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ABSTRACT

Aim To determine the prevalence of blindness, visual impairment and the cataract surgical coverage for people aged 50 years and older in the Lumbini Zone and the Chitwan District (Narayani Zone) of Nepal.

Methods A population-based cross-sectional study in 2006 selected subjects aged 50 years and older through a random multistage cluster sampling and door-to-door enumeration. Ophthalmic examination included visual-acuity assessment and refraction, and anterior and posterior segment examination of the eyes carried out by a trained ophthalmologist and two ophthalmic assistants at centralised locations.

Results The survey examined 5138 of 5196 persons enumerated (response rate of 86.8%). The mean age of the subjects was 61 (SD 9.2) years, and 2701 (52.6%) subjects were women. The age—sex-adjusted prevalence of blindness (best presenting vision <6/60) and visual impairment (better-eye presenting visual acuity of <6/18 to ≥6/60) were 4.6% (95% CI 3.4 to 5.8) and 18.9% (95% CI 16.4 to 21.4), respectively. Blindness was significantly lower in the hill (3.3%) compared with the plain (5.8%) regions (OR 0.6; 95% CI 0.4 to 0.9). The primary causes for blind eyes were cataract (n = 228, 48.1%), refractive error (n = 149, 31.4%), retinal disorders (n = 19, 4.0%) and corneal opacity (n = 18, 3.8%). The overall cataract surgical coverage was 66.6%. Cataract surgical coverage was not significantly associated with age, sex, literacy or District.

Conclusion Although the prevalence of blindness and visual impairment is lower than 10 years ago, particularly among women, correctable blindness due to cataract and refractive error (79.5% of blind people) remains a significant population health problem in Lumbini Zone and Chitwan District.

Sri Rana Ambika Shah Eye Hospital, now known as the Lumbini Eye Institute (LEI), established in 1983 in Bhairahawa, Nepal, is a tertiary referral centre providing most of the eye care services in the Lumbini Zone. Since its inception, LEI has undertaken extensive community outreach activities to provide equitable access to eye care regardless of income or location, and, more recently, to specifically achieve those goals for women and girls.

LEI staff sought programme impact findings in its service area both for overall and for the geographically, demographically and ethnically distinct hill and plain areas. The Lumbini zone has three Districts clearly in the southern plains that continue into and mix with the population of India and three Districts in the northern hills that stretch into and mix with the people of the high Himalayan area. Chitwan District, which LEI also serves, includes both plain and hill areas, and is geographically isolated from India. Agriculture is the main occupation, except in some hill areas (Magar, Gurung ethnicity) where men become army professionals in the British or Indian Army ("Gurkhas").

The Nepal National blindness survey (1981) estimated the prevalence of blindness as 3.8% (best-corrected visual acuity of <3/60) among those aged 45 years or older and cataract surgical coverage as 44% (<3/60).[1] In 1995, a survey of the Lumbini and Bheri Zones[2] found a blindness prevalence of 2.5% (best corrected <3/60) and 3.9% (<6/60) in people older than 45 years and cataract surgical coverage (<3/60) of 46% in the Lumbini Zone. The study also reported that 30% of cataract surgical patients remained blind (presenting VA <6/60).

The objectives of this population-based cross-sectional prevalence study of the Lumbini Zone and the Chitwan District were to explore changes in (a) the prevalence of blindness, (b) cataract surgical coverage and (c) outcome of cataract surgery, among people aged 50 years and older. This paper reports the prevalence of blindness and cataract surgical coverage.

METHODS

Sample population and plan

The population of the seven districts in the study (including Chitwan) was estimated at 3.36 million as of 2006, out of which 13% (0.43 million) were aged 50 years and older with 50% women.[3] We utilised data from the 2001 national population census as the frame for the sampling design.

Sample size

The sample size was calculated to estimate the prevalence of blindness (defined as presenting better-eye visual acuity of <6/60) for people aged 50 years and older of 5%.[3] A sample size of 5000 was based on a 95% CI, 15% error-bound precision, 85% examination response rate, cluster design effects of 2.00 and rounding up to the nearest 1000 people.

