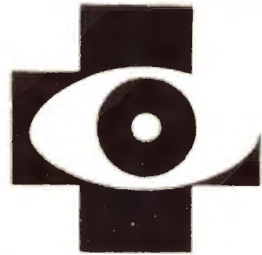


BLINDNESS IN INDIA
TRENDS IN PREVALENCE AND MAGNITUDE



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Ophthalmology/Blindness Control Section
Directorate General of Health Services
Ministry of Health and Family Welfare
Government of India, New Delhi

ACKNOWLEDGEMENT


It is estimated that there are about 12 million blind persons in India, if we define blindness as visual acuity less than 6/60 in the better eye. These estimates are based on last nation-wide survey that was undertaken with WHO assistance in 1986. The results of this survey were available in 1989. A multicentre survey was earlier undertaken by Indian Council of Medical Research in 1971-74. No nation wide survey have been undertaken since 1986 in India. Some State level survey have been undertaken in Gujarat and in Karnataka, latter by rapid assessment method. Thus it would not be possible to estimate current trends in prevalence and magnitude.

An attempt has been made to review trends in prevalence and magnitude of blindness during 1970s and 80s and its relationship with attributable factors. As the methodology was not exactly similar in the two surveys, cautious comparison and interpretation has been attempted wherever possible. The effort is to make available results of these surveys as baseline for any future national or regional surveys. The analysis would also be helpful in planning and implementation of blindness control activities in India and other developing nations.

We acknowledge availability of results of two surveys by ICMR and Dr.Madan Mohan, former chief of Dr.R.P.Centre, AIIMS, New Delhi. We are also indebted to guidance of Dr. M.J.Wysocki, Regional Adviser in Health Statistics, WHO SEARO and support for publication of this document. Guidance and advice of Dr.N.Bihari, DGHS, Mr.P.S.Bhatnagar, Additional Secretary and Mr.Alok Perti, Joint Secretary, Ministry of Health & Family Welfare has given us enthusiasm and courage to work for control of blindness with best of our efforts.



(D.BACHANI)



(R.JOSE)

New Delhi
October, 1996

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1. INTRODUCTION :

1.1 Magnitude of Blindness

There are estimated 27-35 million blind persons in the world¹, if blindness is defined as inability to count fingers at a distance of 3 meters (visual acuity equal to less than 3/60 in the better eye). If the definition of blindness is fixed as visual acuity of less than 6/60, a level recognised as "legal blindness" in some industrialised countries, the world total of blind people would be about 42 million². According to the WHO-Govt of India Survey of 1986-89, there are approximately 12 million people blind in India with visual acuity less than 6/60³.

1.2 Country Profile

India is a vast tropical country with a wide variation in temperature and rainfall. There are wide differences in environmental factors, social and cultural patterns, literacy status and personal hygiene.

According to the 1981 census, India had the population of 685.18 million spread over an area of 3.29 million sq.km. Administratively the country is divided into 25 states and 7 Union Territories. Due to decline in mortality, the expectation of life at birth has been steadily increasing. Consequently age distribution of population undergoes changes and old age population has started growing. This phenomenon has significant influence on the pattern of eye diseases.

1.3 Blindness in India

Blindness has been identified as one of the major public health problems in India. It adds an enormous economic burden on the family, society and the government due to loss of productivity, cost on treatment and rehabilitation of the blind.

A number of studies and surveys have been undertaken in the past to highlight the magnitude of the problem of blindness in India; important being the Sub-Committee report on Blindness (1942)⁴; the Health and Development Committee report (1944) - popularly known as Bhore Committee⁵, the Trachoma Control Pilot Project (ICMR) in 1956-63⁶, the Multicentric Survey of seven centres by ICMR in 1971-74⁷, the National Sample Survey Organisation (NSSO) in 1981⁸ and NPCB-WHO survey (1986-89).³

1.4 Historical Perspectives of Blindness Control Programme

India was the first country in the World to launch Blindness Control Programme at the National level.

According to the Sub-Committee on Blindness and the Bhore Committee, it had been found that Trachoma was one of the major causes of blindness in India. To

tackle the problem of trachoma, the Government of India launched a National Trachoma Control programme in 1963. The multicentric ICMR study (1971-1974) later revealed high magnitude of blindness due to cataract rather than trachoma. This prompted the launching of National Programme for Control of Blindness (NPCB) in 1976, with emphasis on prevention and cure of avoidable blindness. The trachoma control programme was merged with broad based programme for control of blindness.

2. REVIEW OF LITERATURE

Though there have been number of surveys on Blindness in last 5 decades in India, it would be difficult to compare data related to prevalence and causes of blindness, due to differences in definition and methodology. However, two surveys that had similar definition, may be used, with limitations, to assess the magnitude and pattern of blindness since 1970's.

2.1 Multicentric Study by Indian Council of Medical Research (1971-74) (ICMR 71-74)

2.1.1 Objectives of the study were :

1. To estimate the Prevalence of Blindness at the seven different centres in India.
2. To study various etiological causes of blindness prevalent in the country.
3. To study the distribution of some factors like demography, environment, nutrition, personal habits vis a vis various causes of blindness.

2.1.2 Definition of Blindness :

With a view to have uniformity in the findings of the survey, the following definition of blindness was adopted.

a) Economical Blindness

- i) Visual acuity of 6/60 or less in the better eye with the usual spectacle correction.
- ii) Field of vision reduced to 20° or less in the better eye (by confrontation method)
- iii) One eye has vision of 6/60 or less with the usual spectacle correction and the other eye has a field of vision of 20° or less.

b) Total Blindness

Visual acuity of less than 3/60 in the better eye with the usual spectacle correction.

c) One Eye Blindness

Visual acuity of less than 3/60 in one eye and better than 6/60 in the other eye.

2.1.3 Sample Size :

The sample size for the study was estimated by using a rough estimate for prevalence of blindness as 3 per 1,000 persons. Based on this estimate, the sample size worked out to be 60,000 for each centre (with 5% sampling error) and 4,20,000 for all the seven centres.

2.1.4 Sampling Design :

A multistage design was adopted. Different designs were employed for urban and rural areas.

(a) Urban Sampling Design :

The urban areas were divided into two strata, the first stratum consisted of the cities with more than 1 lakh population while the remaining towns/cities formed the other stratum. From the sampling frame of the first stratum, one city was selected at random for inclusion in the study. 200 census blocks were selected at random within the selected city. Finally, in each of the selected 200 census blocks, 10 households were selected using systematic sampling. In the second stratum 4 towns/cities were selected at random, from each one of which 50 census blocks were included by simple random sampling procedure. The procedure for selection of household was similar to that adopted for the first stratum. However, due to some administrative and operational difficulties, in some centres, either the number of towns or the number of households were increased to obtain requisite sample size.

(b) Rural Sampling Design :

The rural sampling design was a three stage design. In the first stage, 11 tehsils/ talukas/ police stations were selected at random. In each of the selected tehsils, 27 villages were selected at random in the second stage. Finally, 25 households were selected systematically in each of the selected villages.

2.1.5 Plan of Study :

On finalisation of the study plan, the statistical division of I.C.M.R. provided the sampling procedure for the survey work. In order to make results of the different centres comparable, a uniform sampling procedure and standardised proforma were adopted for the study. An instruction manual was prepared and supplied to all the centres for collection of the information. It was decided to screen urban and rural population in the ratio of 2:3 at each centre.

The project team at each of the centre consisted of an ophthalmologist, one statistical assistant, one social worker, three screeners, one driver and an accounts clerk. The survey team at each centre was to cover the urban population first and rural population later. Keeping in mind the seasonal factors and the difficulty and impracticability of covering the rural areas in the severe climates of the year like the rainy season, the working was so planned that the team visited a village and completed it in one day. The nonresponse was minimised by visiting such households at least twice while surveying the nearby areas. The team was expected to complete a block in one visit before returning to the head quarters. The survey of a village was so planned that the social worker would first visit the village, contact the head of the village identify the houses to be surveyed and inform the head of the household about the visit of the team during the day. The selected families were requested for their full cooperation in the survey work. The social worker also collected the demographic and environmental data. The team then visited all the households which were selected and all the households members were examined by the screener. Persons aged more than 8 years were first screened by the screener with the usual ophthalmic equipment. Children less than 8 years were subjected to clinical examination only and clearly identifiable visual impairments were recorded. Any person having vision 6/60 or less in both eyes or in one eye with usual spectacle correction was followed up for a detailed clinical examination by the Ophthalmologist. Visual acuity was recorded in day light with the standard Snellen's chart and field examination performed by confrontation method.

2.1.6 Coverage :

A total of 395788 persons were examined in this study at the seven selected centres : Srinagar, Delhi, Ahmedabad, Indore, Varanasi, Cuttack, Madurai. The number of persons examined varied from 44700 (Srinagar) to 66361 (Delhi) at various centres.

2.2 National Survey of Blindness - India (WHO - GOI 1986-89)

2.2.1 Objectives of the survey were :

- i) To determine State/Union Territory wise magnitude and causes of blindness in India.
- ii) To evaluate the blindness control activities with special reference to Trachoma, Cataract and Vitamin A deficiency.

