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Abstract
Volunteer eye/vision care projects to "Third World" countries have become more common in recent years. Though these projects are successful in terms of volunteer care provided, few have provided publishable data in report form. This paper provides unique public health data on a population of natives in Fiji which have to date not had care available. These Fijians were found to have generally good vision with a distribution of refractive errors showing a strong tendency toward emmetropia. Eye health problems were found to increase with age, and to be greatly preventable if care were available. The project included the dispensing of used spectacles, and a majority in demand for these was related to correction of nearpoint vision changes associated with presbyopia.

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VISUAL CHARACTERISTICS
OF NATIVES IN FIJI

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ABSTRACT

Volunteer eye/vision care projects to "Third World" countries have become more common in recent years. Though these projects are successful in terms of volunteer care provided, few have provided publishable data in report form. This paper provides unique public health data on a population of natives in Fiji which have to date not had care available. These Fijians were found to have generally good vision with a distribution of refractive errors showing a strong tendency toward emmetropia. Eye health problems were found to increase with age, and to be greatly preventable if care were available. The project included the dispensing of used spectacles, and a majority in demand for these was related to correction of nearpoint vision changes associated with presbyopia.
KEY WORDS

Fiji, "Third World", visual characteristics, refractive error, emmetropia, hyperopia, myopia, presbyopia, ocular pathology, cataract, pterygium.
INTRODUCTION

For eight years students from Pacific University have participated in a program designed to bring vision care to people in developing, often termed "Third World," countries. In 1983 two volunteers from Pacific University AMIGOS a.
organized a service tour to the Fiji Islands. The program was sanctioned by the Fiji Ministry of Health, and organizational assistance was provided by acquaintances who were serving with the U.S. Peace Corps in Fiji. The program was carried out in July and August of 1983.

Fiji is a group to 300 islands in the South Pacific, about 1000 miles north of New Zealand. Once a British colony Fiji has been independent as a nation since 1970. It remains a sister in the British Commonwealth. Its population of about 700,000 is just under half native Fijian, and slightly over half Indian. The Indian population resides mainly in the cities of Fiji and in the coastal plains where sugar cane is raised as an export crop. The mountain villages and outer islands are occupied mainly by natives. Though there are increasingly more elements of "Western" culture and economy in the cities and along the coast, life and economy in the villages remains quite primitive. Most villagers still "live off the land," with little motivation to own material goods. This results in a very easy-going, low pressure lifestyle. The village diet is relatively low in protein, consisting mainly of root plants, which are cultivated, and augmented with some leafy plants and fruits gathered from the abundant

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vegetation of the surrounding jungle. Meat is only occasionally eaten, with the exception of villages on the outer islands where fish is relatively abundant.

Since health care is more readily available in the cities and coastal areas, the volunteer program was limited to the rural villages. In these areas the demand for vision care was overwhelming. People would wait for days for care, and would sometimes follow the team's move to other villages in order to be examined.

METHODS

The examinations provided by the AMIGOS volunteers included measurements of distance and nearpoint visual acuity, external eye health, retinoscopy and ophthalmoscopy. When questionable ophthalmoscopic findings were noted, Schiotz tonometry was performed. Occasionally, bacterial infections prompted single dose antibiotic treatment and referral to rural nursing stations where common therapeutics were available.

A major part of the volunteer program was the dispensing of spectacle lenses to those people who needed correction and demonstrated improvement in acuity with the lenses. The used spectacles had been sorted, verified, marked and packaged in power groupings before the trip to Fiji.

Information on each examination was recorded on an individual form, and these documents were brought back to the United States by the volunteers. The information was then
entered into a data base management program on a personal computer. Data from 888 random subjects were entered and all the analyses included below are based on these subjects. Since the presence of pathology had occasionally precluded the measurement of visual acuity and refractive error, not every element of information was available on every form.

Using the capabilities of the computer, data were sorted into three age categories: 25 and under; 26 to 45; and 46 and over.

Refractive error was defined as the spherical equivalent of the right eye retinoscopic measurement. Emmetropia was defined as a spherical equivalent retinoscopic measurement between 0.25 D of myopia and 0.50 D of hyperopia, a range where corrective lenses were considered to be unnecessary. Astigmatism was the cylinder portion of the retinoscopic measurement, with axis assigned as closest to "with the rule," "against the rule," or oblique at either 45 or 135°.

Visual acuity values are entrance visual acuities as measured with printed Snellen or tumbling E charts at 20 feet and reduced Snellen cards at 16 inches. Corrected visual acuity was measured the same way, with data recorded only for those individuals to whom spectacles were actually dispensed.