Sampling methodology

We combined small villages and divided larger villages to create sampling clusters with nearly 175 (108 to 216) people ≥50 years (total population between 850 and 1700) in each cluster. We used simple random sampling without replacement (based on the 2001 population census estimate of 12.75% population aged 50 years and older and a total survey population of 39 216 people) to select 32 clusters for the study.

Study team

The study included two enumeration teams and one clinical team. Each enumeration team comprised an enumerator-supervisor, enumerator, map-maker and a helper or a village volunteer. The clinical team consisted of an ophthalmologist and two ophthalmic assistants. Local volunteers were enlisted to assist with the clinical examination. Both enumeration and clinical teams had at least one female member.

Field procedures

Fieldwork took place over 20 weeks during August to December 2006.

Enumeration

All individuals aged 50 years and above in all households in the selected clusters were enumerated through door-to-door visits. Each household was visited at least three times on consecutive days before a member was designated as unavailable. Suitable sites, ideally equipped with electricity, ambient light and adequate examination and waiting areas were selected within a 1 h walking distance of selected households.

Clinical examination

Ophthalmic assistants performed a visual-acuity assessment at presentation with and without spectacles using a back-illuminated Early Treatment for Diabetic Retinopathy Study (ETDRS) E chart at a distance of 4 m. Those unable to read the ETDRS chart at 4 m were asked to read the chart at 1 m, then finger counting at 1 m, hand movements and light perception. Where vision could not be tested, the ophthalmic assistant used their judgement to make a subjective determination and record "believed blind," "believed not blind" or "undetermined."

All people presenting with a visual acuity of less than 6/18 and those operated for cataract surgery in either eye were sent for refraction, while others proceeded directly to the ophthalmologist for detailed eye examination.

Ophthalmologist's examination

The ophthalmologist used a slit lamp, torch light and direct ophthalmoscope for the basic eye examination and to determine the type of cataract surgery and surgical complications. The depth of the anterior chamber was graded against the corneal thickness as "normal, shallow, deep or undetermined." The ophthalmologist performed a fundus examination using direct ophthalmoscopy in a dimly lit room. People with dense cataracts or requiring further examination were referred to the Lumbini Eye Institute for indirect ophthalmoscopy. Intraocular pressure was measured using an applanation tonometer.

The examining ophthalmologist determined the principal cause of blindness or low vision for each eye and recorded the appropriate code as per a prespecified list. Only one condition was marked as the principal cause, and where there were contributory causes, provision was available to record two main causes.

Research ethics and field conduct

Verbal informed consent was obtained from participants. The examination protocol was cleared by the WHO Secretariat Committee on Research Involving Human Subjects. The project was approved by the Ethical Review Committees of Nepal Netra Jyoti Sangh (National Society for Prevention of Blindness) and the Lumbini Eye Institute. Patient confidentiality was maintained as per protocol.

Quality assurance

During the prepilot and pilot stages, inter- and intraobserver data were collected, and analysed by the Technical Advisory Committee. During the study period, quality assurance was tested in five randomly selected clusters by duplicating ophthalmic assistant examination for people who presented with VA <6/18 and in 10% of people with normal vision. The interobserver agreement for presenting VA between vision categories was 98% (unweighted kappa 0.92) and 91.2% (unweighted kappa 0.89) for best-corrected VA.

Data analysis

Five vision categories were defined for analysis and reporting: (1) normal or near normal vision, 6/18 or better in both eyes; (2) visual impairment, unilateral or bilateral visual impairment, <6/18 to 6/60 in the worse eye and >6/60 in the better eye; (3) unilateral blindness, <6/60 in the worse eye and >6/60 in the better eye; (4) moderate bilateral blindness, <6/60 in worse eye and <6/60 to >3/60 in the better eye; (5) severe bilateral blindness, <3/60 in both eyes. Estimates (with 95% CIs) for impairment and blindness prevalence were calculated along with that attributed specifically to cataract. The prevalence of blindness, cataract blindness and cataract surgery was estimated, and potential associations with age, sex, literacy and geographic location were explored using multiple logistic regression.