2.2.2 Definition of Blindness :

For this study, W.H.O. classification of blindness into five grades has been used with slight modification as given below :

WHO Grades	Visual Acuity in the better eye with usual correction		Category of Impairment
	Maximum (Less than)	Minimum (Equal to or better than)	Mohan Nomenclature 1985
Grade I	6/60	6/18	Low Vision (L.V.)
Grade II	6/60	3/60	Economic (E) Blindness
Grade III	3/60	1/60	Social (S) Blindness
Grade IV	1/60	PL+ /PR Accurate	Manifest (M) Blindness
Grade V	PR Faulty	PL Absent	Absolute (A) Blindness

2.2.3 Study Design :

A sample survey, cross-sectional in nature, with states as independent regions of study was planned. Based on state prevalence rates of blindness given by NSSO in its nation-wide study (1981)⁸ for the disabled which included blindness. The sample sizes were determined for each state separately. It was divided into rural and urban in accordance with the population ratios of 1981 census.

Each of the states was divided into units, consisting of adjoining districts, having similar topographical features. The sample size for the Units was calculated from the state sample in proportion to the population of the unit to the state population. 1 to 3 districts in each unit were then randomly chosen. From each district so chosen, statistically determined and randomly selected villages and urban areas were covered in the survey. The requisite number of individuals were examined through systematic selection of as many households as would be needed for coverage in that village/urban area.

2.2.4 Study Methodology :

The visual acuity was determined on Snellen's visual acuity chart with the corrective glasses worn by the person and not with the best corrected vision.

Field of vision as a criterion of blindness was not included in this survey as it was not considered feasible in the study.

The total sample examined consisted of 2,54,758 individuals (Rural 1,85,594, Urban 69,164). The proportion of urban sample was 37.26% as against the corresponding census value of 23.34%.

There has been no nation-wide survey since 1986-89. However, a state wise survey was conducted in 1992 in Gujarat.

2.3 Blindness and Visual Impairment in Gujarat

2.3.1 Objective of the survey :

The objective of the survey was to assess the prevalence of blindness in Gujarat and to know the causes for blindness.

2.3.2 Definition of blindness :

Blindness was defined as visual acuity equal to or less than 6/60 in the better eye with usual correction.

2.3.3 Study Design :

Villages and urban blocks were selected from already available sample units of Sample Registration System where Gujarat is divided into 200 rural units and 100 urban units. Out of these, 100 units from rural areas and 50 units from urban areas were selected randomly. Every 5th household in rural areas and every 3rd house-hold in urban areas were covered. Each investigator was given a random number to start the survey in a unit. The survey was completed between July and October, 1992.

3. OBJECTIVES OF THE REVIEW

1. To review the results of various surveys undertaken since 1970 in India.
2. To compare the observations of the surveys and analyse the trends over time.
3. To study prevalence of blindness with relation to various epidemiological parameters in various surveys.

4. DEFINITION OF BLINDNESS

The need to grade the visual acuity in various surveys is for the following specific purposes :-

- (i) Persons who have subnormal vision but would be able to perform most of the daily chores and professional work. (Low vision or Category I).
- (ii) Persons who have visual acuity less than 6/60 in the better eye and are considered economically blind are further categorised into grades II, III, IV and V of WHO classification to know the severity of the visual disability.

In developed countries visual acuity below 6/60 in the better eye i.e. grade II is taken as a cut off level to include all such persons in the category of blindness often called the economic blindness. Various surveys of Blindness in 1971-74 and 1986-89 conducted in India used the same cut off level for blindness.

W.H.O. however has recommended that, for the developing countries, the cut off level should be kept at 3/60 i.e. grade III or social blindness.

The other two categories i.e. grade IV & V are largely to separate possibly curable (grade IV - Manifest Blindness) from possibly incurable (grade V - Absolute Blindness) categories.

5. ANALYSIS OF AVAILABLE DATA

5.1 Prevalence of Blindness (Table 1 & 2)

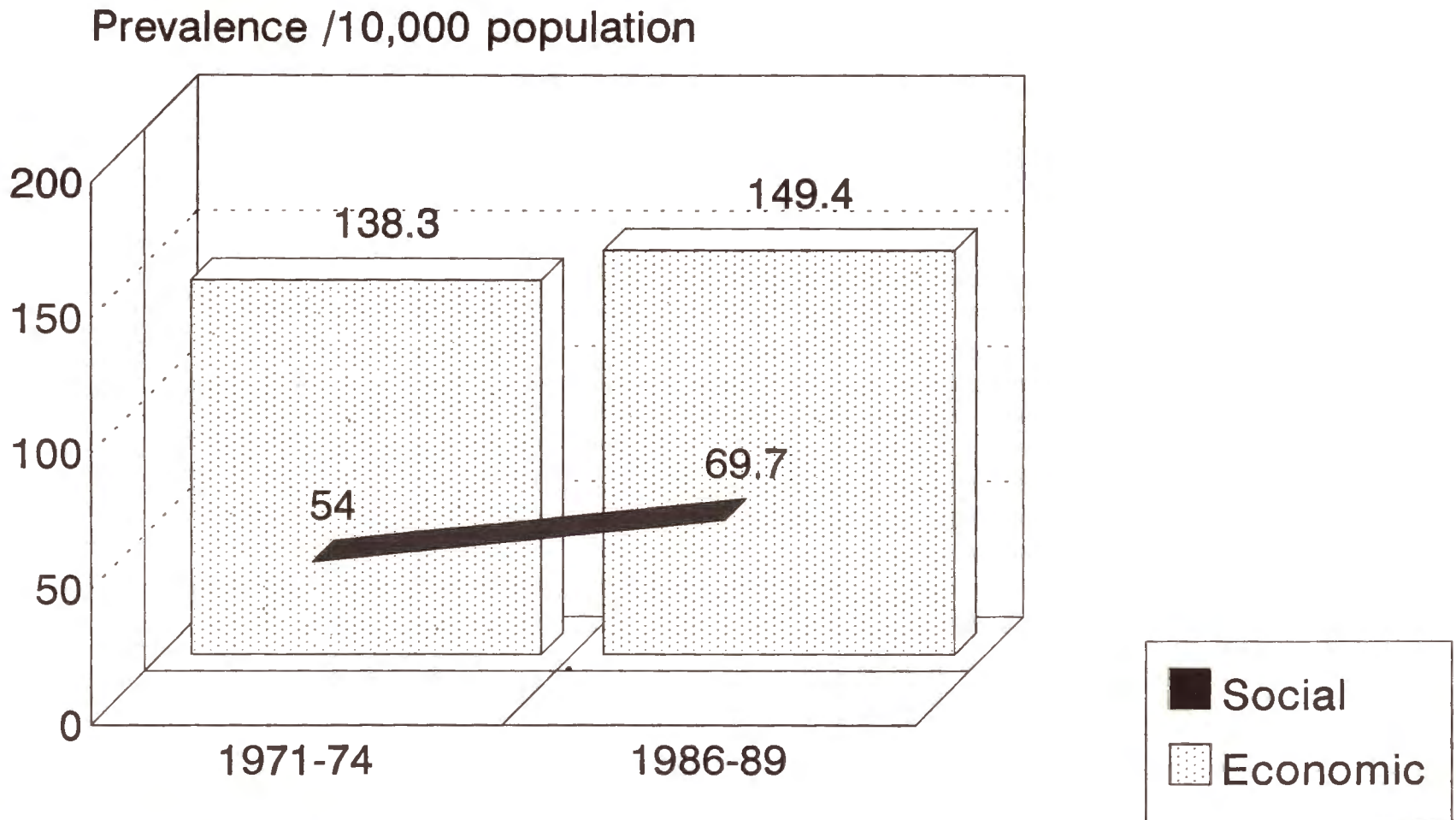
Prevalence of blindness (as measured by Visual acuity $< 6/60$ in the better eye after usual correction) was 138.3 persons per 10,000 population in 1971-74. This rose to 149.43 per 10,000 in 1986-89. While these are estimated prevalence ratios, and do indicate marginal increase in prevalence over the years, the first survey (1971-74) was less representative for the entire country as the study was undertaken only at 7 places. The second survey (1986-89) covered almost the entire country and is more valid for India. In the 71-74 survey, there was an urban bias (urban : rural was 2:3) which was not proportionate to rural/urban census distribution. Thirdly, though visual acuity criteria was similar in both the surveys, the 71-74 survey also considered loss of field of vision in defining blindness. In spite of these differences, one thing was certain, that the goal of National Programme for Control of Blindness (NPCB) to reduce prevalence to 30 per 10,000 (0.3%) was still a distant goal.

5.2 Estimated Blind Persons (Table 1 & 2)

The magnitude of blindness could well be gauged by estimated number of blind persons. This could be estimated crudely by taking into account the prevalence and estimated population in a given year. There has also been significant rise in expectation of life over the years in India, with corresponding rise in ageing population both as proportion of general population as well as in absolute numbers. As both surveys revealed, cataract, a predominant problem of the aged, as the most important cause of blindness. Extrapolation of prevalence to general population, without considering changes in age structure, would give very crude extent of the magnitude of blindness. Nevertheless, with these limitations in place, the estimated number of blind persons (VA $< 6/60$) rose from 8.4 million to 11.94 million from 1975 to 1989. With rise in prevalence of social blindness (VA $< 3/60$) from 54 to 69 per 10,000 population, estimated number of blind persons with VA $< 3/60$ rose from 3.28 million to 5.57 million.

