

A Refractive Error Analysis
on a VOSH Mission to
La Esperanza, Honduras

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Abstract

Inhabitants of la Esperanza, Honduras and neighboring villages were examined by a Michigan VOSH group. The resulting data compared favorably to other studies conducted in similar areas. The majority of patients examined revealed a slightly hyperopic visual status with only a few myopic individuals. When astigmatism was found it was a low degree and often oriented against the rule. Presbyopia occurred at an earlier age as compared to the United States population.

Eye care services in many "third world" countries are unavailable, in part due to the large number of people inhabiting these countries combined with the limited number of facilities offering optometric services. There is a difficulty in gaining access to the centers, as the financial resources are unavailable for the service and also for the travel costs.

This is why the services provided by VOSH groups (Volunteer Optometric Services to Humanity) are so vitally important to the less fortunate in the underdeveloped countries of the world. VOSH international has been providing optometric services for over 23 years. Millions of people in "third world" countries are receiving free eye care thanks to the many volunteers around the world. Many chapters of VOSH international around the world and the numerous support groups are continually organizing and trying to improve eye care missions to those in need. Studies have been conducted in the United States, Europe and other industrialized countries, on the epidemiology of vision problems which provide much information on vision anomalies and ocular disease for future methods of diagnosis and treatment. Unfortunately such studies are less prevalent for those in other parts of the world. The citizens of these countries are faced with a multitude of health problems and vision disorders which subject them from 4 to 6 times as much blindness as found in wealthier countries. In underdeveloped countries loss of vision is

often the result of disease, poor nutrition and difficult environmental conditions. Due to the great effects that environmental vision plays on certain vision epidemiologies, it is of great importance to educate ourselves through studies on the patterns of vision anomalies in other parts of the world. These investigations will enable volunteers to prepare, prevent and then to accurately diagnose and treat the variety of anomalies found on eye care missions.

This study primarily reports on the prevalence of refractive conditions found on a Michigan VOSH mission to La Esperanza, Honduras in March of 1995. The purpose of this study is to help prepare others participating on future missions to this area. This study will also parallel other reports on missions to similar areas and allow for a comparative analysis.

For the past four years, third and fourth year optometry students from Ferris State University along with several Michigan Optometrists and auxiliary personnel, have participated on VOSH missions to La Esperanza, a small mountain village in Honduras. The last mission consisted of a 24 man and woman team. Although there are increasingly more elements of the western culture, the villages remain quite primitive. The citizens of La Esperanza and surrounding villages are primarily hard laboring agriculturers. The La Esperanza Lions Club provided a new building, in which we

set up our optometric clinic. The news of our arrival and vision care services spread quickly through the mountain villages and the Honduran people began to flock by the bus loads. Over 1400 people presented themselves for eye examinations during our five day stay. The number of patients was overwhelming; they often waited overnight for our morning arrival.

METHODS

The examinations provided by the team included the taking of basic case histories, distance and near visual acuities, internal and external ocular health evaluation, and retinoscopic assessment that was sometimes followed by a short subjective refraction and finally by the dispensing of the spectacle prescription, therapeutic ophthalmic agents and sometimes further medical referral. Two slit lamps were available for our evaluations, as were several intraocular pressure measuring devices.

RESULTS

The mean age of patients seen on this mission was 42.7 years, with a range from less than 3 months to 100 years of age. The median age was 45 years and the mode was 50 years. A frequency of distribution of patients ages appears in Figure 1. Despite the