The cataract blindness burden was defined as the sum of those people already operated on for cataract in both eyes and unoperated cataract blind. It was not possible to obtain the preoperative vision status on an already operated eye, so we assumed that both eyes were blind preoperatively if both eyes were operated for cataract, or if one eye was operated, and the other eye was blind at the time of our examination. Surgical coverage was calculated as the number of bilaterally blind cataract cases operated on divided by the number who could have been operated on. The denominator includes the already operated bilateral blind (the numerator) plus the unoperated bilaterally blind with cataract being the principal cause of blindness in at least one eye.

CIs for prevalence estimates and odds rations were calculated. We considered a p value <0.05 as significant. Missing values were assumed to be similar in distribution to available data and ignored during the analysis.

RESULTS

Of the 5916 people enumerated, 5138 (87%) were examined, ranging from 68% to 96% among sampling clusters. Of the 778 people not examined, 80% were working or visiting relatives outside the village and were presumed not to have significant visual impairment. Only seven people refused eye examination.

No significant demographic differences were found between the enumerated and examined populations (table 1). Women constituted 52% and 53% of the total enumerated and examined population, respectively, compared with an estimated 50% women in the population in the Lumbini and Narayani zones.[3]

Agriculture (46%) was the only significant income-earning occupation, and women provided essentially all the household work (99%).

Table 2 shows the prevalence of visual impairment and blindness based on presenting visual acuity (with spectacles if presenting with them) and best-corrected visual acuity. Severe (<3/60) and moderate (<6/60) bilateral blindness in the best eye were estimated as 2.3% each, and visual impairment (<6/18) in the worst eye as 18.9%.

Table 1 Enumerated and examined population by age, sex and literacy

	Enumerated No (%)	Examined No (%)	Percentage examined
Age (years)			
50–59	2898 (49.0)	2472 (48.1)	85.3
60–69	1795 (30.3)	1590 (31.0)	88.6
70+	1223 (20.7)	1076 (20.9)	88.0
Sex			
Male	2859 (48.3)	2437 (47.4)	85.2
Female	3057 (51.7)	2701 (52.6)	88.4
Literacy*			
Literate	809 (13.7)	648 (12.6)	80.1
Illiterate	5107 (86.3)	4490 (87.4)	87.9
Residence			
Plain area	3097 (52.3)	2661 (51.8)	85.9
Hill area	2819 (47.7)	2477 (48.2)	87.9
All	5916 (100.0)	5138 (100.0)	86.9

*Not including three people with missing literacy values.

Table 3 provides the prevalence of presenting visual impairment and blindness in people, by age, sex, literacy and geographical location. Almost one-third of the population (32.3%) have a visual problem, with 19% having visual impairment in at least one eye and 8.8% unilateral blindness (<6/60). There was a slightly higher prevalence of visual impairment and blindness in men compared with women (19.9% vs 18.1%). However, the distribution of presenting vision between men and women was not statistically significantly different across any of the five visual acuity categories. People aged 60–69 years (adjusted OR 3.2, 95% CI 2.2 to 4.6) and people aged 70 years and older (adjusted OR 6.1, 95% CI 4.1 to 9.1) had a statistically significantly greater prevalence of bilateral blindness compared with people aged 50–59 years. There was a significantly higher prevalence of blindness among people considered illiterate versus literate (adjusted OR 2.9, 95% CI 1.6 to 5.1) and living in the plain versus the hill districts (adjusted OR 0.6, 95% CI 0.4 to 0.9).

Cataract (49%), refractive error (31%), corneal opacity (3.8%) and retinal disorders (4.0%) were the leading causes of unilateral and bilateral blindness in eyes (table 4). Of people with bilateral blindness (<6/60), 48% have cataract in both eyes, and 31% have bilateral refractive error.

Table 5 provides estimates of cataract blindness and surgical coverage by age, sex, literacy and residence. In the multivariate analysis, cataract blindness burden was significantly higher with age (OR 9.8, 95% CI 6.7 to 14.4) and illiteracy (OR 1.8, 95% CI 1.2 to 2.6). The cataract blindness burden was significantly higher in the plain than the hill districts (OR 1.51, 95% CI 1.21 to 1.88).

