WORLD VIEW

Cataract blindness in Turkmenistan: results of a national survey

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Aim: To present results of a rapid assessment of cataract in Turkmenistan.
Methods: 6120 eligible people of 50 years and older were selected by systematic random sampling from the whole of Turkmenistan. A total of 6011 people were examined (coverage 98.2%).
Results: Cataract is the major cause of bilateral blindness (54%), followed by glaucoma (25%). The age and sex adjusted prevalence of bilateral cataract blindness (VA <3/60) in people of 50 years and older was 0.6% (95% CI: 0.4 to 0.9), with a cataract surgical coverage of 75% (people). For VA <6/60 the prevalence was 2.6% (95% CI: 2.1 to 3.2) in people aged 50 and above, approximately 0.26% of the total population. In this last group the surgical coverage was 44% (people) and 32% (eyes). Of the patients operated with IOL implantation 8.2% could not see 6/60, 44.8% of those operated without IOL could not see 6/60. The main barrier to cataract surgery was indifference ("old age, no need for surgery"), followed by "waiting for maturity."
Conclusion: To increase the cataract surgical coverage in Turkmenistan the intake criteria should be lowered to VA <6/60 or less. At the same time the visual outcome of surgery can be improved by expanding the number of IOL surgeries and routine monitoring of cataract outcome. Additional investments will be required to provide all eye surgeons with appropriate equipment and skills for IOL surgery.

Age related cataract remains the major cause of visual impairment and blindness in developing countries. A declining birth rate and increased life expectancy resulted in a sharp increase in the number of people of 50 years and older. In many countries this has caused an increase in the prevalence of cataract blindness and a greater demand for adequate cataract surgical services.

Turkmenistan became independent from the former Soviet Union in 1991. The country is situated in the western part of central Asia, bordering the Caspian Sea in the west, Iran and Afghanistan in the south, Uzbekistan in the northeast, and Kazakhstan in the north. The Karakum desert occupies nearly 80% of its territory. Turkmenistan is divided into five administrative regions: Akhal (Ashgabad city, the capital), Mary (Mary city), Lebap (Turkmenabad city), Balkan (Balkanabad city), and Dashoguz (Dashoguz city). Each region consists of a large regional city, surrounded by little towns and settlements.

Ophthalmic services in Turkmenistan are only provided by the government. Private practice is not allowed. Besides the scientific clinical centre for eye diseases in the capital Ashgabat, with 120 beds, there are nine more eye departments with a total of 380 beds in general hospitals in regional cities. In the centre, 15 eye surgeons operate on cataract patients and another 20 surgeons work in the peripheral eye units. In the year 2000 they conducted a total of 2500 cataract operations, giving a cataract surgical rate (CSR) of 562. In 1990, 1711 cataract operations were performed and the CSR was estimated at 440.

Of all extracapsular cataract extractions, 60% are conducted in the centre in Ashgabat and 40% in the regional centres. In 1995 a special national health policy was introduced, focusing on the introduction of new technologies into health care, including in ophthalmology. From 1996 to 2000 the number of cataract operations in the centre increased from 869 to 1448 operations per year, an increase of 66%. The proportion of extracapsular extraction with IOL implantation rose from 45.5% to 76.2%.

A nationwide survey on blindness and visual impairment due to cataract was conducted in 2000–1. The findings from this survey provide baseline data for the cataract intervention activities and facilitate adequate planning and future monitoring of the programme.

MATERIALS AND METHODS

According to the latest population statistics report of Turkmenistan, the total population was 4.738 million people in 1996, of whom 470 775 people were 50 years or older (9.94%).[1] Results of a population based survey in the same year, conducted by well organised eye units throughout Turkmenistan, but without random sampling, indicated that 0.55% of the examined population of all age groups was bilaterally blind with a visual acuity of less than 3/60 with best correction. Of all blindness 47% was caused by cataract.[2 3]

On a total population of 4.738 million in 1996, and a prevalence of bilateral blindness (VA <3/60) of 0.55%, we would expect 26 060 people to be bilaterally blind in Turkmenistan, of whom 47% (12 250) are blind due to cataract.

