Table 1. Demographic Characteristics of the Sample Population

Age Group (Years)	Male, *n* (%)	Female, *n* (%)	Total, *n* (%)
5–29	742 (29.7)	943 (37.7)	1,685 (67.4)
30–49	180 (7.2)	363 (14.5)	543 (21.7)
50+	116 (4.6)	155 (6.2)	271 (10.8)
Total	1,038 (41.5)	1,461 (58.5)	2,499 (100)
Mean age (SD)	22.2 (16.9)	25.1 (16.3)	23.9 (16.6)
Median age (IQR)	15 (9–32)	22 (11–35)	20 (9–35)

IQR, interquartile range; SD, standard deviation.
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conflict, there were no eye care services available in the study area. However, in November 2004, an eye surgery camp was conducted by Christoffel-Blindenmission (CBM) during which training of integrated eye care workers (IECW) took place.

Study Population

The study was conducted among persons aged 5 y and above. This target group was included because anecdotal data showed that blindness was common in both adults and children. The minimum age for visual acuity testing was predetermined to be 5 y.

Sample Size and Sampling

There are no reliable data on blindness prevalence in southern Sudan on which to base sample-size calculations. We calculated our sample size assuming an expected blindness prevalence of 2.0% and worst acceptable prevalence of 1.0%. Using a 5% level of significance (two sided), 95% confidence limit, 90% power, and a design effect of 1.5, we estimated that at least 2,104 persons aged 5 y and above were to be examined [11–13]. A two-stage cluster random sampling design with probability proportional to size was used to select the sample. A cluster was defined as a village. The four bomas of Mankien payam have 73 villages. One boma (Mankien boma) comprising 12 villages was inaccessible at the time of the survey due to insecurity and was excluded from the sampling frame. In the first stage, 22 villages were randomly selected from the remaining 61 with probability proportional to the estimated population of the subdistrict. In the second stage, 25 households were selected from each sampled village using the random walk method, after selecting the first house by spinning a pen in the middle of the village [14]. All residents of selected households were enumerated and those present examined. An attempt was made to examine absentees by returning to households in which persons were absent on the day of the survey. Households in which all residents were not available were skipped. Due to logistical constraints, it was not possible to return to the village on a different day to follow up any absentees.

Visual Acuity Testing and Basic Eye Examination

Integrated eye care workers (IECW) were retrained in visual acuity (VA) testing and basic eye examination by an experienced ophthalmic nurse (F. Ole-Sempele) over a period of 5 d. During the training, the minimum accepted interobserver agreement was set at 80% and reliability was assessed. Each trainee examiner was allowed to evaluate a set of 50 participants selected to represent varying VA (blindness, low vision, and normal vision), cataract, trichiasis, corneal opacity, and normal eye. Interobserver agreement was then calculated for each trainee examiner using the ophthalmic nurses' observation as the "gold standard." Only trainees achieving an interobserver agreement of 80% and above were eligible to participate as examiners.

VA testing was conducted using the Snellen E chart at 6 m in adequate daylight, outdoors. In participants with VA less than 6/60, VA was evaluated with the Snellen chart at 3 m. Further VA assessment was done in participants with VA less than 3/60 by counting fingers, hand movement, and light perception, as appropriate. Basic eye examination was done in all persons after VA testing [2]. Using a torch and a 2.5× magnifying binocular loupe, each eye was examined separately for in-turned lashes (trichiasis), the cornea was then inspected for corneal opacities, and the lens examined for cataract. It was not possible to conduct detailed eye examination, intra-ocular pressure measurement, visual fields testing, and refraction, due to logistical and technical difficulties involved in conducting these examinations in the field set-up. Data were recorded on a customized form, and the cause of visual impairment determined by the examiner for all participants with a presenting VA of less than 6/18 for each eye separately. Participants who required surgical intervention or further assessment were referred to attend a surgical camp that was organized and conducted after the survey.

Operational Definitions

The WHO categories of visual impairment were used to define vision status for study participants [15]. Blindness was defined as a presenting VA of less than 3/60 in the better eye. *Low vision* was defined as presenting VA of at least 3/60 but less than 6/18 in the better eye. Monocular visual impairment, which is not a WHO definition, was derived to represent participants who had normal or near-normal vision in the better eye (VA of at least 6/18) and visual impairment in the other eye (VA less than 6/18).

Quality Control, Data Entry, and Analysis

After the survey, the ophthalmic nurse reviewed the forms and determined the principal disorder responsible for blindness or low vision for the participant, taking into account the main cause for each individual eye. In the instance when different causes had been identified for each eye separately in a given individual, the principal disorder was chosen to be the one that was most readily curable or, if