DISCUSSION

The survey findings suggest that blindness prevalence may have decreased since the 1995 survey.[2] However, during this period, the population aged 50 and older in the Zone and Chitwan District increased from 390 000 to 435 000 with a corresponding increase in life expectancy from 54 to 63 years. Any rigorous comparison would require calculation of age and sex standardised rates to account for the ageing population and possible changes in sex distribution.

Using point estimates, the 2006 survey found a reduced blindness prevalence (4.6%, 95% CI 3.4 to 5.8; presenting vision <6/60) in people aged 50 years and older, compared with people age 45 and older (5.3%) in the 1995 survey involving the Lumbini Zone.[2] A blindness estimate for the comparable population (≥age 50) from the 1995 survey almost certainly lies outside the 95% CI for the 2006 survey. Using the CIs from 2006, the severe blindness prevalence estimate was also significantly reduced in 2006 (2.3%, 95% CI 1.7 to 2.8; presenting vision <3/60) compared with people aged 45 and older in 1995 (3.0%)[2] and 1981 (3.8%).[1]

This 2006 Lumbini survey estimates a blindness (<6/60) prevalence of 4.3% for women and 5% for men, respectively. This represents a reversal of the 1995 ratio which favoured men (4.6%) over women (6.1%). The reversal was almost certainly due to increased cataract surgical coverage in women (70.8%) versus men (61.7%) compared with the 1995 estimates (women 40.6%, men 44.2%). Reducing gender inequity has been an important outreach programme emphasis at LEI since 2001. Beginning in the late 1990s, LEI trained female community health volunteers to identify and support women both to attend its expanding network of regular screening camps and to undergo surgery either in the camp or more often back at LEI or Bhartpur Hospital in Chitwan.

Table 2 Visual impairment and blindness prevalence based on presenting and best-corrected visual acuity

	Better eye				
Worse eye	**≥6/18**	**<6/18 to ≥6/60**	**<6/60 to ≥3/60**	**<3/60**	**All**
≥6/18	Normal/near-normal vision				
	3477 (67.7)				3477 (67.7)
	4287 (83.4)				4287 (83.4)
<6/18 to ≥6/60	Unilateral or bilateral vision impairment				
	974 (18.9)				974 (18.9)
	385 (7.5)				385 (7.5)
<6/60 to ≥3/60	Unilateral blindness		Moderate bilateral blindness		
	450 (8.8, 7.2 to 10.3)				191 (3.7)
	369 (7.2, 6.0 to 8.4)				29 (0.6)
<3/60				Severe bilateral blindness	
			120 (2.3, 1.5 to 3.2)		496 (9.7)
			11 (0.2, 0.0 to 0.4)		
				117 (2.3, 1.7 to 2.8)	438 (8.5)
				86 (1.7, 1.3 to 2.1)	
All					
	4080 (79.4)	821 (16.0)	120 (2.3)	117 (2.3)	5138 (100.0)
	4790 (93.2)	251 (4.9)	11 (0.2)	86 (1.7)	5138 (100.0)

Data are given as number of people (prevalence percentage, 95% CI). For each pair of numbers, presenting visual acuity is on top and best-corrected visual acuity on the bottom.

Table 3 Visual impairment and blindness prevalence by age, sex, literacy and geographical area

Particulars	Examined	Visual impairment No (%)	Blindness Unilateral No (%)	Blindness Bilateral No (%)	Blindness Total No (%)	Visual impairment+blindness
Age (years)						
50–59	2472	259 (10.5)	114 (4.6)	42 (1.7)	156 (6.3)	415 (16.8)
60–69	1590	377 (23.7)	164 (10.3)	86 (5.4)	250 (15.7)	627 (39.4)*
70+	1076	338 (31.4)	172 (16.0)	109 (10.1)	281 (26.1)	619 (57.5)†
Sex						
Male	2437	484 (19.9)	231 (9.5)	121 (5)	352 (14.4)	836 (34.3)
Female	2701	490 (18.1)	219 (8.1)	116 (4.3)	335 (12.4)	825 (30.5)
Literacy						
Literate	648	84 (13.0)	42 (6.5)	10 (1.5)	52 (8.0)	136 (21.0)
Illiterate	4490	890 (19.8)	408 (9.1)	227 (5.1)	635 (14.1)	1525 (34.0)‡
Residence						
Plains	2661	544 (20.4)	276 (10.4)	155 (5.8)	431 (16.2)	975 (36.6)
Hills	2477	430 (17.4)	174 (7.0)	82 (3.3)	256 (10.3)	686 (27.7)§
Total	5138	974 (19)	450 (8.8)	237 (4.6)	687 (13.4)	1661 (32.3)