Assuming that cataract blindness in people younger than 50 years is negligible, and with approximately 470 775 people of 50 years and older, the prevalence of bilateral cataract blindness in people of 50 years and older would be 12 250/470 775 ×100 = 2.6%.

Allowing for a precision of plus or minus 20% of the likely prevalence (2.6%) with a confidence of 95%, the required sample size for simple random sampling is 3572. For cluster random sampling, this figure has to be multiplied with a correction factor, the design effect. Because of the distances, it was decided to use a cluster size of 60, with an estimated design effect of 1.7.[4] Hence the total sample size would be 6120, comprising 102 clusters of size 60.

Clusters were selected from a census list with all settlements in the whole of Turkmenistan and their respective population. A column with the cumulative population was added from which the 60 clusters were selected through systematic random sampling. Following this procedure, clusters are selected with a probability proportional to the size of the population.

The above set up will provide reliable results for the entire country only. In order to obtain results with the above precision and confidence for each of the five Velayats (provinces) and for Ashgabat city, the sample size given above should be completed for each of these six regions. That would involve the examination of 32 000–36 500 people, depending upon the cluster size. However, this option was rejected as unfeasible and too expensive.

For the rapid assessment a standardised protocol, developed in India,[4 5] was used, with some minor adaptations to make it suitable for global use.

A standardised survey record is filled in for each eligible person, which has seven different sections: general information; vision and pinhole examination; lens examination; principal cause of vision less than 6/18; history, if not examined; why cataract operation has not been done; and details about cataract operation.

Visual acuity is measured with a tumbling "E" chart with a Snellen optotype size 6/18 on one and size 6/60 on the other side at 6 or 3 metre distance with available correction. This was done in full daylight, in the courtyard or on the street. If the VA is less than 6/18 in either eye, pinhole vision is also taken for each eye.

The WHO defines blindness as visual acuity (VA) less than 3/60 in the better eye with the best possible correction. In this survey we used the same cutoff point, but with available correction, the optical correction that the patient actually uses. A VA less than 6/60, but equal to or better than 3/60 in the better eye is classified as severe visual impairment and a VA less than 6/18, but equal to or better than 6/60 in the better eye is classified as visual impairment. Some patients may have more than one eye disorder causing visual impairment. The accepted WHO convention is to assign the major cause to the disorder that is easiest to treat.

After measuring visual acuity, the examinee is taken inside the house, into a shaded or dark area. There, the lens status is assessed by torch and binocular loupe and by distant direct ophthalmoscopy at 20–30 cm distance in semidark condition, without dilatation of the pupil. The lens in each eye is examined and graded as "normal lens," "obvious lens opacity present," "lens absent (aphakia)," "IOL implanted without posterior capsule opacification," or "IOL implanted and posterior capsule opacification present." If the lens cannot be examined because of corneal scarring, phthysis bulbi, or other causes, "No view of lens" is noted.

Each team of two ophthalmologists could examine one cluster (60 people aged 50+) in one day. In total, four teams were operational. The population was notified before the survey. If after repeated visits an eligible person could not be examined, information about his visual status was collected from relatives or neighbours.

A special software program (RACSS version 1.01) for data entry and automatic standardised data analysis has been developed in EPI-INFO version 6.04. After data entry is completed, the user first selects the cutoff point for blindness or visual impairment (VA <3/60, VA <6/60, or VA <6/18) and then the required analysis report using the menu system. This report appears on screen or can be sent to a printer. The following standard reports can be produced:

- prevalence of all blindness, of blinding cataract, and other major causes of low vision and blindness
- prevalence of aphakia and pseudophakia
- cataract surgical coverage
- visual outcome of cataract surgery
- major causes of poor visual outcome
- barriers to cataract surgery
- age at time of surgery, place of surgery, use of glasses, reasons for not using glasses, type of surgery.

Further customised analysis is possible using the analysis facilities of EPI-INFO version 6.04d.