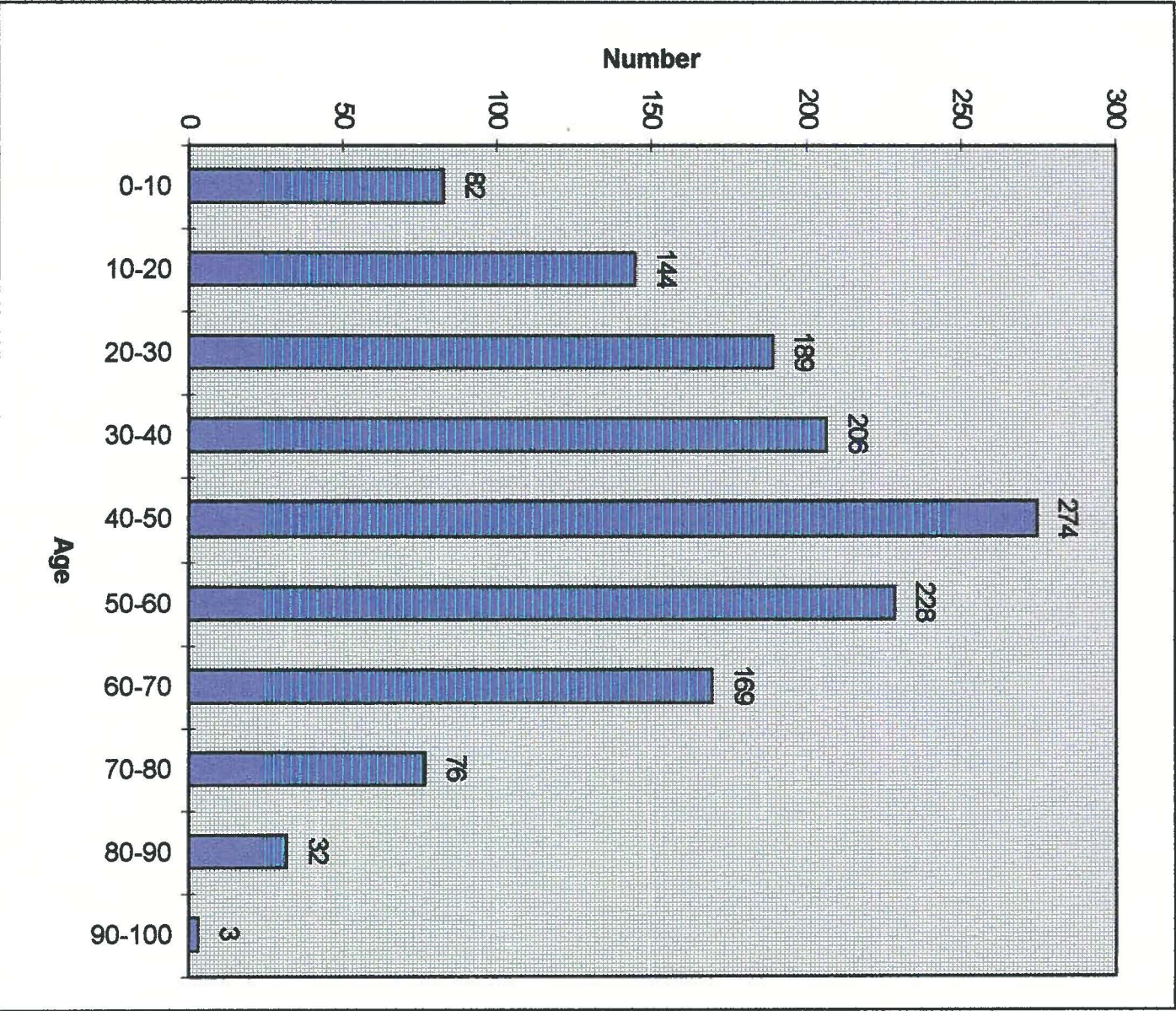


Figure 1: Frequency distribution of patient age

fact that recording sheets had a male or female indication, very few of the records showed any indication, and because the patients names are not always indicative of the sex, numbers and percentages of males and females could not be tabulated. On future missions, this data can be investigated in order to provide further insight on the population examined.

As previously mentioned, over 1400 people were seen during the five day period of which 1040 (73.9%) were able to be helped with a spectacle prescription. Table 1 shows a brief refractive distribution of eye glasses dispensed.

Table 1. Prescription distribution report.

Single Vision Minus	Bifocal Minus	Single Vision Plus	Bifocal Plus	Special Rx	Reading only
111	89	164	390	11	275
10.7%	8.6%	15.8%	37.5%	1.0%	26.4%

The mean spherical correction of the right eye was +0.44 D with a median and mode of +0.50 D and the left eye was +0.46 D also with a median and mode of +0.50 D. The range of corrections ran from +16.00 D to -14.00 D in the right eye and +14.00 D to -16.00 D in the left eye. A frequency of distribution of the distance spherical corrections for the right eye appears in Figure 2. In

