patients was between 23 and 65 years, mean of 45.6, C.I. 95% (L.I.=44.3 and L.S. 46.92). (Figure 1).

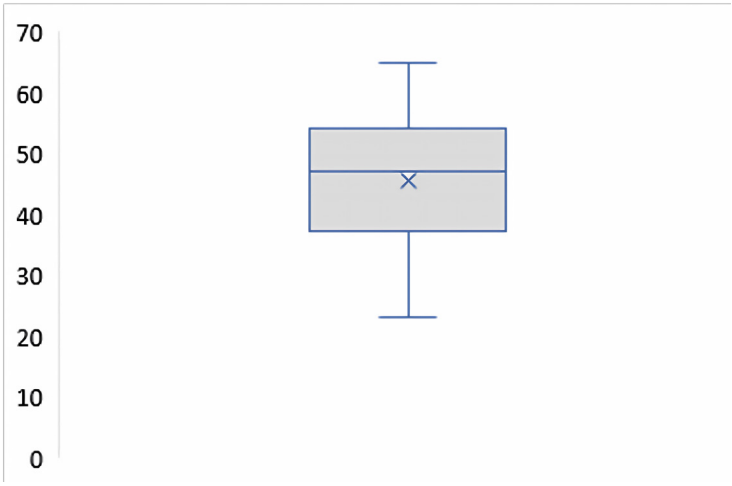

Figure.1- Age in years.

Binocular visual acuity (VA AO), in decimal scale, was: Visual acuity in far vision without optical correction (VA VL SC), Mean = 0.6085; 95% CI (L.I.= 0.5309; L.S. 0.6862). Uncorrected far vision visual acuity (AV VL CC), Mean = 0.9360, 95% CI (L.I.= 0.9179; L.S.= 0.9541). Uncorrected near vision visual acuity (AV VP SC), Mean = 0.3948, 95% CI (L.I.= 0.3573; L.S.= 0.4323) (Table 1).

Table 1. Descriptive characterization of visual acuity 95% C.I.

95% confidence interval of trust difference					
		N	Average	Lower	Upper
AV, AO.	AV VL SC	220	.6085	.5309	.6862
	AV VL CC	220	.9360	.9179	.9541
	AV VP SC	220	.3948	.3573	.4323
	AV VP CC	220	.9392	.9218	.9566

Concerning the categorization of the visual acuity of the patients, it was determined that 8 individuals, equivalent to 4.09% of the patients were blind. 8 individuals; equivalent to 3.64%, severe visual impairment. 38 persons, equivalent to 17.3%, have a mild visual impairment; and 114 persons, equivalent to 51.8%, have normal vision (Figure 2).

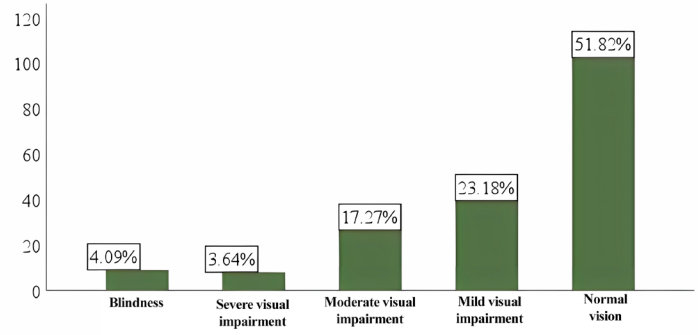

Figure 2. Classification of Visual Acuity

The prevalence of Ametropia was: Hypermetropia 64; 29%. Hypermetropic Astigmatism, with 54; 25 %. Myopic Astigmatism 37; 17%. Simple Astigmatism 25; 11%. Myopia 22; 10%. Emmetropic 18; 8.20% (Figure 3).

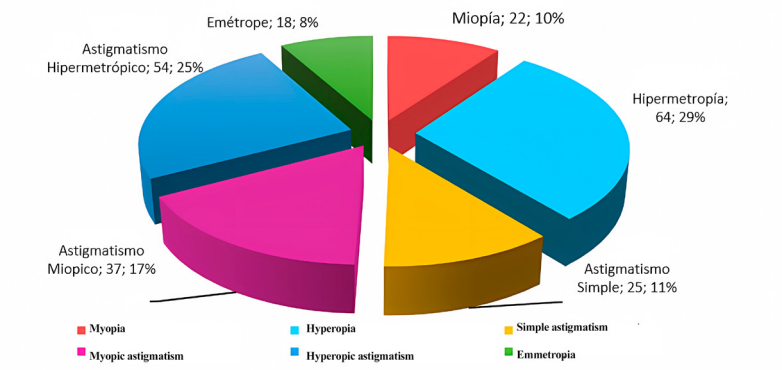

Figure 3. Prevalence of refractive errors.