Prevalence of Blindness in India

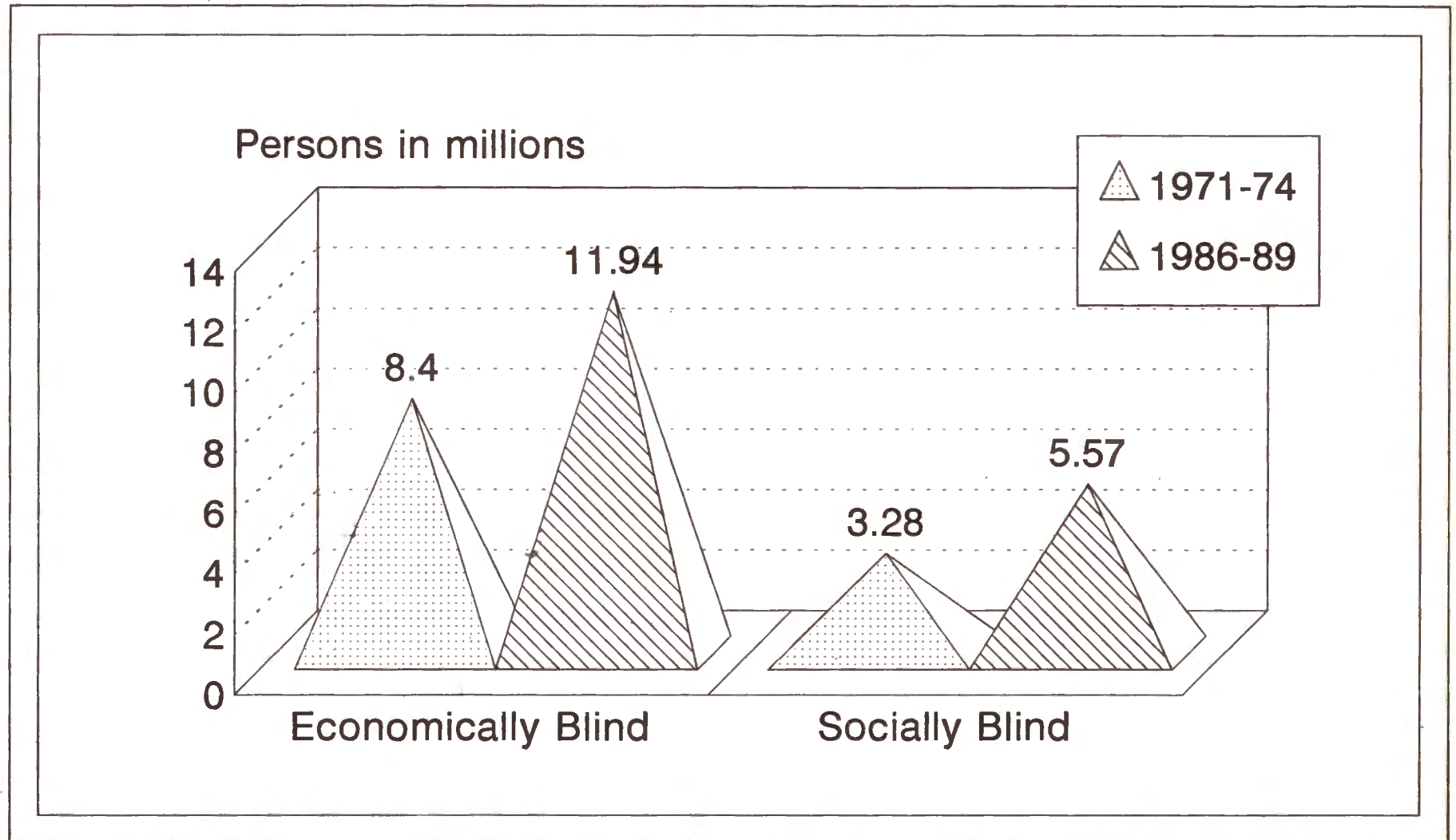
Results of 1971-74 & 1986-89 Surveys



Economic Blindness VA < 6/60 in the better eye
Social Blindness VA < 3/60 in the better eye

Magnitude of Blindness in India

Results of 1971-74 & 1986-89 Surveys



Eco.Blindness- VA<6/60 in the better eye

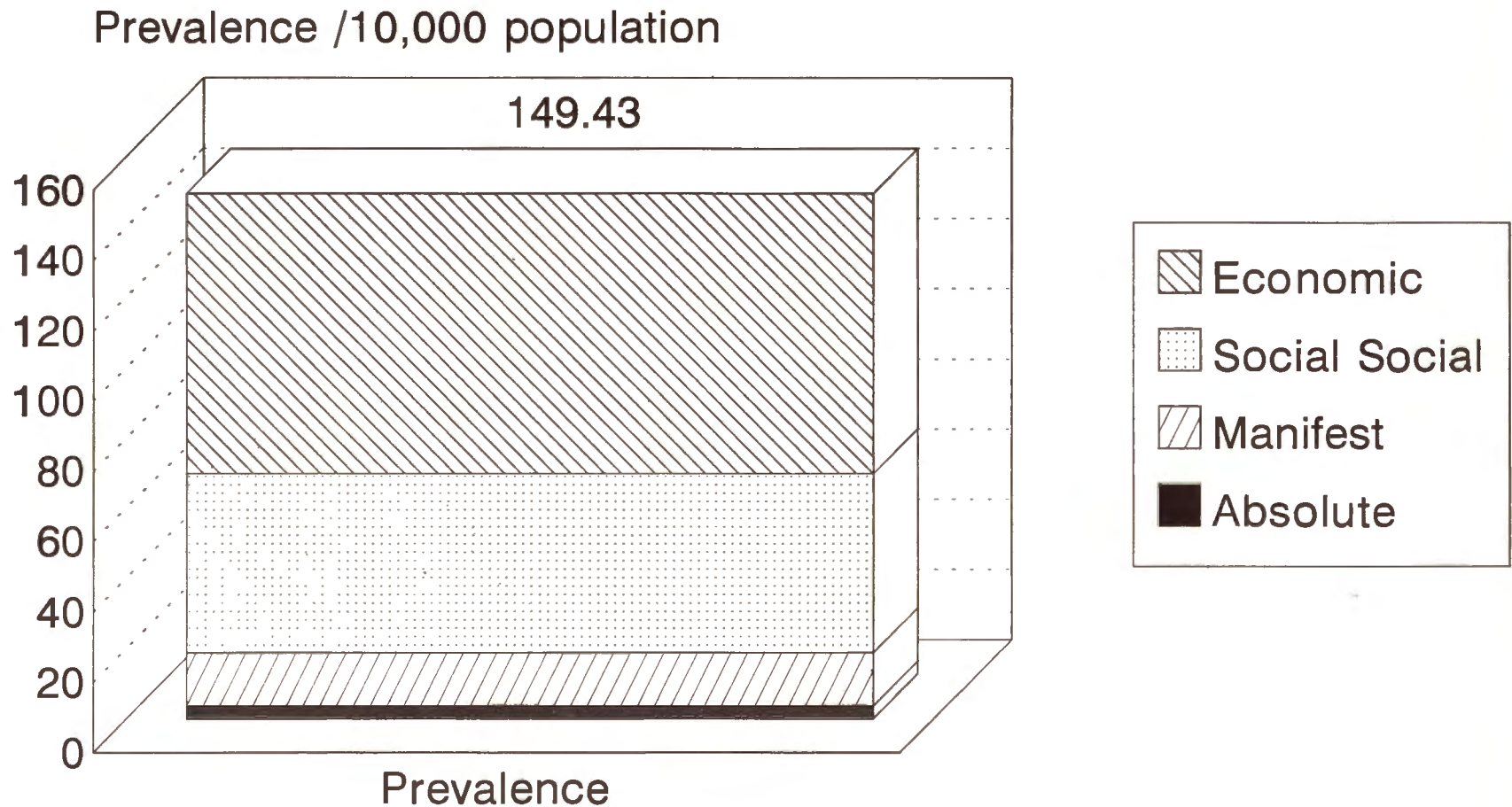
Soc.Blindness- VA<3/60 in the better eye

Table 1 : Prevalence of Blindness in India

Indicator : Prevalence of Blindness	Source of data: ICMR Survey (1971-74) and WHO-GOI Survey (1986-89)		
<p>Indicator definition : Economic Blindness is defined as Visual Acuity <6/60 in the better eye with usual correction as determined on Snellens' visual acuity chart.</p> <p>Social Blindness is defined as Visual Acuity <3/60 in the better eye with usual correction as determined on Snellens' visual acuity chart.</p> <p>Prevalence of Blindness is estimated number of blind persons per 10,000 population at a given time</p>			
Parameter	Reference year		Remarks
	1975	1989	
Census Population 1971/1981	548.2 million	685.18 million	<p>1989 estimated population projected on the basis of decennial growth rate between 1971 and 1981 census</p> <p>1975 results on the basis of multicentric study</p>
Estimated mid-year population	607.5 million	799.3 million	
Prevalence of Economic Blindness	138.3	149.43	
Prevalence of Social Blindness	54.00	69.69	
Estimated blind persons (VA < 6/60)	8.4 million	11.94 million	
Estimated blind persons (VA < 3/60)	3.28 million	5.57 million	