*Adjusted odds ratio versus age 50–59: 3.2 (95% CI 2.2 to 4.6; p<0.01).
†Adjusted odds ratio versus age 50–59: 6.1 (95% CI 4.1 to 9.1; p<0.01).
‡Adjusted odds ratio 2.9 (95% CI 1.6 to 5.1; p<0.01).
§Adjusted odds ratio 0.6 (95% CI 0.4 to 0.9; p<0.01).

This 2006 Lumbini survey estimates a significantly lower blindness (<6/60) prevalence in the hill (3.3%) versus plain region (5.8%) (adjusted OR 0.6, 95% CI 0.4 to 0.9) despite very similar demographics (age and sex). The blindness prevalence in the plain area is consistent with estimates of Indian populations (8.5%) which they resemble ethnically.[4] However, although the hill population consists of more of an "Asian" population, its prevalence is much lower than blindness (<6/60) estimates for people over the age of 50 (10.9%) in the Tibet Autonomous Region of China,[5] for example.

The higher prevalence of blindness in the plain area is most likely due to a larger backlog of unoperated cataract cases. The cataract blindness burden (sum of unoperated and operated, presumed blind) was found to be higher in the plain (8.9%) than in the hill (6.1%) areas (OR 1.51, 95% CI 1.21 to 1.88) and the cataract surgical coverage was almost the same. LEI achieves the cataract surgical coverage in the hill districts through an eye hospital in Tansen, the only hospital in the hill districts of Nepal, and a network of regular screening visits and surgical eye camps conducted by the resident ophthalmologist.

The significantly lower blindness prevalence estimate in the hill versus plain region is similar to the 1981 Nepal National Blindness survey.[1] They also attributed the lower prevalence of blindness in the hill Districts primarily due to the lower prevalence of cataract compared with the central plain (Tarai) areas. Current (2009) population-based studies in Nepal plan a further examination of these geographical patterns.

The current Lumbini blindness (<6/60) prevalence estimate is comparable with people age ≥50 years in the Satkhira District in Bangladesh (presenting vision 4.5%)[6] The Lumbini blindness prevalence (presenting vision <3/60) estimate of 2.3% is lower than the 2002 estimate of 3.4% for the South East Asian Region[7] and lower than the Pakistan National Study in people aged ≥50 which estimated a blindness (<3/60) prevalence of 7%.[8]

A survey conducted in the adjacent Gandaki Zone of Nepal in 2002[9] found a lower blindness (<6/60 presenting vision) prevalence for people age 45 and older (2.6%) compared with the 2006 Lumbini study (4.6%). However, the Gandaki study only sampled patients from the three Districts closest to the base hospital where programme impact was likely greatest, and Gandaki consists of only hill regions similar to the hill Districts of Lumbini, where the prevalence estimate was similar (3.3%).

Cataract remains as the principle cause of blindness in Lumbini Zone (48% of eyes) but is substantially lower than the

Table 4 Principal causes of blindness in eyes

Principal cause	Eyes of bilaterally blind people N (%)	Eyes of unilaterally blind people N (%)	All blind eyes N (%)
Cataract	228 (48.1)	228 (50.7)	456 (49.4)
Refractive error	149 (31.4)	58 (12.9)	207 (22.4)
Corneal opacity	18 (3.8)	33 (7.3)	51 (5.5)
Retinal disorders	19 (4.0)	13 (2.9)	32 (3.4)
Glaucoma	4 (0.8)	21 (4.7)	25 (2.7)
Globe disorders	2 (0.4)	4 (0.9)	6 (0.7)
Amblyopia	1 (0.2)	8 (1.8)	9 (1.0)
Optic atropy	0 (0.0)	2 (0.4)	2 (0.2)
Other/undetermined	51 (10.7)	83 (18.4)	134 (14.5)
Missing	2 (0.4)	0 (0.0)	2 (0.2)
Total	474 (100.0)	450 (100.0)	924 (100.0)