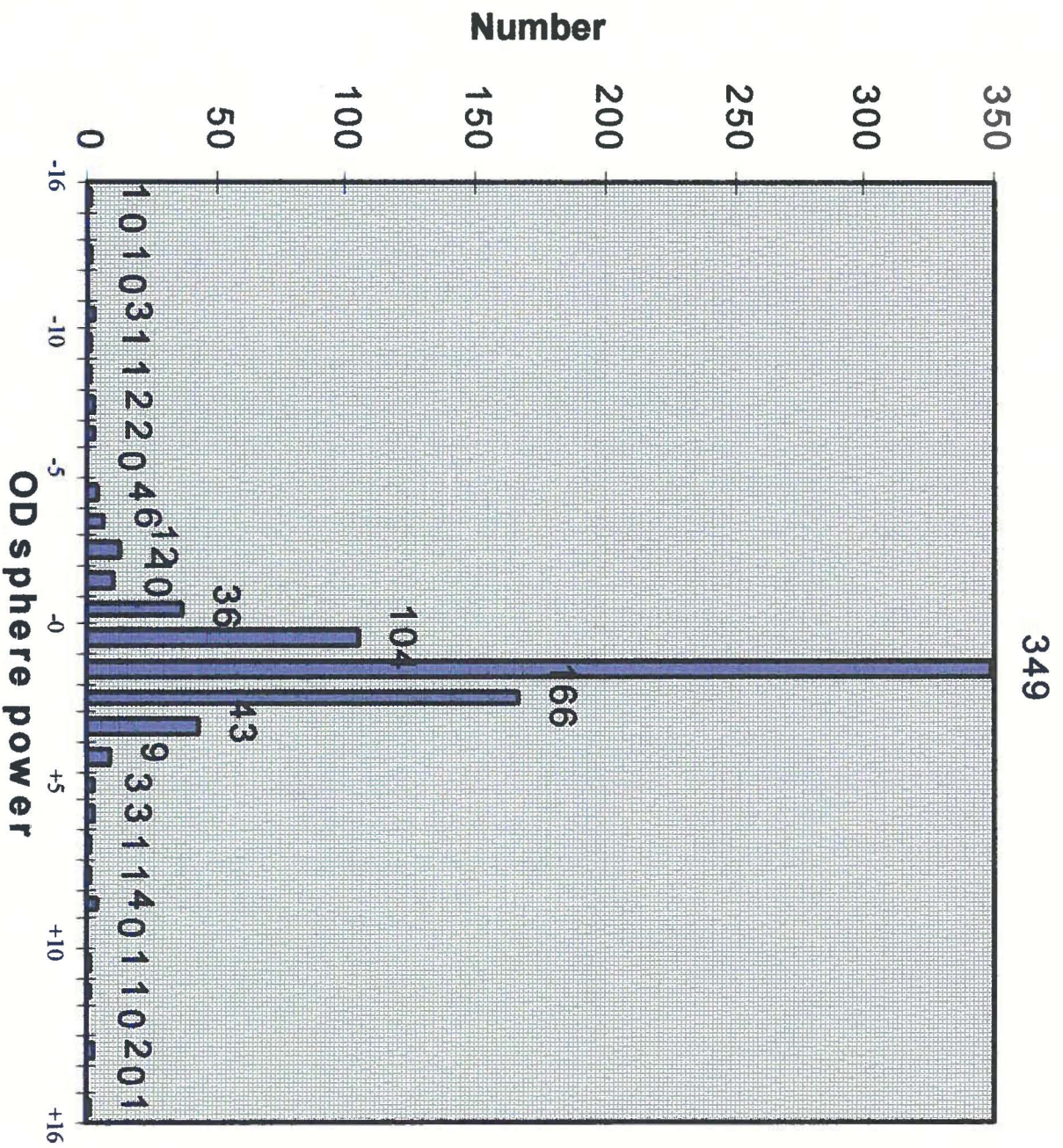


Figure 2: Distance sphere power (OD only)

addition the spherical refractive error for the right eye was broken down into age groups. This is represented in Figure 3. The mean refractive error tended to become more hyperopic as the age of the patient increased.