Type of Blindness in India

Results of 1986-89 Survey



Economic- VA 6/60 to 3/60; Manifest- VA 1/60 to PL+PR
 Social- VA 3/60 to 1/60; Absolute- PR faulty-PL absent

Table 2: Prevalence of Blindness and Low Vision by Grades in India

Indicator : Prevalence of Blindness and Low Vision		Source of data: ICMR Survey (1971-74) and WHO-GOI Survey 1986-89)			
Indicator definition			Results		
Grade	Visual Acuity in the better eye usual correction		ICMR Survey 1971-74	WHO-GOI Survey 1986-89	
	Less than	Equal to or better than			
I	Low Vision	6/18	6/60	NA	357
II	Economic Blindness	6/60	3/60	NA	79.74
III	Social Blindness	3/60	1/60	NA	50.98
IV	Manifest Blindness	1/60	PL+PR	NA	15.13
V	Absolute Blindness	PR faulty	PL absent	NA	3.58
Economic Blindness (VA < 6/60)		II+III+IV+V		138.3	149.43
Social Blindness (VA < 3/60)		III+IV+V		54.0	69.69

NA - Not available

5.3 Causes of Blindness

It is pertinent to know the causes of blindness as the approaches for prevention and control of various causes of blindness is totally different. Senile Cataract cannot be prevented but blindness due to cataract can be prevented by appropriate and timely surgery. Glaucoma is a disorder that needs to be diagnosed before it affects vision. Early diagnosis and prompt treatment has to be the strategy in this regard. Corneal blindness needs comprehensive eye banking and corneal transplantation services. While refractive errors need corrective glasses, trachoma and other infections are best tackled by good personal hygiene and treatment with antibiotics. Blindness due to vitamin A can be best prevented by provision of balanced diet and supplementation of Vitamin A.

Target groups are also different for different disorders. While Nutritional blindness and trachoma are childhood problems, cataract and glaucoma are problems of the aged. It is thus an important exercise in any blindness related survey to identify causes of blindness.

In the ICMR (71-74) survey, efforts were made to identify the site of affection to draw meaningful conclusions. Blind eyes rather than blind persons were the units of study. Thus the study could not give separate diagnosis for refractive errors including amblyopia. The WHO-GOI (86-89) survey focussed on blind persons and diagnostic cause of blindness. Due to different approaches, it would not be fair to make direct comparisons.

5.3.1 *Causes of Blindness according to site of affection as revealed by ICMR Survey (1971-74) (Table 3)*

In almost three-fourth (74.65%) of total eyes, lens was the affected part of the eye ball. Involvement of cornea (7.31%) and optic nerve (7.28%) followed next. However, there were variations in these findings from centre to centre. Attempt was also made to diagnose reasons for these affected eyes⁷. 5.8% of blind eyes were due to infectious diseases. Injuries and poisoning were responsible in 3.1% eyes. Nutritional deficiency accounted for only 0.3%. There were significant rural/urban differences in causes of blindness. Prevalence of blind eyes due to affection of cornea and lens and bulbar atrophy was higher in rural areas. Prevalence of blind eyes due to involvement of uvea, macula and optic nerve was higher in urban areas. Similarly cornea, lens and optic nerve were more common in females while there was not much difference by sex in other involvements.

5.3.2 *Causes of Bilateral and Unilateral Blindness and by eyes affected as revealed by WHO-GOI Survey (1986-89)*

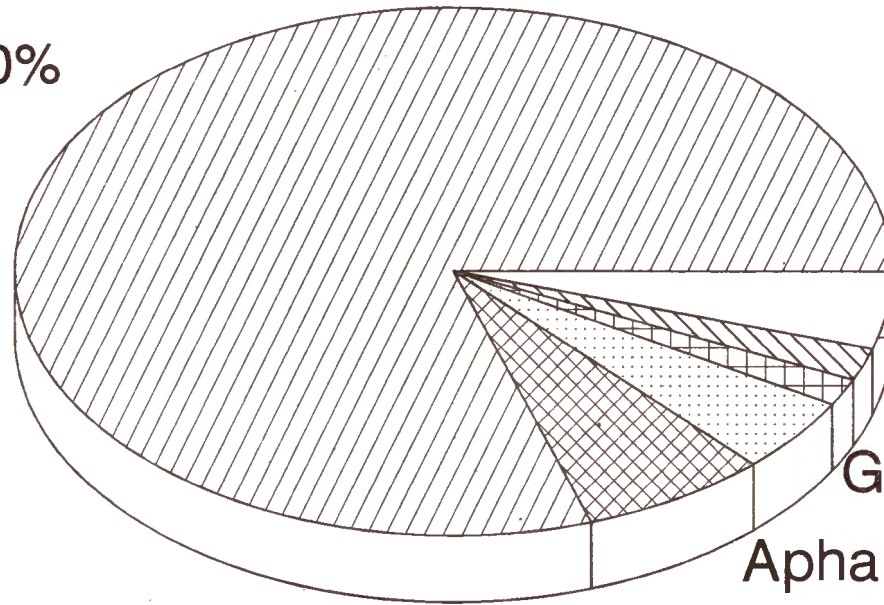
5.3.2.1. Bilateral Blindness (Table 4)

The survey revealed that cataract (80.1%) was the most common cause of bilateral blindness. In addition, 4.69% people were aphakia blind (operated but still not able to see due to non-use of corrective glasses). Refractive errors were

Causes of Blindness in India

(WHO/GOI Survey: 1986-89)

Cataract 80.0%



Others 4.6%

Corneal 2.0%

Glaucoma 1.7%

Aphakic Blind 4.7%

Refractive Errors 7.0%

responsible for 7.35% blind persons. Corneal blindness and glaucoma accounted for 1.52% & 1.7% respectively. As compared to 71-74 survey, there was definite decline in proportionate blindness due to trachoma (5% to 0.39%), small pox (3% to 0%) and Vitamin A deficiency (2% to 0.39%). While it would be difficult to comment on the trends in refractive errors as 71-74 survey did not consider this separately, Cataract continued to be the major cause of blindness (74.8% to 80.1%) over the years.

5.3.2.2. Unilateral blindness (Table 5)

The ICMR (71-74) survey⁷ revealed prevalence of unilateral blindness as 74.6 per 10,000 population. The prevalence was found to be higher in females (8.23 to 6.79) and in urban areas (8.23 to 7.00). Causes of unilateral blindness were not analysed separately in this survey. In the WHO-NPCB (86-89) survey, it was observed that Cataract (72.27%) continued to be the major cause of unilateral blindness, followed by central corneal opacities (7.78%) and refractive errors (6%). Glaucoma (1.4%), strabismus (1.86%), trauma (0.56%) and trachoma (0.41%) were other important causes.

Table 3: Sites of affection of blind eyes in India as revealed by ICMR Survey : 1971-74

Indicator : Prevalence of Blind Eyes by Site of Affection		Source of data: ICMR Survey (1971-74)				
Indicator definition : Prevalence of blind eyes is estimated number of blind eyes per 10,000 eyes by site of affection						
Site of Affection	Prevalence by Sex		Prevalence by Area		Total	%
	Male	Female	Rural	Urban		
Lens	81.4	123.8	116.8	74.6	101.0	74.65
Cornea	1.7	13.1	11.2	7.7	9.9	7.31
Uvea	2.1	1.6	1.3	2.8	1.8	1.35
Macula	1.3	1.2	0.7	2.1	1.2	0.91
Retina	1.0	0.9	0.9	1.0	0.8	0.70
Optic Nerve	5.8	11.9	9.2	10.9	9.8	7.28
Bulbar Atrophy	4.8	7.0	7.0	4.3	6.0	4.44
Other locations	0.8	1.4	0.4	2.3	1.1	0.84
Unknown locations	2.7	4.2	3.3	3.6	3.4	2.52

**Table 4: Causes of Blindness in India as revealed
by WHO-GOI Survey (1986-89)**

Indicator : Causes of Blindness	Source of data : WHO-GOI Survey (1986-89)
Indicator definition : Proportion of blind persons affected by various blinding disorders	
Cause of Blindness	Percentage (%)
Cataract	80.10
Aphakic Blindness	4.69
Refractive Errors	7.35
Glaucoma	1.70
Corneal Opacities	1.52
Trachoma	0.39
Others	4.25

**Table 5: Causes of One Eye Blindness in India as revealed
by WHO-GOI Survey (1986-89)**

Indicator : Causes of One Eye Blindness	Source of data : WHO-GOI Survey (1986-89)
Indicator definition : Proportion of blind persons affected by various blinding disorders	
Cause of One Eye Blindness	Percentage (%)
Cataract	72.27
Refractive Errors	6.00
Cent. Corn. Scar	7.78
Glaucoma	1.40
Trachoma	0.41
Strabismus	1.86
Trauma	0.56

5.3.2.3 Causes of blindness by eyes affected (Table 6 & 7)

Complete spectrum of visual defects can be explained in terms of diagnosis or site of affection. Comparison by diagnosis of blindness over the years is not possible

as the 71-74 survey did not analyse data in that manner. However, both surveys did classify blindness according to the site of affection. As compared to 71-74 status, there was rise in percent distribution in affections of lens (74.8 to 84.61) and decline in corneal (7.3 to 5.06) and optic nerve afflictions (4.4. to 1.61). As these are proportions and rise in lenticular pathology will influence proportions of other sites, it would have been better to compare prevalence of blindness by site of affection, which is not available for 1986-89 survey.