Spherical refractive values (Esf) in: Right eye (OD) are Mean= 0.0918; 95% CI (L.I.= -0.2111 & L.S.= 0.3948). Left eye (LO): Mean= 0.0670; 95% CI, (L.I.= -0.2669 & L.S.= 0.4009).

Cylindrical refractive values (Cil), right eye (OD): Mean: -0.6763; 95% C.I. (L.I. = -0.7838 & L.S. = -0.5689). Left eye (LO): Mean-0.7227; C.I. 95% (L.I. = -0.8297 & L.S.= -0.6157) (Table 2).

Table 2. Descriptive characterization of refractive error values based on 95% C.I.

95%				
			95% confidence interval of the difference	
	N	**Average**	**Lower**	**Upper**
Spherical refractive O.D.	177	.0918	-.2111	.3948
Spherical refractive O.I.	168	.0670	-.2669	.4009
Cylindrical refractive O.D.	112	-.6763	-.7838	-.5689
Cylindrical refractive O.I.	119	-.7227	-.8297	-.6157

Linear Regression Analysis showed statistical significance between the values of the spherical refractive powers of the right and left eye with a coefficient of determination $\mathbf{R^2}$ = 0.9412 and a linear regression coefficient **b** = 1.0143 (Figure 4).

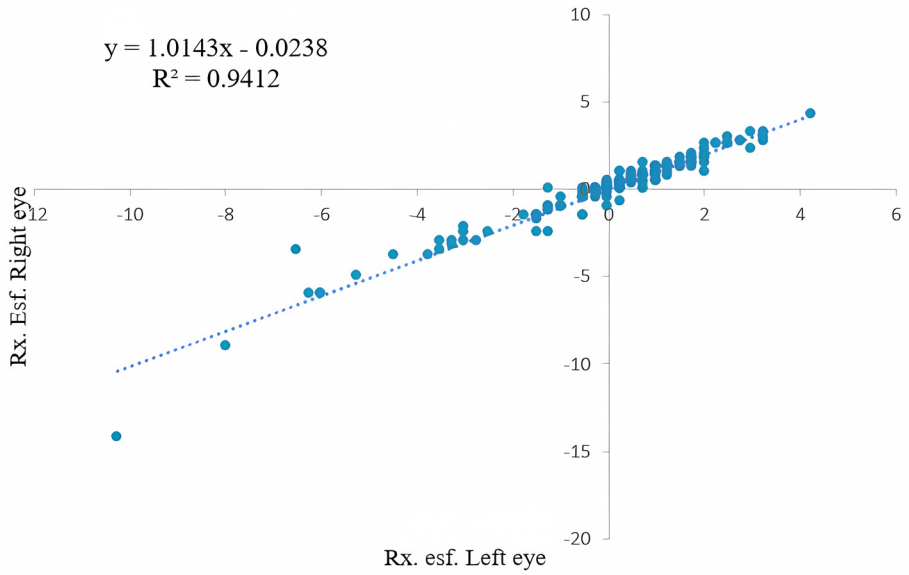

Figure 4. Representation of the values of the spherical refractive powers.

Linear regression analysis showed statistical significance between the values of the spherical refractive powers of the right and left eye with a coefficient of determination $\mathbf{R^2}$ = 0.7436 and a linear regression coefficient **b** = 0.8862 (Figure 5).

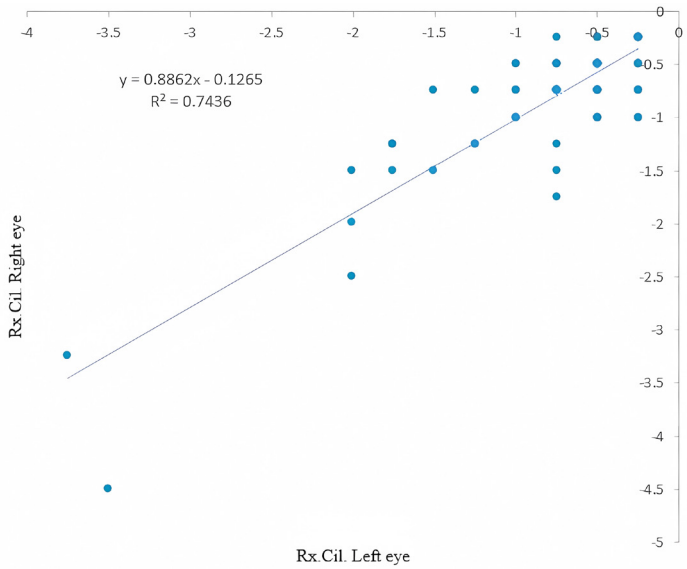

Figure 5. Representation of the values of the cylindrical refractive powers.