Two hundred and twenty-six patients were found to have astigmatism in the right eye, which represents 16.1% of the total population seen. The mean cylindrical correction in the right eye was -1.12 D. Two hundred and two patients showed astigmatism in the left eye, which represents 14.3% of the population seen. The mean cylindrical correction here was -1.20 D. A frequency of distribution for the cylindrical power corrections for the right eye appears in Figure 4. Of the prescriptions having cylinder correction in the right eye, (n=226), 135 of them (59.7%), had their cylinder aligned against the rule, (ATR), meaning the minus cylinder was oriented between 60 and 120 degrees. Sixty-four out of the 226, (28.3%), had their cylinder aligned with the rule, (WTR), meaning the minus cylinder axis was oriented between 0 to 30 or between 150 to 180 degrees. The remaining 12% were oblique with their minus cylinder axis located between 30 to 60 or between 120 to 150 degrees. In the left eye, 56.9% of the cylinder corrections were ATR, 31.2% were WTR and 11.9% were oblique. The frequency of distribution of correcting cylinder axis orientations for the right eye is shown in Figure 5. Seven hundred and fifty-four patients, 53.6% required a near add. The mean add power prescribed was +1.92

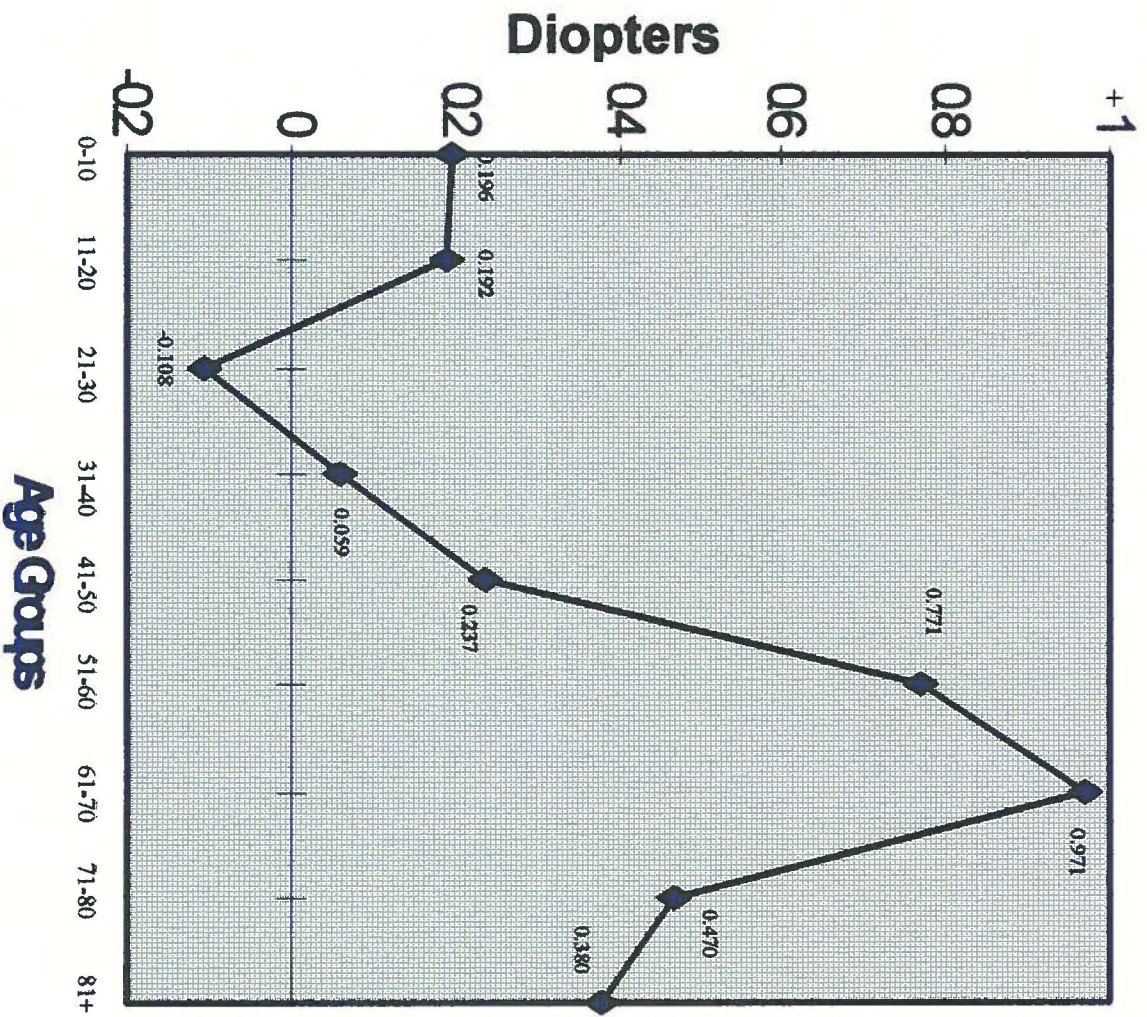


Figure 3: Average sphere power by age (OD only)