The 86-89 survey did give a complete picture about causes of blind eyes by diagnosis, which shows that leading causes of blind eyes include senile/degenerative cataract (83.53%) followed by refractive errors (3.80%), trauma (3.51%) and glaucoma (1.84%). Nutritional deficiency accounted for only 0.39% eyes.

Table 6: Blind Eyes by all Causes in India as revealed by WHO-GOI Survey (1986-89)

Indicator : Causes of Blindness	Source of data : WHO-GOI Survey (1986-89)
Indicator definition :	Proportion of blind persons affected by various blinding disorders
Causes of Blindness	Percentage (%)
Congenital	0.80
Nutritional	0.39
Degenerative	83.53
Trauma	3.51
Refractive Errors	3.80
Amblyopia	0.43
Trachoma	1.33
Non-trachomatous affection	1.51
Other inflammations	1.36
Neoplastic disorders	0.09
Vascular disorders	0.11
Endocrinal disorders	0.03
Glaucoma	1.84
Iatrogenic causes	0.11
Others	0.62
Unknown	0.54

**Table 7 : Blindness by Site of Pathology as revealed
by WHO-GOI Survey (1986-89)**

Indicator : Blindness by Site of Pathology	Source of data : WHO-GOI Survey (1986-89)
Indicator definition : Proportion of blind persons by site of pathology	
Site of Pathology	Percentage
Conjunctival	1.04
Corneal	5.06
Iris	0.34
Lens	84.61
Vitreous	0.20
Choroidal/Retinal	0.78
Optic Nerve	1.61
Muscle imbalance	0.39
Eye ball/orbit	5.14
Unknown location	0.41
Adnexal pathology	0.42

5.3.2.4 Causes of low vision (Table 8)

In the 86-89 survey, it was revealed that prevalence of low vision (VA between 6/18 to 6/60 in the better eye) was 357 per 10,000 population, which is almost two and half times more than prevalence of economic blindness (VA < 6/60) of 149 per 10,000. This would mean an estimated 28.56 million affected people in this category. On analysis of the data, it was observed that Cataract (77.05%) was also the leading cause of low vision followed by refractive errors (18.87%). Corneal opacities and pterygium were among other causes, collectively responsible for less than 5% cases.

5.4 Epidemiological features of blindness

While it is pertinent to know trends of prevalence, magnitude and causes of blindness, study of blindness by sex, age, location, socio-economic and occupational status would be pertinent to draw effective strategies to control blindness.

**Table 8: Causes of Low Vision in India as revealed
by WHO-GOI Survey 1986-89**

Indicator : Causes of Low Vision	Source of data: WHO-GOI Survey (1986-89)
Indicator definition :	Low vision is defined as Visual Acuity between 6/18 and 6/60 in the better eye
Parameter	Results
Prevalence of Low Vision	3.57%
Estimated No. with Low Vision	28.56 million
<i>Causes of low vision :</i>	<i>Percent :</i>
Cataract	77.05
Refractive Errors	18.87
Corneal Opacities (Central)	0.82
Pterygium	0.25
Corneal Opacities(Peripheral)	0.17
Others	2.84

5.4.1 Blindness by Sex (Table 9)

There was definite indication in all surveys that prevalence of blindness was higher in females over the years though difference in prevalence had narrowed down from 61 to 18 per 10,000 in 1986-89 as compared to 1971-74. There is no known difference in incidence of blindness or cataract between males and females. As such, this only indicates that higher prevalence in females is possible due to under utilisation of eye care services by females.

Table 9: Prevalence of Blindness by Sex in India

Indicator : Prevalence of Blindness by Sex	Source of data: ICMR Survey (1971-74) and WHO-GOI Survey (1986-89)	
Indicator definition :	Prevalence of Blindness by sex is estimated number of blind males/females per 10,000 males/females.	
Sex	Reference Year	
	1975	1989
Male	110	142
Female	171	160
Both Sexes	138	149

5.4.2 Blindness by Age (Table 10, 11 & 12)

Prevalence of blindness by age is associated with the causes of blindness. As cataract is the leading cause of blindness, which is predominantly an age-related problem, age-specific prevalence obviously increases by age in such a scenerio. The 71-74 survey indicated prevalence of blindness lower than 22 per 10,000 upto 40 years of age but significantly increasing to 64 per 10,000 in 40-49 year age group and increasing continuously thereafter upto more than 2700 per 10,000 in those with age 70 years or more. A similar trend was observed in 86-89 survey. (Table 11)

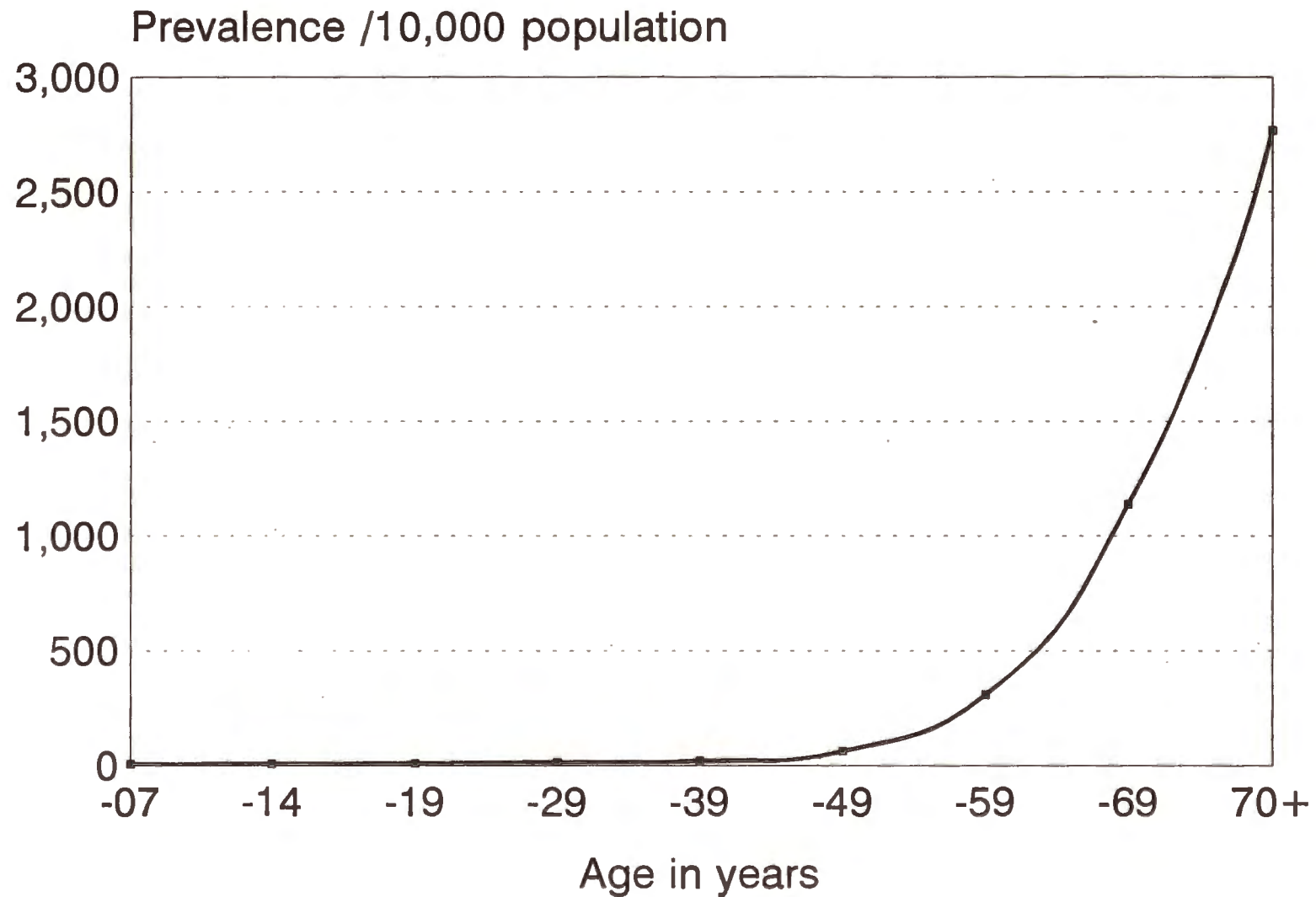
This survey also showed that the prevalence of cataracts indicated the same trend. While only 18 per 10,000 under 40 years of age had cataracts, the figure rose to 306 in 40-49 year group and ten fold to 3061 in 50-59 year age group. This shows that every third person with age 50-59 had cataract. In higher age group, 6 to 7 out of 10 persons had cataract. With increase in life expectancy and corresponding rise in ageing population and with expected increase in cataracts, glaucoma and diabetic repropathy (all mainly age-related problems), the focus group on eye care services would continue to be the 40+ age group.