The most representative astigmatic axes in OD of patients: 61° to 90° with 50%. 151° to 180° with 24.1%; and axes from 31° to 60°, and from 121° to 150° were ≤ 4.46%. In OI 61° to 90° with 40.67%. from 91° to 120° with 21.18%; and 31° to 60°, as well as those from 121° to 150°, ≤ 5.08% (Figure 6).

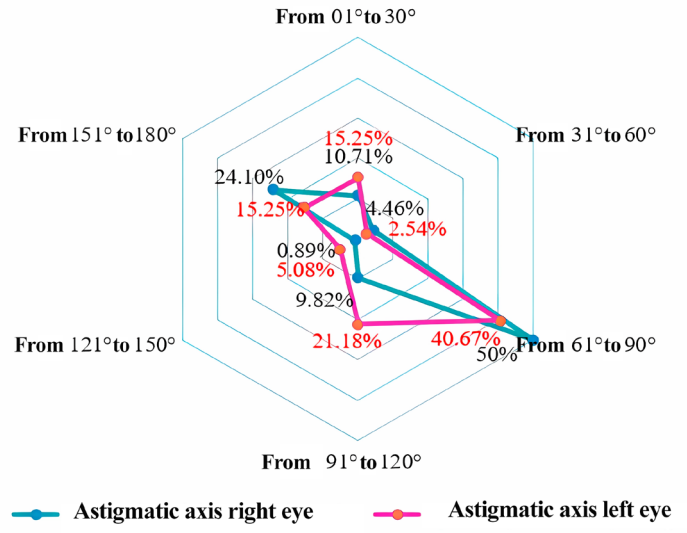

Figure 6. Characterization of the astigmatism axis.

The prevalence of conditions associated with refractive problems was: Presbyopia, in 156 patients equivalent to 71%. Anisometropia 4 patients equivalent to 2% and Amblyopia 1 patient equivalent to 2% (Figure 7).

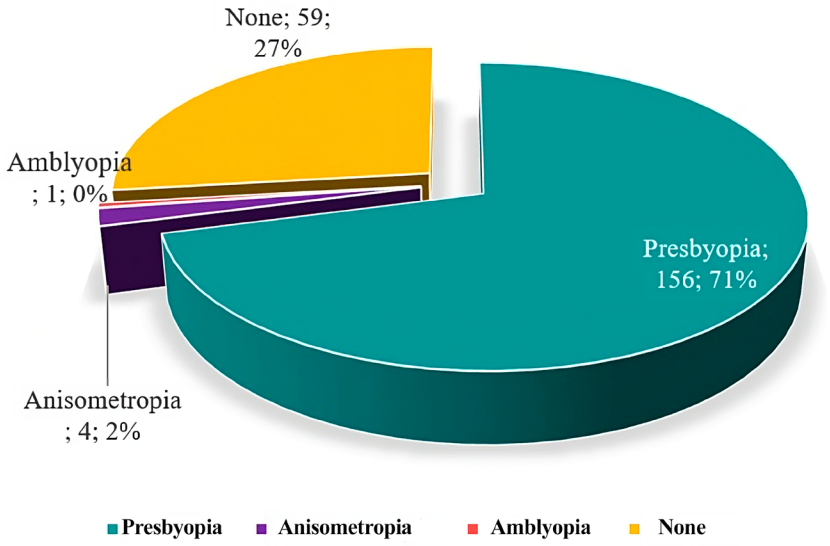

Figure 7. Associated Refractive Conditions

A highly significant correlation was determined between age and visual acuity in far vision without binocular correction (AV VL SC AO) and the variable visual acuity in near vision without binocular correction (AV VP SC AO), employing a P value = 0.020 and 0.000, which is less than the critical level of comparison (Table 3).

Table 3. Pearson's correlation for age and binocular visual acuities at near distance, with and without optical correction.

		AV VL SC AO	AV VP SC AO	AV VL CC AO	AV VP CC AO
Age in years	Pearson's correlation	-.157*	-.638**	-.061	-.109
	Sig. (bilateral)	.020	.000	.367	.106
	N	220	220	220	220

Contingency analysis showed that Myopia (3; 1.4%), and Myopic Astigmatism (4; 1.8%), are more frequent in patients with blindness. Myopic Astigmatism (3; 1.4%) and Hyperopic Astigmatism (3; 1.4%), in patients with severe visual impairment. Hyperopia (16; 7.3%) and Myopic Astigmatism (11; 5%), in patients with moderate visual impairment. Hyperopia (18; 8.2%) and Emmetropia (19; 8.6%), in patients with mild visual impairment. Hyperopia (28; 12.7%), Hypermetropic Astigmatism (25; 11.4%), Simple Astigmatism (19; 8.6%), and Emmetropia (18; 8.2), in patients with normal vision.