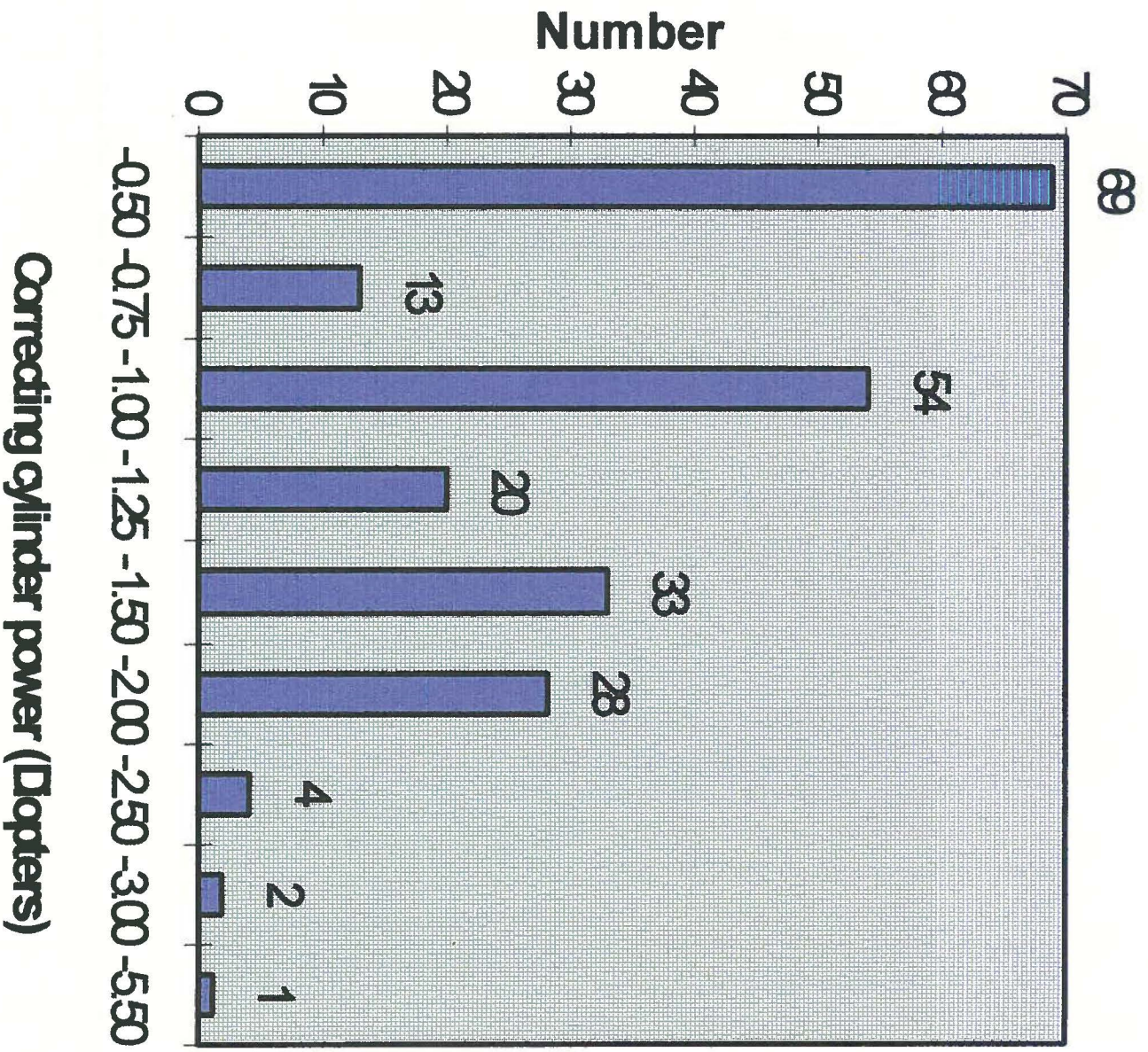


Figure 4: Frequency distribution of cylinder power (OD only)