Table 5 Cataract blindness and surgical prevalence by age, sex, literacy and residence

		Never operated cataract blind		Cataract operated				Cataract blindness burden		Percentage surgical coverage
				All operated		Presumed blind*				
	No examined	No	Prevalence†	No	Prevalence†	No	Prevalence†	No	Prevalence†	
Age (years)										
50–59	2472	15	0.6	60	2.4	39	1.6	54	2.2	72.2
60–69	1590	43	2.7	130	8.2	98	6.2	141	8.9‡	69.5
≥70	1076	72	6.7	169	15.7	122	11.3	194	18.0§	62.9
Sex										
Male	2437	69	2.8	162	6.7	111	4.6	180	7.4	61.7
Female	2701	61	2.3	197	7.3	148	5.5	209	7.7	70.8
Literacy										
Literate	648	6	0.9	34	5.3	18	2.8	24	3.7	75.0
Illiterate	4490	124	2.8	325	7.2	241	5.4	365	8.1¶	66.0
Area of residence										
Plain	2661	76	2.9	208	7.8	162	6.1	238	8.9	68.1
Hill	2477	54	2.2	151	6.1	97	3.9	151	6.1	64.2
All	5138	130	2.5	359	7.0	259	5.0	389	7.6	66.6

No significant association was found between age, sex, literacy or residence with surgical coverage. Data are given as adjusted odds ratios (95% CIs), obtained by multiple logistic regression.
*Includes all bilaterally operated people and unilaterally operated people with a blind fellow eye.
†Adjusted prevalence per 100 examined subjects.
‡Adjusted odds ratio versus age 50–59: 4.4 (3.0 to 6.3 (95% CI); p<0.01).
§Adjusted odds ratio versus age 50–59: 9.8 (6.7 to 14.4 (95% CI); p<0.01).
¶Adjusted odds ratio 1.8 (1.2 to 2.6 (95% CI); p<0.01).

1995 estimates (78%)[2] and the current national estimate of 70%.[10] This is consistent with the cataract surgical coverage of 66% compared with the Nepal national estimate of less than 50%.[10] The current cataract surgical coverage (66% <6/60) is also much higher than in 1995 in the Lumbini Zone (42%).[2]

The cataract surgical coverage over the 10-year period not only increased from 42% to 66%, but also showed a more equitable distribution of service delivery by sex and geographic location. The surgical coverage became more rather than less common among women (71%) versus men (62%) and similar in the plain (68%) and more remote hill Districts (64%).

From 1995 to 2006, the number of cataract operations in Lumbini Zone increased from approximately 4000 (3300 LEI +700 private and conducted elsewhere) to 6700 (5700 LEI); a cataract surgical rate of 2666 per million. Using the survey estimate of unoperated cataract blindness (<6/60) as 2.3% (50% of total blindness) there was a backlog of approximately 8300 cases in 2006.

For programme planning, in keeping with IAPB planning in India,[11] LEI should also consider both the incidence of cataract and operations on eyes with vision >6/60, second eyes, and unilaterally blind people. LEI should expect an annual incidence of 0.45% (20% of the prevalence)[12] or 1600 people needing surgery in at least one eye. In addition, LEI estimates that, of its current operations, approximately 10% of operated eyes (670) have vision better than 6/60, and at least another 10% (670) are second eyes or unilaterally blind people. Therefore, approximately 50% of the annual cataract operations (3000) reduce the backlog of blind eyes (8700), and the other half deal with incident case and non-blind people.

Refractive error accounted for 31% of bilaterally and 12.9% of unilaterally blind people. Refractive error as the principal cause of blindness is greater than the Gandaki survey, 13.2% of bilateral and 10.2% unilateral blind.[3] In the 1995 Lumbini survey, there where only 3.8% of eyes blind due to refractive error,[2] and it was not a cause of blindness in the 1981 National Nepal Survey. The increased prevalence likely reflects an older population with more age-related cataract and no access to optometric services.