The Phi and Kramer's V test of association provided statistical evidence with a P value = 0.000, which is less than the critical level of comparison α = 0.05, indicating a statistically significant association between refractive diagnoses and categories of visual impairment in patients without optical correction in distance vision (Table 4 and 5).

Table 4. Contingency analysis between the prevalence of ametropia and visual impairment categories.

Visual acuity category								
Prevlece of ametropia	Myopia		Blondness	Severe visual impairment	Moderate visual impairment	Mild vision impairment	Normal vision	Total
		Count	3	1	4	2	12	22
		% of total	1.4%	0.5%	1.8%	0.9%	5.5%	10.0%
	Hyperopia	Count	1	1	16	18	28	64
		% of total	0.5%	0.5%	7.3%	8.2%	12.7%	29.1%
	Simple Astigmatism	Count	1	0	0	5	19	25
		% of total	0.5%	0.0%	0.0%	2.3%	8.6%	11.4%
	Myopic Astigmatism	Count	4	3	11	7	12	37
		% of total	1.8%	1.4%	5.0%	3.2%	5.5%	16.8%
	Hypermetropic Astigmatism	Count	0	3	7	19	25	54
		% of total	0.0%	1.4%	3.2%	8.6%	11.4%	24.5%
	Emmetropic	Count	0	0	0	0	18	18
		% of total	0.0%	0.0%	0.0%	0.0%	8.2%	8.2%
	Total	Count	Count	8	38	51	114	220
		% of total	% of total	3.6%	17.3%	23.2%	51.8%	100.0%

Table 5. Phi and Kramer's V association between prevalence of ametropia and categories of visual impairment.

Symmetric measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	.507	.000
	V de Cramer	.254	.000
N of valid cases		220	

Discussion and analysis

Refractive errors are the first cause of blindness worldwide; determining the characterization of comorbidities allows to exercise of timely action plans to reduce the rates of blindness or visual impairment in these patients.

Based on the results of this study, the characterization of these refractive errors was determined in a population of administrative workers of the Universidad Nacional Autónoma de Nicaragua. Of which 59% were female and 41% male and the average age was 69 years, which is defined as an adult age in its majority, which is very important due to the increased risk of manifestations of other diseases that may aggravate the refractive and visual condition of the patients.

Regarding the characterization of the visual function, 40.45% of the patients presented visual impairment between mild to moderate, and 7.73% of the students presented between severe visual impairment and blindness, which is data of great concern since, in the world, about two thousand two hundred million people live with some type of visual impairment or blindness, of which, at least one billion could have prevented their difficulty or are still to be treated (WHO, 2020, p. 6), , knowing that visual impairment also poses a huge financial burden on a global scale (Frick et al, 2015), (Naidoo et al, 2019).

These visual conditions when not detected promptly, cause severe repercussions that could even generate visual impairment or blindness, which in turn impacts the overall economic and social development indices of societies (Flores, 2014).

The refractive diagnoses with the highest prevalence were hypermetropia meaning 29% and hypermetropic astigmatism against the rule with 25%; these results are associated with that described by (Zapata, 2018), where from segmentation of the prevalence of Ametropias by continents, the Asian continent, the most prevalent Ametropia was Myopia; for the American continent it was Astigmatism, for the European continent it was Myopia and Astigmatism.

These results contrast with those raised by (Hashemi et al, 2018), where from the combination of a random effects model of different publications of scientific articles, they determined that the Ametropias with the highest prevalence in adult populations, with CI: 95% were: Myopia, Hyperopia, and Astigmatism with 11.7%; 4.6% and 14.9% respectively.

It is evident that refractive errors have a significant influence on the visual impairment of people, demonstrating a statistically significant correlation between refractive errors and degrees of visual impairment in the study population, with a P value = 0.000. Therefore, timely correction should be a matter of vital interest for the community and university authorities.

CONCLUSIONS

Refractive errors continue to be one of the main causes of blindness and visual impairment worldwide, in Nicaragua, it is necessary to deepen and increase the number of publications that show statistics regarding these visual conditions, which directly affect the quality of life, labor productivity, economy and other facets of people's lives.

The population of administrative workers has a high prevalence of refractive errors such as hyperopia, hyperopic astigmatism, and presbyopia. And it was demonstrated that there is a statistically significant association between refractive conditions with visual impairment in patients without optical correction. Therefore, it is necessary to promote and facilitate visual health care, with effective diagnoses and treatments, as well as the development of educational campaigns to help foster a good culture of prevention, health care, and visual hygiene within our university community.

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