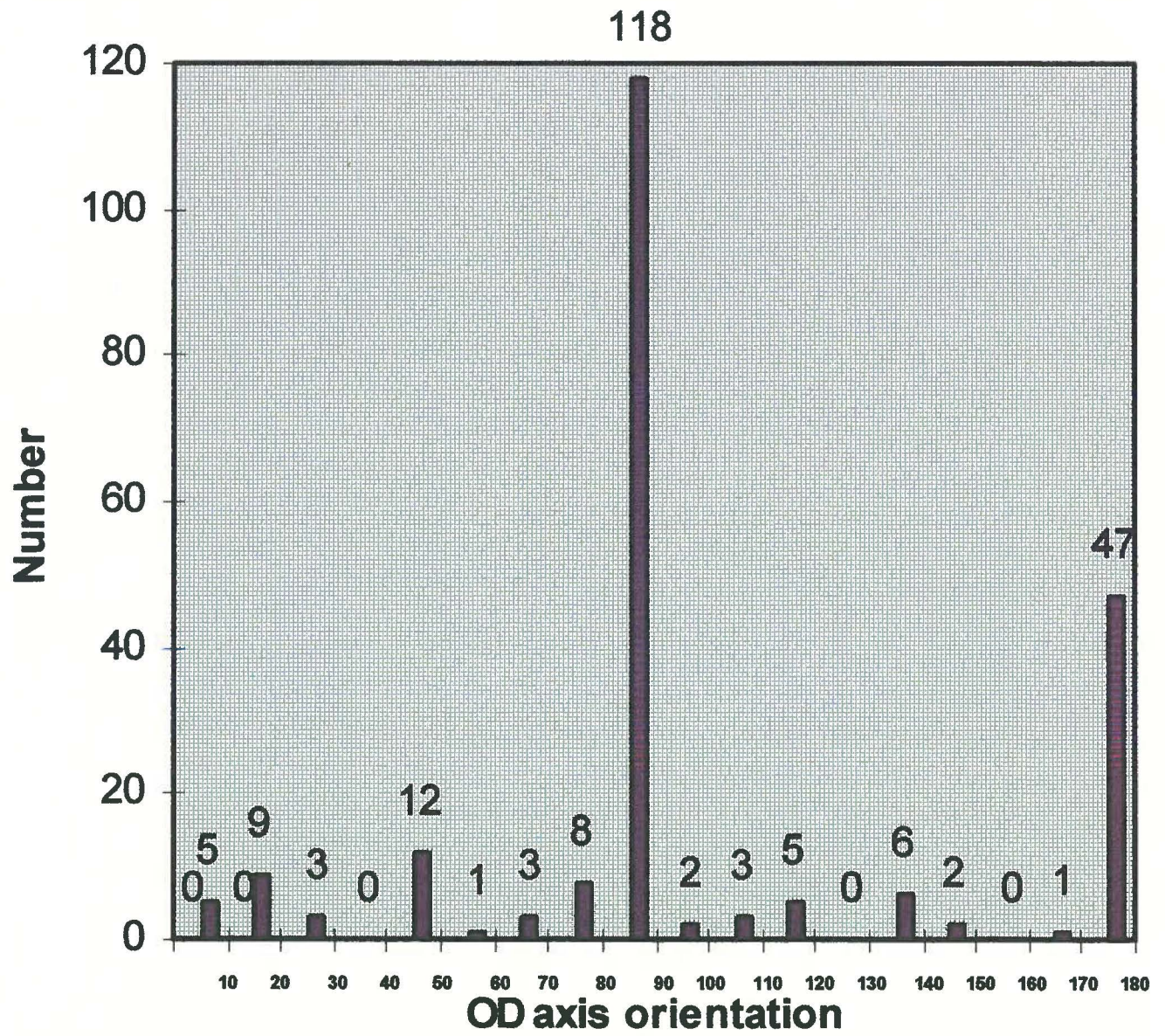


Figure 5: Frequency distribution of cylinder axis (OD only)

D with a mode power of +2.00 D. The range was from +0.50 D to +4.00 D. A frequency of distribution of add power is shown in Figure 6.

DISCUSSION AND COMPARATIVE ANALYSIS

The mean refractive error for this population was low hyperopia of approximately +0.50 D. This compares favorably to other reports. A report of a VOSH mission to Nicaragua by Wingert revealed an average refractive error of +0.75 D. A study on the visual characteristics of rural Central and South America by Wharton also show a greater proportion of low hyperopes. Visual characteristics of natives in Fiji, South Pacific also reveal a low hyperopic tendency. The theory that the environmental factors may play a role in determining refractive errors has been studied by a number of researchers. It has been generally accepted that myopia is more prevalent among persons involved in occupations requiring near point visual demands. This study revealed that only 19.6% of the patients examined were nearsighted. A study conducted on a United States population in 1983 revealed the prevalence of any degree of myopia to be 25%. Several other studies including the United States Department of Health study of persons between 4 and 74 years done in 1971-72, found similar results. As would be predicted there is a lower incidence of myopia in La Esperanza, Honduras as compared to the United States, and supports previous studies