Nearpoint prescription values were not analyzed because the only values recorded were the actual powers of spectacles dispensed. These lenses were variably appropriate depending on the availability in the supply of used spectacles; thus they do not provide an exact indication of nearpoint needs.

Other data recorded were ocular health and whether the
Figure 1. Refractive Error Distribution in a sample of 787 Fijians. Labeled groupings represent spherical equivalent values as measured by retinoscopy, right eye.
spectacles dispensed were intended for distance vision, nearpoint vision, or both.

RESULTS

REFRACTIVE ERROR

Refractive data were available on 787 of the 888 subject forms, with 511 (64.9%) being within measurement error (-.25 to +.50) of emmetropia. Figure 1 illustrates this trend toward emmetropia. It also demonstrates the preponderance of low dioptric values in cases of ametropia, of which 196 (25%) were hyperopia and 80 (10%) were myopia. Analysis shows half of the hyperopia was 0.75 D or less, and only 8% measured 2.00 D or greater (including 3 cases of aphakia). Half of the myopia measured was also 0.75 D or less, and only 10% was 3.00 D or greater.

Figure 1 also shows that percentages change little with age, although more refractive error is found in the higher age group where there is 31% hyperopia and 15% myopia. It is interesting to note that the middle age group shows least ametropia with 76% emmetropia, while the younger group has 28% hyperopia and only 4% myopia.

ASTIGMATISM

Of the 787 persons on who refractive data were available, 167 (21%) had measurable astigmatism (Figure 2), and those tended toward low "against the rule" astigmatism. Only 10% of those with astigmatism (2% of the total sample)
Figure 2. Astigmatism found in 167 of 787 Fijians. Inset shows orientation of correcting minus cylinder; numbers represent percentages of axes locations that are "against the rule" (90th meridian), "with the rule" (180th meridian), and oblique (45th and 135th meridians).
had cylinder greater than 1.00 D, and the highest value recorded was 4.50 D.

The inset in Figure 2 reveals astigmatism orientation is 67.5% ATR, 27.5% WTR, and 6% oblique.

The figure suggests an increase in both incidence and severity of astigmatism with age. While only 15% had measurable cylinder in the sample of 0 to 25 year olds, 23% in the middle age group and 26% of the sample of 46 years and over had astigmatism. No subject in the low age category had greater than 1.00 D of astigmatism, and 88% were measured at 0.50 D or less. 11% of the middle age group and 14% in the higher age group had 1.25 D or more astigmatism.

ENTRANCE VISUAL ACUITY

Entrance visual acuity measures were available on 880 of the subject forms. Figure 3 shows that good vision was very common among Fijians. 20/30 or better vision was measured in 69% of all subjects. Very "sharp" vision was especially frequent in the younger ages, with most reduced acuity found in the higher age group.

Nearpoint visual acuity values divided into age categories (insert to Figure 3) show differences related to presbyopia. 78.6% of subjects in the low age group read 20/20 on a reduced Snellen chart at 16 inches, but just 2 subjects in the older group retained 20/20 near vision. Most of this group fell between 20/60 and 20/200.
Figure 3. Entrance Visual Acuity Distribution in a sample of 880 Fijians. Large graph is distance acuity and inset is near acuity. Labeled values in both graphs indicate the denominator of Snellen Visual Acuity, and the cumulative frequency scale is the same in both graphs.
CORRECTED VISUAL ACUITY

In most cases when spectacles were dispensed to the Fijian patients, visual acuity was measured through the spectacles. 504 subject forms provide such data. Of those, 11.5% demonstrated 20/15 vision, with 44% at 20/20 and 24% more at 20/30. 4.4% remained 20/200 or worse. Frequencies are graphically presented in Figure 4.

Again, better vision was demonstrated in the younger subjects, with 20/60 being the lowest acuity recorded after correction in the low age group. The older subjects were not as successfully corrected; 3% remained at 20/120, and 6.6% remained 20/200 or worse.

Corrected nearpoint acuities were also available on 504 subject forms (the insert to figure 4). The values only differ from the distance values in the higher age groups; presbyopia had caused deficiency in near vision, and thus potential for improvement was greater. Again, most of the remaining poor vision was in the higher age group, where more (37.6%) measured at 20/30 after correction than were improved to 20/20 (33%), and 5% remained at 20/120 or worse.

SPECTACLES DISPENSED

Of 888 subject forms, 61.6% indicated spectacles were dispensed. Figure 5 shows that 6.8% were intended for distance vision alone, 58.5% for near vision alone, and 34.7% for both. Spectacles were dispensed to 19% of subjects under age 26, 77% of those age 26 to 45, and 84% of those over 45.
Figure 5. Spectacles Dispensed to Fijians attending the volunteer clinics were mostly intended for nearpoint vision. Numbers of spectacles dispensed which were intended for near vision alone, far vision alone, and both near and far vision are shown.
Percentages in the three categories of use did not differ remarkably between the age groups.