The surveys indicate that 40% of blind persons are under 60 years of age in india. They can be considered as economically productive and suffer mainly due to preventable or curable causes of blindness like refractive errors and cataract. Similarly, more than 3000 per 10,000 persons in 50-59 year group had cataracts and they can further lead a productive life span if treated appropriately for cataracts and their vision restored. In terms of economics, increasing productivity and extending productive life span of the affected people would have high returns to the family and collectively to the nation.

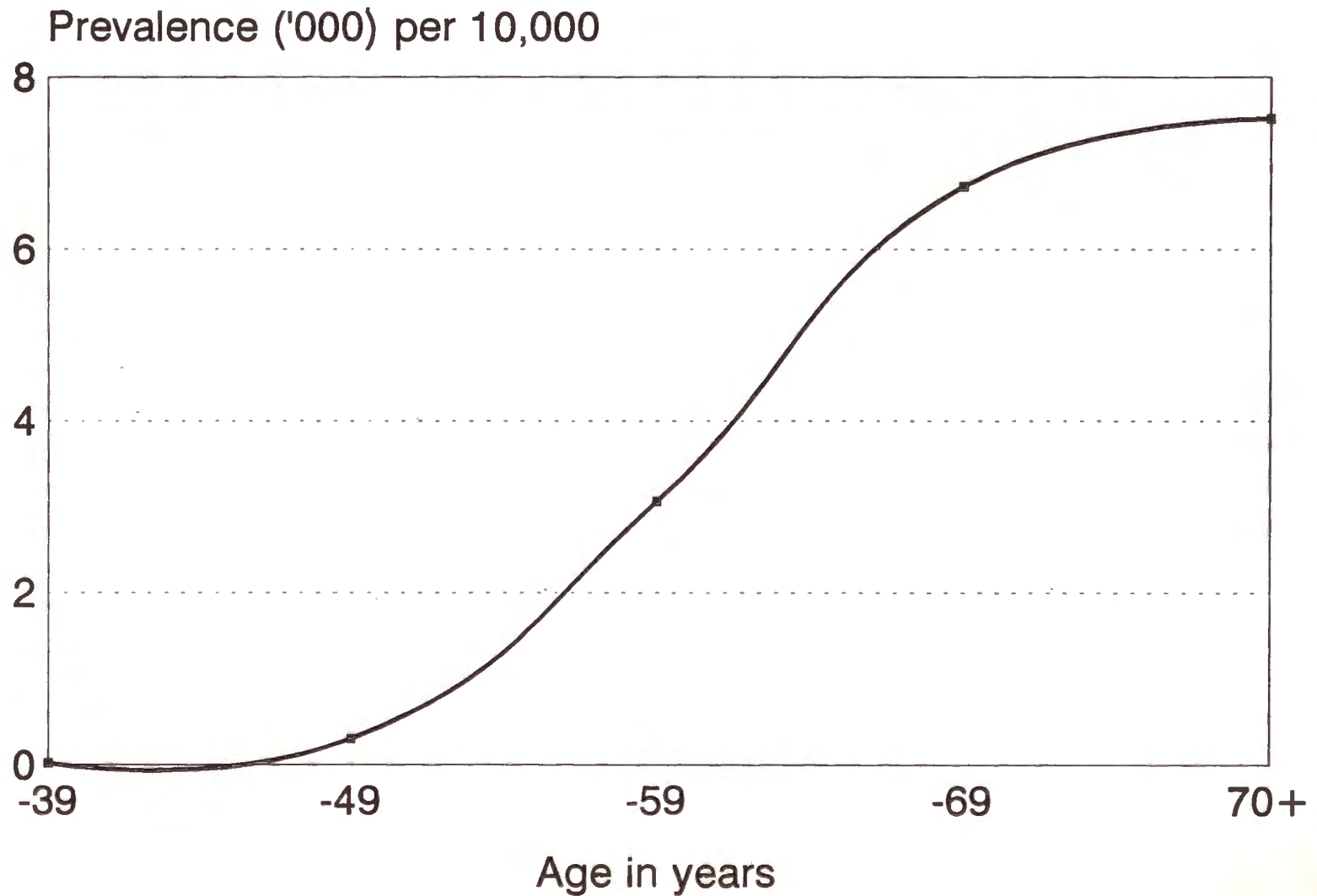
Table 10 : Age specific Prevalence of Blindness in India as revealed by ICMR Survey (1971-74)

Indicator:	Age specific Prevalence of Blindness	Source of Data: ICMR Survey (1971-74)
Indicator definition : Age specific Prevalence of blindness (VA < 6/60) is estimated number of blind eyes per 10,000 eyes in a given age group		
Age (in years)	Prevalence	
<7	7.5	
8-14	9.1	
15-19	10.4	
20-29	15.8	
30-39	21.5	
40-49	63.9	
50-59	310.3	
60-69	1138.4	
70+	2768.8	

Age Specific Prevalence of Blindness in India Results of 1971-74 Survey



Age Specific Prevalence of Cataract in Rural India Results of 1986-89 Survey



5.4.3 Blindness by residence (Table 13)

Both the surveys clearly revealed that prevalence of blindness was higher in rural areas in India where almost three-fourth of the population resides. The problem, both in terms of prevalence and magnitude, is therefore predominantly rural.

5.4.4 Blindness by educational status (Table 13)

The incidence as well as prevalence of blindness is influenced by the knowledge and practices related to eye care and attitude of the affected persons and their caretakers. These factors also affect the utilisation of available services. The 86-89 survey showed significantly higher prevalence of well over 300 per 10,000 in those who were illiterate or had no formal education. As most of the causes of blindness in India are preventable or easily curable, there is strong negative association between educational status and blindness. It also signifies role of educating the affected people and their caretakers to seek available services in time.

Table 11 : Age specific Prevalence rate of Blindness per 10,000 Population

STATES/UTs	6-10	11-14	15-19	20-29	30-39	40-49	50-59	60-69	70-99	All ages
Andhra Pradesh	13	11	0	5	24	65	351	1064	3131	150
Assam	6	0	11	8	23	67	372	1339	2766	134
Bihar	7	13	0	17	16	27	197	1103	2506	123
Gujarat	0	19	4	19	37	74	357	1104	2052	144
Haryana	10	7	0	4	52	67	309	795	2163	113
Himachal Pradesh	33	0	0	1	79	38	102	450	1026	87
Jammu & Kashmir	0	0	18	36	18	169	870	1863	3947	280
Karnataka	4	6	11	0	18	49	182	1195	2282	128
Kerala	0	0	7	22	16	42	137	921	2020	131
Madhya Pradesh	15	18	12	8	33	77	728	1760	2922	201
Maharashtra	5	4	19	26	28	101	304	1209	2427	165
Manipur	0	0	0	0	0	0	0	357	2000	65
Meghalaya	0	0	0	0	0	0	0	0	455	23
Nagaland	0	0	0	0	0	0	0	0	0	
Orissa	7	0	8	10	19	25	763	1652	2227	172
Punjab	0	0	0	0	6	40	127	650	1067	73
Rajasthan	5	15	25	19	25	119	464	1869	3198	224
Sikkim	0	0	0	0	0	0	0	1429	0	45
Tamil Nadu	0	8	6	21	20	44	433	1401	2468	167
Tripura*	0	0	0	0	0	0	200	1525	714	118
Uttar Pradesh	0	17	8	41	16	37	437	1440	2130	158
West Bengal	0	0	27	0	0	45	345	323	1604	96
A & N Islands*	0	0	38	24	0	71	199	390	2222	67
Arunachal Pradesh*	0	0	0	0	0	0	53	2143	0	123
Chandigarh*	0	0	0	99	0	0	857	1765	5000	189
Delhi	23	27	50	36	33	41	31	573	690	65
Goa*	0	0	0	0	0	0	0	1875	2963	203
Lakshadweep*	0	0	0	0	115	0	227	690	2222	89
Mizoram*	0	0	0	0	0	0	0	0	0	
Pondicherry*	0	0	0	0	0	0	0	0	0	0

Note : Accurate Visual acuity assessment could not be done in 0-5 years age group and hence excluded.
* indicates that the sample size examined in the state is less than 2000.

Table 12 : Age specific Prevalence of Cataract in Rural Areas of India as revealed by WHO-GOI Survey (1986-89)

Indicator: Age specific Prevalence of Blindness	Source of Data: ICMR Survey (1971-74)
Indicator definition : Age specific Prevalence of blindness (VA < 6/60) is estimated number of blind persons per 10,000 persons in a given age group	
Age in years	Prevalence
< 40	18
40-49	306
50-59	3061
60-69	6731
70-79	7518
All ages	745

5.4.5 Occupation (Table 13)

Both surveys had used different occupation categories and therefore comparison would be difficult. However, these surveys indicated that prevalence rates were higher in those performing outdoor jobs like farming and fishery. While prevalence in housewives/domestic category seemed to increase, it declined in those who are professional by occupation.

5.4.6 Religion (Table 13)

Prevalence by religion may be indirectly a reflection of socio-economic and educational status of the affected population. On comparing results of the two surveys, it was observed that prevalence has gone down in Christians (216 to 65 per 10,000) and remained static in Sikhs (98 to 94 per 10,000). But an increase was observed in prevalence among Hindus (147 to 196) and Muslims (70 to 126) over the years. The 86-89 survey also revealed that prevalence was higher in scheduled castes (200) as compared to national average of 149 per 10,000 population.