RESULTS

A total of 6120 people aged 50 years were eligible for examination, out of which 6011 (98.2%) were physically examined: 2810 males and 3201 females. Nine people refused examination and another 100 remained absent, despite repeat visits. Information about the visual status of these 109 people was obtained from relatives or neighbours. Their data are not included in the analysis.

Out of the total 6011 examined people of 50 years and older 76 (1.26%) were bilaterally blind (VA <3/60 with available correction) due to all causes. From these, 32 people (42%) were bilateral blind due to cataract, giving a prevalence of 0.5%. Detailed results are given in Table 1. Prevalence rates are for the 50+ age group.

The prevalence of blindness (due to cataract as well as other causes) increases by age and is usually higher in females. When the age and sex composition of the sample differs from the actual population of the survey area, the prevalence rates calculated from the sample data do not reflect the true prevalence in the population. When the age and sex composition of

Table 1 Sample results cataract blindness survey, Turkmenistan

	Males (n=2810)		Females (n=3201)		Total (n=6011)	
Sample size people 50+	Cases	Prev	Cases	Prev	Cases	Prev (95% CI)
VA <3/60						
All bilateral blindness	34	1.2	42	1.3	76	1.4 (0.9 to 1.6)
Bilateral cataract blindness	13	0.5	19	0.6	32	0.5 (0.3 to 0.9)
Cataract blind eyes	86	1.53	108	1.69	194	1.61 (1.33 to 1.95)
VA <6/60						
All bilateral blindness	102	3.6	149	4.7	251	4.2 (3.5 to 4.9)
Bilateral cataract blindness	53	1.9	88	2.8	141	2.4 (1.9 to 2.9)
Cataract blind eyes	241	4.29	320	5.00	561	4.67 (4.18 to 5.21)
VA <6/18						
All bilateral blindness	487	17.3	693	21.7	1180	19.6 (18.3 to 21.0)
Bilateral cataract blindness	333	11.9	510	15.9	843	14.0 (12.9 to 15.2)
Cataract blind eyes	878	15.6	1211	18.9	2089	17.4 (16.5 to 18.3)
Bilateral aphakia	39	1.4	33	1.0	72	1.2 (0.9 to 1.6)
Unilateral aphakia	59	2.1	55	1.7	114	1.9 (1.5 to 2.4)
Aphakic eyes	137	2.44	121	1.89	258	2.15 (1.82 to 2.53)

95% CI = 95% confidence interval.

Table 2 Age and sex adjusted results cataract blindness survey, Turkmenistan

	Males (n=211570)		Females (n=259205)		Total (n=470775)	
Total population aged 50+	Cases	Prev	Cases	Prev	Cases	Prev (95% CI)
VA <3/60						
All bilateral blindness	2296	1.1	3900	1.5	6196	1.3 (1.0 to 1.7)
Bilateral cataract blindness	857	0.4	1964	0.8	2821	0.6 (0.4 to 0.9)
Cataract blind eyes	5769	1.36	10467	2.02	16236	1.72 (1.44 to 2.06)
VA <6/60						
All bilateral blindness	7048	3.3	13797	5.3	20844	4.4 (3.8 to 5.2)
Bilateral cataract blindness	3591	1.7	8570	3.3	12161	2.6 (2.1 to 3.2)
Cataract blind eyes	16307	3.85	30343	5.85	46650	4.95 (4.46 to 5.49)
VA <6/18						
All bilateral blindness	33388	15.8	62279	24.0	95668	20.3 (19.0 to 21.7)
Bilateral cataract blindness	22368	10.6	46439	17.9	68807	14.6 (13.5 to 15.8)
Cataract blind eyes	59883	14.15	109618	21.14	169501	18.0 (17.1 to 18.9)
Bilateral aphakia	2606	1.2	3074	1.2	5680	1.2 (0.9 to 1.7)
Unilateral aphakia	4184	2.0	4960	1.9	9144	1.9 (1.5 to 2.5)
Aphakic eyes	9396	2.22	11108	2.14	20504	2.18 (1.85 to 2.56)

Table 3 Cataract surgical coverage (CSC) in people 50+ (in sample)