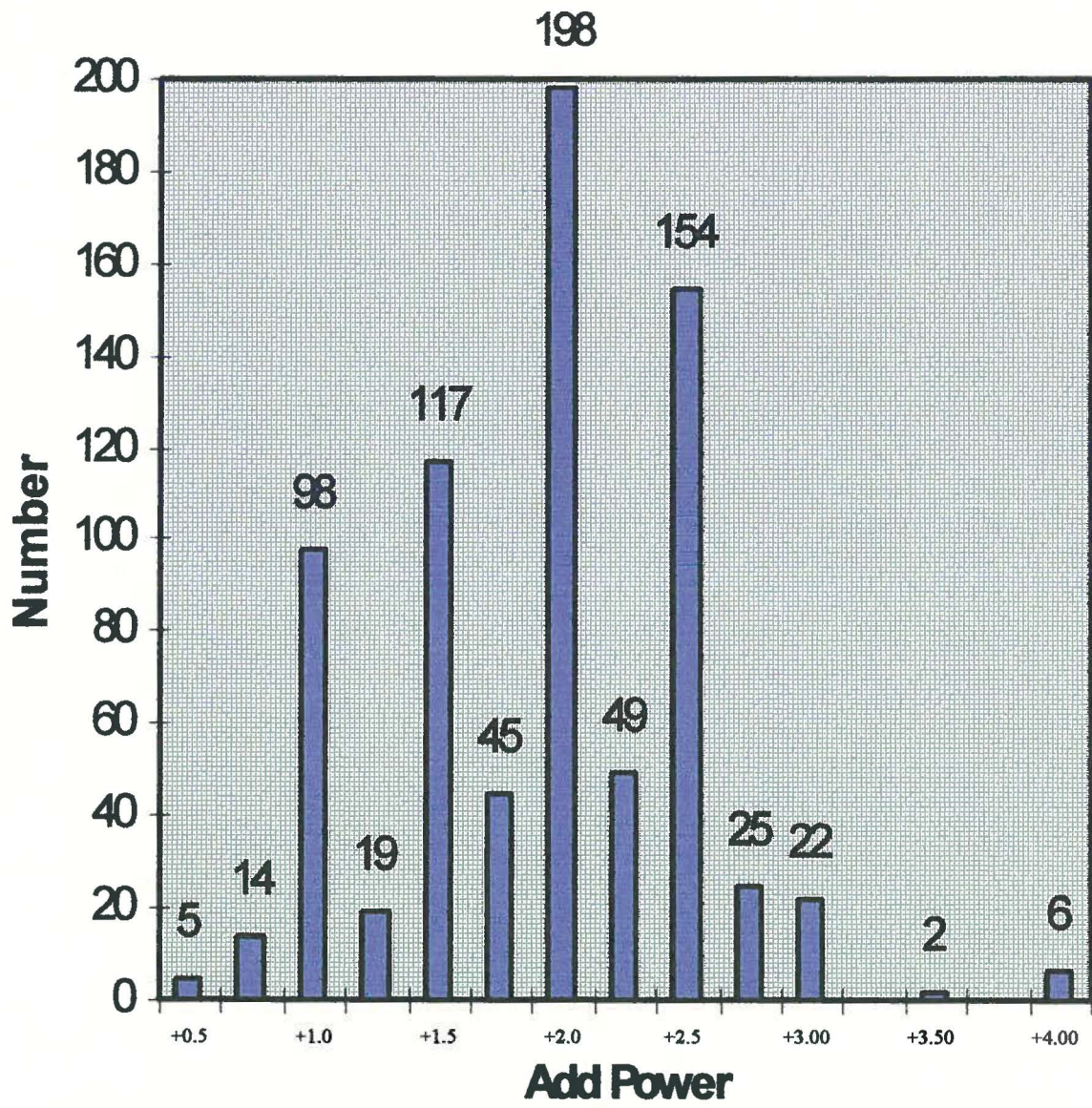


Figure 6: Frequency distribution of Add Power

conducted on Central and South American rural populations. The patients seen on this mission have a lower literacy rate and very few of the people claiming literacy in the mountain villages read regularly. Interestingly, the only age group found to have a myopic mean on this mission was the 21 to 30 year olds. Patients in this age group are the most educated persons seen; they are the students, the teachers, the bankers and the most literate people of the villages. As previously mentioned, the refractive error, other than the early and late myopic shift tended to become more hyperopic as the age of the patient increased. This compares favorably to Wingert's finding on his study done in Nicaragua.