Blindness in India

Specific Prevalence Rates: 1986-89

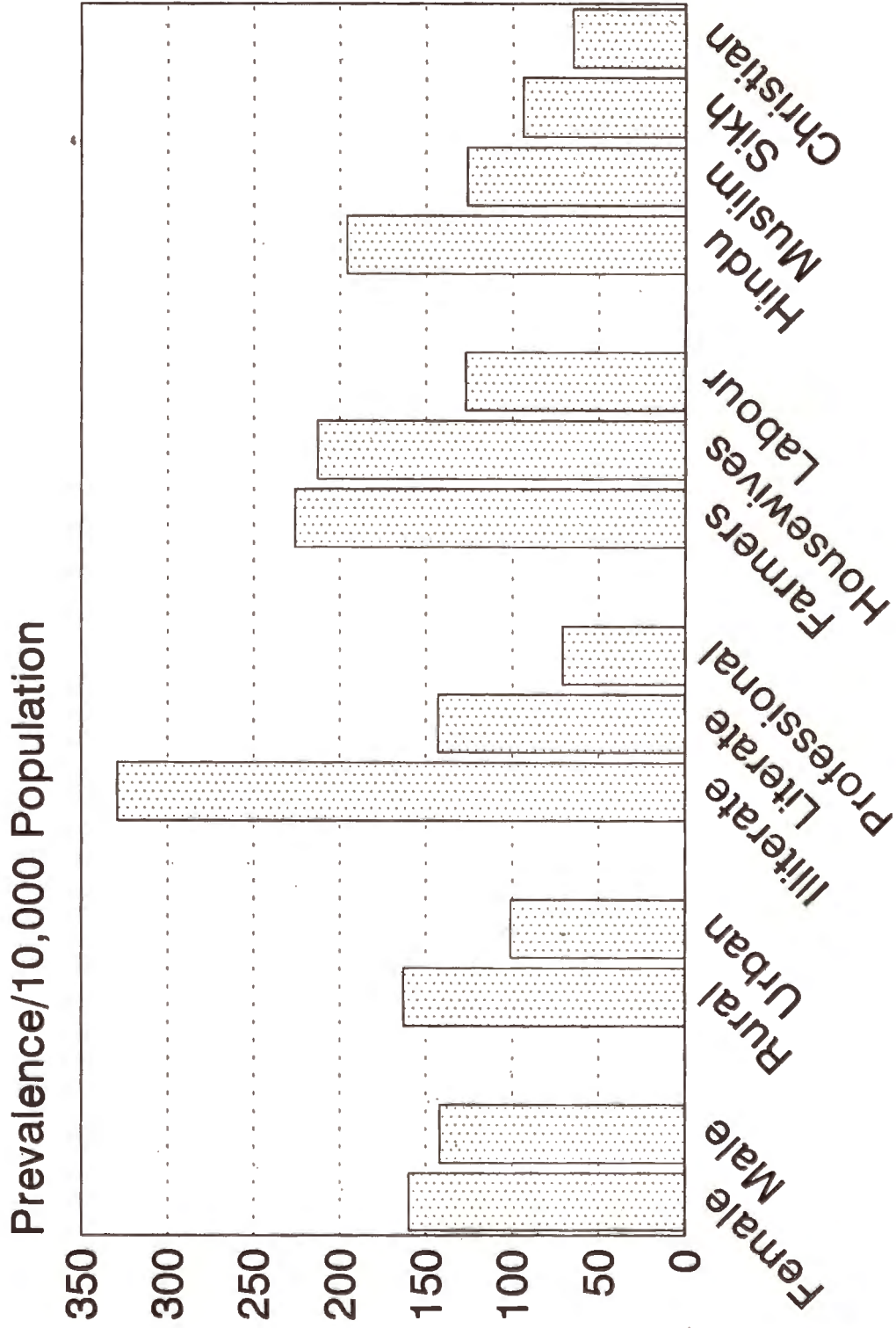


Table 13 : Prevalence of Blindness by Socio-economic parameters

Indicator : Prevalence of Blindness by Socio-economic parameters	Source of data: ICMR Survey (1971-74) and WHO-GOI Survey (1986-89)	
Indicator definition : Prevalence of blindness is estimated number of blind person per 10,000 population in each category.		
Parameter	Reference year	
	1975	1989
Residence		
Urban	111	101
Rural	154	163
Educational Status		
Illiterate	NA	329*
Without Schooling	NA	356*
Schooling	NA	143*
Professionals	NA	071*
Occupation		
Farmers/fishermen	230	226
Housewives/domestic	129	213
Manual labour	138	127
Retired	NA	1558
Professional	127	109
Religion		
Hindu	147	196
Muslim	70	126
Sikhs	98	94
Christians	216	65

NA - Not available

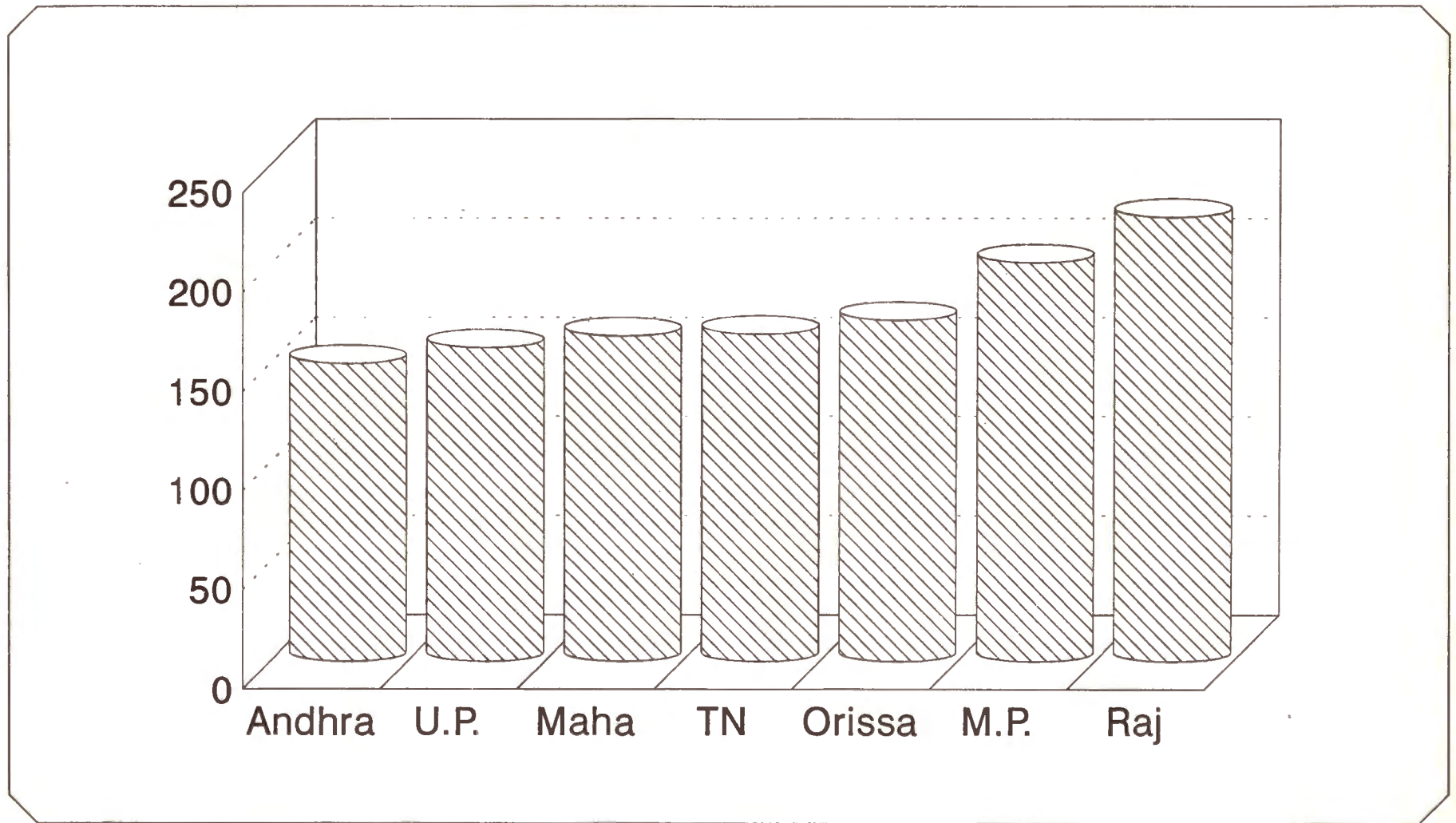
* - Highest prevalence among major States of India.