CONCLUSIONS

In the past 10 years, blindness prevalence, particularly due to cataract, has decreased, and cataract surgical coverage has increased in the Lumbini Zone and Chitwan District. Cataract and other surgical services are equitably distributed by age and sex throughout all Districts in the service area. Blindness due to refractive error has increased tenfold in the past 10 years. With 79% of bilateral blindness attributable to cataract and refractive error, there is substantial scope for further reduction in burden of blindness in this population. The current cataract surgical rate will gradually decrease blindness due to cataract in the zone.

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Cover illustration

The eye of the tiger

The love-fear relationship between humans and animals is probably as old as the origin of the human species. When the *Homo sapiens* occupied their position at the top of the 'food chain' they were to be naturally feared by animals on which they preyed for food and sport. Equally, the grace, power, strength and physical structure of many animals earned them the respect and awe of humans. History and mythology contain many examples of humans according divine status to animals, worthy of worship and prayer. The Tiger has been touched by all these aspects of human nature. It adorns stamps, coins and flags. It is the 'vehicle of the revered Hindu goddesses Durga'; the symbol of compassion and generosity to Tibetan Buddhists; has an important role in Korean mythology wherein, in an interesting legend (Korea in the eye of the tiger[1]), Tangun Wanggom, the father of Korea successfully granted a tiger (the tiger of Shinshi) a wish to become human; and the tiger also figures heavily in Chinese mythology where it is believed to have magical powers. It is the third animal in the Chinese zodiac and the Yin and Yang are at times symbolised by a tigress and a dragon.[2] The deification of the tiger unfortunately is also pushing it towards extinction. Extracts of every single part of the tiger has been used in traditional Chinese medicine for over a thousand years[2] and still sold all over the world.

Of all the body parts of the tiger, its eye have caught the imagination of poets and song writers and the phrase 'the eye of the tiger' is variously used in the English language. Seeing the eye of the tiger usually signifies death for its prey. The tiger also has two white 'eye spots' on the back of its ears. When it is about to attack its prey it turns its ears towards the prey and the eye spots on the back serve to confuse any predator behind it. Published in 1794, William Blake's poem 'The Tyger' is still popular—'Tyger Tyger burning bright, … in what distant deeps or skies. Burnt the fire of thine Eyes?' However in recent times the song 'Eye of the Tiger' by the American band Survivor is the most popular expression of our fascination with the tiger's eye. In this song it signifies the survival instinct in the face of adversity.

The 'Tiger's eye' gem stone, a natural semi-precious stone of quartz and crocidolite, presents a shimmering array of colours provided by the iron rich crocidolite. The reflections from the stone resemble that of an eye of a cat or tiger catching light at night, hence the name. It was a talisman of Roman soldiers to give them power and courage during battle. The 18th century physicians used it to cure patients afflicted by 'demons and ghosts'. The blue gem stone is considered to help in relieving stress. For this and other reasons the gem stone in all its varieties is still worn by many to bring health and wealth, ward off evil spirits and help through life's struggles.[3]

The phrase is also used in medicine as 'The eye-of-the-tiger sign' for the magnetic resonance image appearance of excess iron deposition seen in the globus pallidus in Hallervorden-Spatz syndrome and other extrapyramidal parkinsonian disorders. T2-weighted MR images depict a low-signal-intensity ring surrounding a central high-signal-intensity region in the medial aspect of the globus pallidus resembling an eye of the tiger.[4]

What then is the truth about the eye of the tiger? All tigers have yellow-orange eyes except the white tiger which has blue eyes. Unlike other cats with slit pupils, the tiger's pupils are round and dilate excessively at night to capture more light for its rod dominant retina. The tiger's night vision is six times more than humans, aided by the tapetum lucidum that reflects light back on to the rods. This also gives it its special 'tiger eye' brightness that has captured the imagination of so many. The tiger's day vision and colour vision is worse than that of humans.[5] Nevertheless, in the wild, it vision allows it to hold its position as an efficient, solitary night hunter, at the top of the food chain.

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