	CSC, people (95% CI)	CSC, eyes (95% CI)
VA <3/60		
Male	78.7 (61.4 to 89.9)	61.4 (52.5 to 69.7)
Female	71.6 (54.8 to 84.3)	52.8 (44.1 to 61.4)
Total	75.0 (63.5 to 84.0)	57.1 (50.9 to 63.1)
VA <6/60		
Male	51.4 (38.7 to 63.9)	36.6 (30.0 to 43.0)
Female	38.9 (28.7 to 50.1)	27.4 (22.2 to 33.4)
Total	44.3 (36.2 to 52.6)	31.5 (27.4 to 35.9)
VA <6/18		
Male	20.1 (15.3 to 26.0)	13.5 (10.8 to 16.7)
Female	12.8 (9.5 to 17.1)	9.1 (7.2 to 11.4)
Total	15.9 (13.0 to 19.2)	11.0 (9.4 to 12.8)

the population in the entire survey area is entered in the software package, it will adjust the sample results automatically to present the actual situation. The age and sex adjusted results are presented in Table 2.

The age and sex adjusted prevalence of all bilateral blindness was 1.3% (95% CI: 1.0 to 1.7), an estimated total of 6196 people. Assuming that bilateral blindness under the age of 50 is negligible, this would be equal to a prevalence of 0.13% in the entire population, approximately 10% of the prevalence in the 50+ age group. The adjusted prevalence of bilateral cataract blindness is 0.6% (95% CI: 0.4 to 0.9), an estimated total of 2821 patients. In 45% of the patients cataract was the main cause of bilateral blindness. A total of 16 236 eyes are estimated to be blind due to cataract.

The prevalence of bilateral severe visual impairment due to cataract is more than four times higher: 2.6% (95% CI: 2.1 to 3.2), or 0.26% for the entire population, an estimated 12 161 patients. The prevalence of all VA <6/60 was 4.4% (95% CI: 3.8 to 5.2), or 0.44% of the entire population, an estimated 20 844 patients. In 58% of these patients cataract was the main cause of bilateral severe visual impairment.

After cataract, glaucoma is the second most common cause of bilateral blindness (25%), followed by posterior segment disorders (6.6%) and phthysis bulbi (5.3%). In case of severe visual impairment (VA <6/60) bilateral cataract is the major cause with 58%, with glaucoma as second. Cataract is more common in females, phthysis bulbi more common in males.

Patients blind or severely visually impaired due to cataract were asked why they had not been operated so far. Fatalism ("old age, no need for surgery") was the main barrier, followed by "waiting for maturity," "fear of operation," and "no company."

By comparing the number of (pseudo) aphakic people or eyes, with the number of cataract blind people or eyes, we can calculate the cataract surgical coverage, the proportion of the all cataract blind people or eyes, that have been provided surgical services, irrespective of the visual outcome.[6] It can be calculated for various levels of blindness or visual impairment, for males and females. It indicates which part of the cataract problem has been covered so far and also gives an idea of the availability and accessibility of the cataract surgical services to the population of the survey area during the past period.

Of each four bilateral cataract blind people (VA <3/60), three have been operated in one or both eyes and one was not operated in either eye. Of all cataract blind eyes 57% have been operated on. The coverage was less for severe visual impairment (VA< 6/60) due to cataract: 44% of the patients with bilateral impairment were operated in one or both eyes and nearly 32% of the eyes were operated on.

Visual acuity was measured in all aphakic or pseudophakic eyes in the sample (Table 4). This gives an impression of the

Table 4 Postoperative visual acuity with available correction

	IOLs		Non-IOLs		Total eyes	
Category of visual acuity	Eyes	%	Eyes	%	Eyes	%
Can see 6/18	48	65.8	31	16.8	79	30.6
Cannot see 6/18, can see 6/60	19	26.0	71	38.4	90	34.9
Cannot see 6/60	6	8.2	83	44.8	89	34.5
Totals	73	100.0	185	100.0	258	100.0

visual outcome after cataract surgery. It is important to realise that these cases include patients operated recently as well as decades earlier, by skilled as well as less skilled surgeons under optimal as well as less optimal conditions. Good results from recent operations may be overshadowed by less successful practices from the past. Also, initial good outcome may have deteriorated because of concurrent sight threatening disorders, like age related macular degeneration, glaucoma, etc.