OCULAR HEALTH

Health status was noted on every patient seen in Fiji by the AMIGOS volunteers. Incidence of pathological conditions showed definite trends, which prompted specific groupings for summarizing those conditions. Since eye care is scarcely available, many older patients presented with cataracts that would have been readily treatable in the U.S. Pterygia were also very common, and enough patients presented with both pterygia and cataracts to warrant a separate category for that combination. Additional categories of pathology were trauma, conjunctivitis and blepharitis, and trachoma. A miscellaneous grouping of other conditions included corneal leukoma, nystagmus, ectropian, meibomianitis, ptosis, strabismus, ocular albinism, amblyopia, macular degeneration, undiagnosed retinal lesions, "bear track" retinal degeneration, hyaloid remnant, and aphakia.

354 cases of pathology were recorded, and are summarized in Figure 6. Cataracts and pterygia account for 79% of the pathologies reported. Cataracts showed occurrence in 18.5% of the Fijian population, and pterygia occurred in 16.5%.

Only 9% of the pathological conditions occurred in the lower age category, and most of these fell in the miscellaneous grouping. The middle age category provided 72 cases, (20%) and 68% of these cases were pterygia.

Most of the pathology (71%) occurred in the older group;
pathology was present in 62.5% of the population sample aged 46 and over. Cataracts account for half of the pathology, and pterygia make up half of the rest. Both pterygia and cataracts were present in 28 cases.

Trachoma was separately grouped, in part, because of concern among Fijian Health officials regarding its frequency. Based on this sample, trachoma is found in only 0.34% of Fijians seeking the volunteer eye care, but all 3 cases were found in the older age group.

DISCUSSION

To set a perspective for these data, it is appropriate to note that 45% of the subjects were in the over 45 age group, and, as might be expected, these older Fijians had more visual problems. This might be attributed to normal aging processes combined with relative lack of care available to the population studied.

Except for the problems that appear with age, vision is very good among Fijians. Most had very good unaided visual acuity, and the analysis of corrected visual acuity suggests that acuity potential was high among those who presented with reduced unaided acuity. Cases of poor vision following lens prescription were usually explained by pathology, and in most cases cataracts were responsible. Except for 2 cases in the middle age group, all those remaining 20/200 or worse after correction were over 45 years of age.
The striking effect of the lack of available care in the Fijians studied, as compared to an American population, is in the occurrence of cataracts which would be routinely treated in the United States. Cataracts were present in nearly 40% of those over 45, and greatly limited the volunteers' ability to improve vision. A few patients had found their way to one of the four ophthalmologists in Fiji for cataract extraction, but these were in need of spectacles to compensate their aphakia.

Beyond cataracts, pterygium was the other major ocular health problem for Fijians, with 16.5% of the population presenting with this problem. Pterygia (2) are thought to develop from a variety of causes, including ultraviolet radiation and chronic irritation from environmental factors. It is known that they occur mainly in the tropical latitudes and among those who spend a majority of their time out-of-doors. Fijian natives fit both these categories, but it is probable that routine care could prevent many of the problems caused by pterygia.

Though trauma was a concern, and is also more frequent in tropical latitudes (3), it was found to be rare in Fiji.

The primary goal of the AMIGOS volunteers was to bring eye care to the unserved Fijian population by dispensing used spectacles where indicated. An analysis of spectacles dispensed indicates the general refractive status among Fijians, and serves as an index to our ability to improve vision. More practically, an analysis of the spectacle powers needed becomes a guideline in preparations for future
projects. A majority of spectacles dispensed were intended for correcting nearpoint vision problems related to normal presbyopic changes. Though very little reading was done by most of the older natives, it was rare that one was not literate enough to use a Bible or hymnal in church, and visual demands associated with handicraft work also required nearpoint lenses.

SUMMARY

The information presented in this report is condensed from data obtained during a volunteer vision care project in Fiji, and is unique in that it is the only known data on a population of native Fijians.

Trends in visual characteristics in this population include a very strong tendency toward emmetropia and very good visual acuity, especially among younger Fijians. Astigmatism is infrequent, but when present tends to be oriented "against the rule." Nearpoint visual acuity is also good in youth, but is reduced in the older Fijians as presbyopia develops. Finally, ocular health is good among 60% of Fijians with a majority of ocular health problems occurring in the older population; cataracts and pterygia account for most of these problems, and complications would be greatly reduced if routine eye care was available.
a. The AMIGOS committee at Pacific University was so named because of its original participation with the national organization, Amigos de las Americas, which provides its services in Latin America.
REFERENCES