5.4.7 Geographical distribution of blindness in India (Table 14)

India is a vast country with variations in climatic conditions, socio-economic structure, health care service systems and geophysical situations. There are deserts in the west, snow clad states like Jammu and Kashmir and Himachal Pradesh in the North, the hilly terrains of North-Eastern states and tropical climatic conditions in the South. Within regions, the rural urban divide, the difference in socio-cultural behaviour and people below and above poverty lines make even a region or state wise pattern more of an academic exercise. However, state or region wise prevalence of blindness is of interest to planners and policy makers to take decision on resource allocations. While 71-74 survey was a multicentric study in only 7 selected centres,

Cataract Blindness Control Project-India

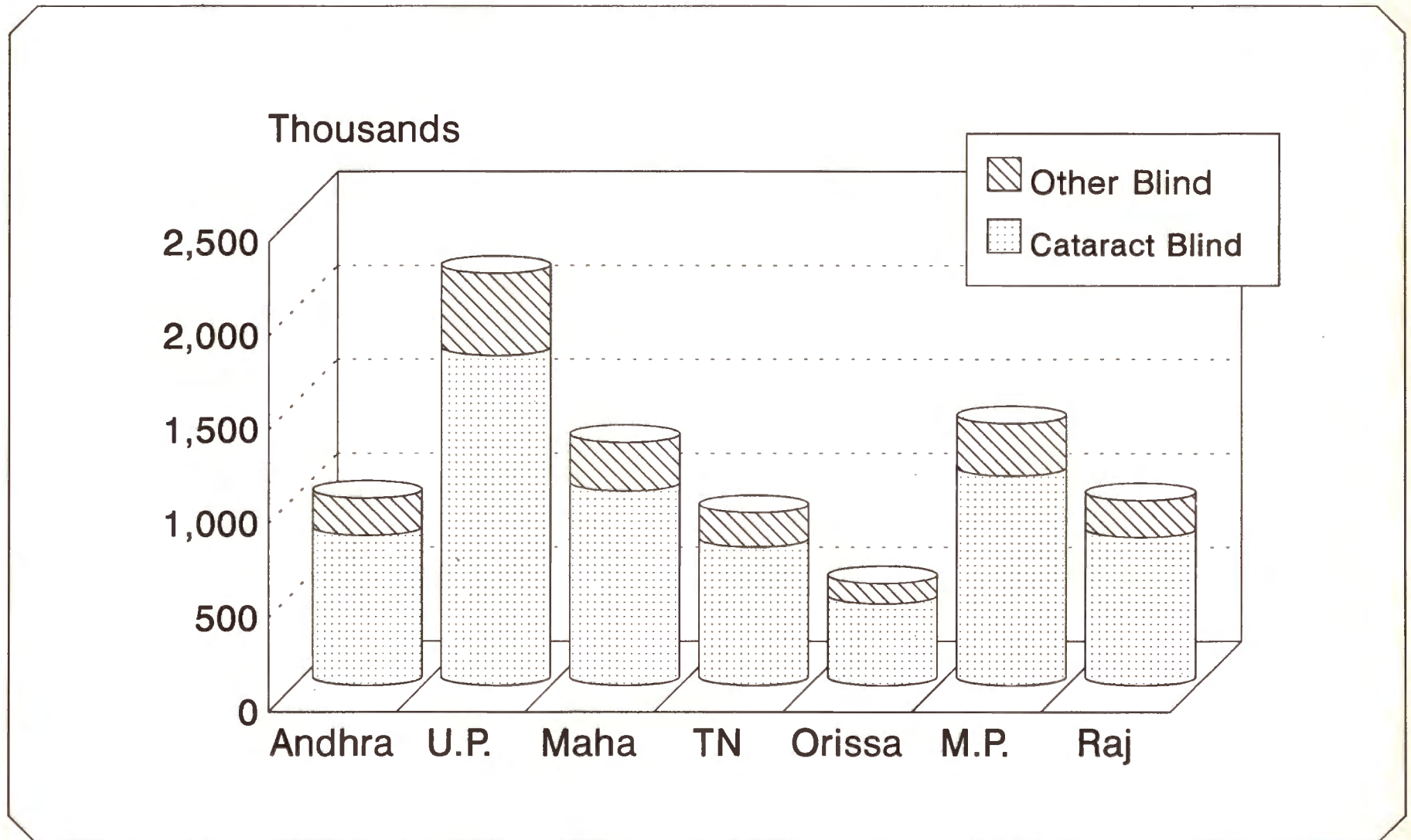
Prevalence of Blindness in Project States (per 10,000 population)



Blindness defined as VA < 6/60 in the better eye

Cataract Blindness Control Project-India

Estimated Blind Persons in Project States



Blindness defined as VA < 6/60 in the better eye

no valid projections can be made on regional or state level prevalence rates. The 86-89 survey gave a more comprehensive picture in this regard. The eastern region (123.42) had significantly lower prevalence than that in other regions (ranging between 152 to 160). Statewise data showed that Jammu and Kashmir, Rajasthan, Madhya Pradesh, Orissa, Tamil Nadu, Maharashtra, Uttar Pradesh and Andhra Pradesh had higher prevalence than national average of 149 per 10,000 population. Punjab and Delhi had low prevalence (<75). These two along with West Bengal & Himachal Pradesh had low prevalence of social blindness also (<50 per 10,000). Sample size in small states, particularly in North Eastern states and Union Territories, was less than 2000, and therefore no valid conclusions can be drawn for these states. The survey did indicate that except Tripura (118), & Arunachal Pradesh (123), the prevalence was lower than 75 in other states of North Eastern region.

6. SCENERIO AFTER 1990 (Table 15)

There has been no nation-wide survey on blindness in India after WHO-GOI survey 1986-89. Only one state level survey was conducted in Gujarat State in 1992⁹. Incidentally, Gujarat is one of the leading states of the country and findings of this state level survey should not be interpreted as reflective of the trends in India as a country.

As compared to 1986-89 survey results, the 1992 survey indicated decline in prevalence of blindness both in rural and urban areas and in both sexes in Gujarat. There was a reduction in prevalence of blindness from 144 to 116 per 10,000 population from 1986 to 1992. While prevalence in urban areas reduced from 103 to 88, the decline was more evident in rural areas (161 to 131). Though prevalence went down in both sexes, it continued to be higher in females.

Proportionate blindness due to cataract was reduced by more than ten percent points, from 79.28% in 1986-89 to 68.30% in 1992. There was increase in percent distribution for corneal blindness and glaucoma.

There have been many other surveys localized to a few districts, indicating a mixed trend. With strategic changes in approaches to control blindness in India after 1986-89, a national-level survey is due to evaluate the effectiveness of revised plan for programme implementation. This would help the country to plan eye care services beyond the year 2000 AD.

**Table 14 : Statewise Prevalence of Blindness in India
as revealed by WHO-GOI Survey (1986-89)**

Indicator : Statewise Prevalence of Blindness in India	Source of data: WHO-GOI Survey, 1986-89	
Indicator definition :	Prevalence is defined as estimated number of blind persons per 10,000 persons in a State	
State[#]	Economic Blindness VA < 6/60	Social Blindness VA < 3/60
Andhra Pradesh	150	73
Assam	134	74
Bihar	128	56
Gujarat	144	55
Haryana	113	71
Himachal Pradesh	87	42
Jammu & Kashmir	280	169
Karnataka	128	60
Kerala	131	56
Madhya Pradesh	201	104
Maharashtra	164	82
Orissa	172	87
Punjab	73	23
Rajasthan	224	127
Tamilnadu	165	53
Uttar Pradesh	158	74
West Bengal	96	32
Delhi	63	18
All India	149	70

Smaller States & UTs where sample size was less than 2000 excluded.

**Table 15 : Prevalence of Blindness in Gujarat as revealed by
WHO-GOI Survey 1986-89 and State Survey, 1992**

Indicator : Prevalence of Blindness in Gujarat	Source of data: WHO-GOI Survey, 1986-89	
Indicator definition :	Prevalence is defined as estimated number of blind persons per 10,000 persons in Gujarat	
Parameter	Reference Year	
	1989	1992
Prevalence	144	116
Sex wise prevalence		
Male	120	93
Female	172	142
Prevalence by residence		
Rural	161	131
Urban	103	88
Prevalence by Religion		120
Hindu	147	89
Muslim	127	
Prevalence by Caste	170	146
Schedule Castes	110	110
Background Class		
Causes of Blindness (Percent)		
Cataract	79.28	68.30
Refractive errors	10.66	10.00
Corneal opacity	2.85	5.70
Glaucoma	1.20	3.80
Trachoma	0.90	1.60
Others	5.11	10.60

REFERENCES

1. C. Kupfer: A Brief Overview of the Global Program for the Prevention of Blindness in 'World Blindness and its Prevention' Vol. 4 pp 361-373 Ed C. Kupfer and T.Gillen : International Agency for the Prevention of Blindness: 1991.
2. IAPB : World Blindness and its Prevention Vol. 2 : 1984.
3. M. Mohan: National Survey of Blindness - India : NPCB - WHO Report; 1989.
4. Govt. of India : Sub-Committee Report on Blindness; 1942
5. Govt. of India : Health and Development Committee Report; 1944.
6. Indian Council of Medical Research : Report on Trachoma Control Pilot project; 1963.
7. M. Mohan: Collaborative Study on Blindness (1971-1974) : Indian Council of Medical Research , New Delhi; 1987
8. Govt. of India : Report of the National Sample Survey Organization; 1981.
9. Blindness and Visual Impairment in Gujarat 1992 : Govt. of Gujarat; 1992.