After IOL implantation 8.2% of the operated eyes could not see 6/60, against 44.8% of the cataract operations without IOL implantation. Poor outcome was mostly attributed to uncorrected aphakia (43%), concurrent eye diseases causing blindness (38%), and surgery related complications (19%). All patients were operated on in government hospitals only. Treatment was provided free of cost in 62% of cases. Another 38% paid part of the costs, mostly the cost of the IOL and some special investigations. Cost recovery schemes for cataract operations were introduced 3–4 years ago.

DISCUSSION

The age and sex adjusted prevalence for all bilateral blindness (VA <3/60) in the entire population of 0.13% is less than half of the WHO estimate of 0.3% for this region.[7] The age and sex adjusted prevalence of bilateral cataract blindness in people of 50 years or older was 0.6% (95% CI: 0.4 to 0.9), less than a quarter of the estimated prevalence used in the design of the study. As a result the confidence intervals around the prevalence rates for VA <3/60 are far wider than anticipated.

The age and sex adjusted prevalence of bilateral cataract and VA<6/60 in the better eye is considerably higher: 2.6% (95% CI: 2.1 to 3.2). With a variation of 22% around the prevalence this is a fairly accurate estimate. An estimated 12 161 people have a VA less than 6/60 in the better eye due to cataract. A total of 46 650 eyes are severely visually impaired due to cataract.

The surgical coverage for VA <3/60 is fairly good with 75% of all bilateral cataract blind people and 57% of all cataract blind eyes having been operated. The coverage for VA <6/60 is considerable less, indicating that most eye surgeons use VA <3/60 as intake criteria for cataract surgery or have only recently lowered their threshold to VA <6/60. The fact that "waiting for maturity" was the second main barrier to cataract surgery may also support this.

The proportion of people of 50 years and older is relatively low with 9.94% of the total population, and hence fewer people are at risk for age related cataract. But these factors are not enough to explain the low prevalence of bilateral cataract blindness.

With 35 cataract surgeons (one eye surgeon per 135 000 people) and 500 dedicated beds there is potential to increase the annual output of cataract surgeries further above the current CSR of 500, an average of 71 cataract operations per surgeon per year. If each cataract surgeon could perform 285 surgeries in a year, the total annual output would be 10 000, a CSR of 2000. This would be in line with the recommendations given by the global initiative for the elimination of avoidable blindness.[8]

To achieve this, the intake criteria for cataract surgery may have to be lowered from the current level of VA <3/60 to VA <6/60, and at a later stage perhaps even to VA <6/36. Awareness campaigns may have to be initiated to inform the public of the advantages of modern IOL surgery, that it can be done at an earlier stage, and that the results are better. Approximately 54% of the population is rural, living far away from the urban hospitals and surgical service. They rely on regional hospitals where the IOL surgery is not yet available. Of all cataract operations, 72% was on "first" eyes and 28% on second eyes, indicating that many patients seem to be satisfied with one operated eye only. There may be some indifference and lack of awareness by patients, since "old age, no need for surgery" was the main barrier for patients to have operations. However, the second major barrier, "waiting for maturity," may indicate that some patients do request cataract surgery at an earlier stage but are told to wait. The recent introduction of family doctors may also help to create more awareness with the public and lead to timely referrals for cataract surgery.

From the visual outcome data (Table 4) it appears that not all surgeons have shifted to IOL surgery. The visual outcome of cataract operations without IOL needs to be further investigated to explain the high proportion of poor visual outcome. Uncorrected aphakia, which appeared as a major cause of poor outcome, is unnecessary and relatively easy to solve. Routine monitoring of visual outcome after cataract surgery could be introduced to improve results of future operations.

When lowering intake criteria for cataract surgery, IOL implantation is recommended because of the higher gains in visual functioning. However, care should be taken that all surgeons are adequately trained and their units are all provided with the necessary equipment for IOL surgery.

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