Astigmatism, found primarily by retinoscopic measurement was found in 16.1% of the right eyes and 14.3% of the left eyes. Both cylindrical power and axis orientation found compare favorably to studies done in Central and South America. Consistent with our mission, the average cylindrical power was approximately -1.00 D and predominantly oriented against the rule. As a comparative analysis, in the United States, an estimated 63% of the population has some degree of astigmatism which is significantly higher. It should be noted however that refractive values on this mission were primarily reached by objective retinoscopic measurement.

As expected near add power increased with the age of the person. The analysis of presbyopic correction may be somewhat misleading,

as students on the mission predominantly prescribed the add power according to the age of the person, with only occasionally a subjective verification. Add powers were determined by approximate age standards in the United States. A figure showing the average add power for the different age groups could of been informative, but since most near point additions were given according to age, it would not reveal any further information. There was however some evidence that presbyopia occurred at an earlier age. This may have indeed been influenced by a reduction in near point visual acuity followed by acceptance of a subjective near addition. Despite the illiteracy, the patients examined on the mission required an adequate near point focus for conducting their daily activities of cooking, sewing, washing and certain aspects of farming. Previous studies have shown that people who inhabit Central and South American countries do indeed seem to develop presbyopia at an earlier age than others in the United States. The onset of presbyopia in the U.S. has been accepted to begin in the early to mid forties which in contrast, by previous studies and by results found on this mission, seem to indicate the onset of presbyopia to occur approximately five to ten years earlier. Earlier presbyopia has also been noted in many regions including India, the Philippines, Bolivia and in Somalia where a World Health Organization study found that presbyopia was not unusual even in patients in their late twenties or early thirties. Several interesting theories, many of which seem applicable to the Honduran

population, have been advanced to explain early development of presbyopia. These theories include environmental conditions including high average temperature, the frequency and length of ultraviolet exposure, chronic deficiency of essential amino acids and exposure to toxic factors. High average environmental temperature can accelerate the aging of the crystalline lens which was found by Moran and Zigman. Many of the people examined were rural patients who are exposed to sunlight more than urban patients. Many patients examined were primarily vegetarians, only having the food of their own land to eat. Several protein and essential amino acids are absent from that of a complete diet. Long term deficiency of essential amino acids found in food groups that are not being consumed regularly by the patients seen, can precipitate presbyopia at an earlier age as found by studies in rural Central and South America. Many of the proteins lacking from their diets are the proteins that make up the human crystalline lens.

Correlations have been made between refractive error and age of presbyopia onset. Corrected hyperopic individuals between 38 and 48 years more frequently present with presbyopic symptoms than corrected myopes in the same group as found by Snider. Additional studies support this as the average age of onset of presbyopia in India was found to be earlier for corrected hyperopes than for corrected myopes. As seen on this mission, the average refractive

error was low hyperopia, combined with the apparent earlier age of presbyopia also lends support to the above argument.

CONCLUSIONS

This study of the refractive status of the people of La Esperanza, Honduras reveals many similarities to other mission reports and research that was conducted in similar environmental settings. The mean corrections for sphere power, cylinder power, cylinder axis orientation and presbyopia correction compare quite favorably. It can be concluded by examination of the mean refractive error that the majority of patients seen were slightly hyperopic, with astigmatism being of small magnitude and oriented against the rule. Further investigation along with comparative analysis show that presbyopia occurred at an earlier age.

This is the valuable information that can be used on future VOSH missions to similar environmental locations. If add determinations are to be done by age determination, they should be done five to ten years earlier than the North American standards. Donations to VOSH spectacle banks should be screened for appropriate powers that parallel the numbers generated in these studies. In addition, sunglasses of all types are needed for patients seen on these missions. Protection from ultraviolet light can reduce the incidence of cataract formation, pterygium and as just been stated

possibly delay the onset of presbyopia. Additional studies on the refractive status of patients seen on these missions would serve to maximize the effect of the eye care missions, and further improve the visual well-being of fellow human beings.

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