PREVALENCE OF BLINDNESS DUE TO POSTERIOR SEGMENT DISORDERS: A RURAL POPULATION BASED STUDY
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ABSTRACT: PURPOSE: To estimate the prevalence of blindness due to posterior segment disorders which include diabetic retinopathy, retinal detachment, age related macular degeneration in rural area in central India of Wardha District. MATERIAL AND METHODS: Multistage Cluster sampling method was used. Sample size was calculated to be 1400. Door to door examination of 100 people aged ≥40 years, in each cluster. Demographic information with relevant history, visual acuity, anterior segment examination including AC depth was seen by torch light. Intraocular pressure, and fundus examination for posterior segment patients was done using direct ophthalmoscope. OBSERVATIONS AND RESULTS: Out of 2800 eyes of 1400 individuals, posterior segment disorders were diagnosed in 31 eyes which include Diabetic retinopathy, ARMD and retinal detachment. The Prevalence of Blindness due to Diabetic Retinopathy is 0.035% in 2800 eyes. The Prevalence of blindness due to ARMD in eyes was 0.07%. The prevalence of Blindness due to Retinal Detachment in eye was 0.035%.
CONCLUSION: Population based data on the magnitude of disease is essential to plan for required services. This was a population based survey in which door to door examination was done. But Slit lamp biomicroscopy or indirect ophthalmoscopy were not done as they were not feasible in rural survey setup. Therefore, the total prevalence reported may be underestimated.
KEYWORDS: Blindness, posterior segment disorder, Diabetic retinopathy age related macular degeneration (ARMD) retinal detachment.

INTRODUCTION: Blindness is the functional end stage of many eye disorders. The occurrence and course of these disorders differ markedly throughout the world, and this is reflected by difference in the prevalence of blindness and visual impairment.

India, the second most populated country in the world, is home to nearly ¼th of the world blind population. All surveys in the country have shown that cataract is the most common cause of blindness and prevention of blindness program have been cataract oriented. The other important causes of blindness in India are glaucoma, posterior segment disorders and refractive errors which are less widely studied. A recent study found that retinal disorders are an important cause of blindness in India.¹ ²

Posterior segment disorders are responsible for great ocular morbidity and blindness in rural area. There are very few population- based studies on posterior segment disorder in India. To plan strategies, it is of utmost importance that prevalence of posterior segment disorders should identified.
OBJECTIVE: To estimate the prevalence of blindness due to posterior segment disorders which include diabetic retinopathy, retinal detachment, age related macular degeneration in this population.

MATERIAL AND METHODS: Population based survey was carried out in rural areas of Wardha district for the rapid assessment of prevalence of posterior segment disorders in people aged 40 years and above.

Multistage sampling method was used for this study. As per 2001 census total population of the district was 1225212. As per Aravind Comprehensive Eye Study (2004) the prevalence of posterior segment disorder in India was 10.4%. Stratification of population of was done first and the proportion was taken out. At this stage Cluster Sampling Method was adopted to select clusters from respective blocks depending upon their total population. Listing of the names of villages wise was done from census 2001 report. Cumulative population was calculated. The sampling universe consisted of all those aged 40+ years who were habitual residents (staying in the village for at least the previous six months).

The sample size was calculated using stat calc program of the EPI INFO version 6.04. Taking all the parameters into consideration sample size was calculated to be 1308. A total 14 clusters were studied, where each cluster had 93 subjects. Taking operational feasibility into consideration, a total of 100 subjects were considered in each cluster and the total sample size was calculated to be 1400.

A standardized survey record was filled in for each eligible person. An informed consent was taken from all subjects. Proforma was filled on separate paper had information including Demographic information with relevant history.

The team performed door to door examination of 100 people aged ≥40 years, in each cluster.

Ophthalmic assistants measured presenting distance visual acuity (with or without glass) separately for each eye using an ETDRS chart cut out with “E” optotypes. The ‘E’s on one side correspond to 6/60 equivalent of Snellen’s chart while the ‘E’s on the reverse correspond to 6/18 on the Snellen’s chart at 4-m distance. This was done in full day light in courtyard or on the street. Participants who could not read 6/18 from either eye had their VA recorded with pin hole.

The anterior segment examination was assessed by torch. The anterior chamber depth was seen by torch light & distant direct ophthalmoscopy was done. After measuring visual acuity all individuals, individuals of VA<6/18 in either eye were reexamined at a basic eye clinic (arranged at either in grampanchayat or school as per availability of the village). The basic eye clinic examination consisted of reconfirmation of visual acuity, torch light Examination, Fundus examination was done with Direct Ophthalmoscope after dilating the pupil to 8mm, with mydriatic eye drops. (tropicamide or phenylephrine).

Ocular disorders involving the posterior segment (diabetic retinopathy, ARMD, retinal detachment) present in participants eyes were recorded for each eye separately in individuals.

Diabetic retinopathy was diagnosed on the basis of ETDRS classification. Even single microaneurysm with history of diabetes was included in the study.
ARMD was diagnosed on the basis of drusens or subretinal neovascular membrane seen on macula.

Diagnosis of retinal detachment with direct ophthalmoscope was made and the suspected Cases were referred to the hospital.

If both anterior segment and posterior segment pathology was found, then only those patients were taken in whom the significant vision loss was due to posterior segment entity. (For e.g. if cataract and ARMD were present in a patient then it was confirmed that the major cause of vision loss is ARMD and not cataract).

| Category of visual impairment | Best corrected visual acuity (BCVA) in the better eye (WHO) |
|-----------------------------|-------------------------------------------------------------|
| 0. Normal                   | 6/6 to 6/18                                                 |
| 1. Visual Impairment        | < 6/18 to 6/60                                               |
| 2. Severe Visual Impairment | < 6/60 to 3/60                                               |
| 3. Blind                    | < 3/60 to 1/60                                               |
| 4. Blind                    | < 1/60 to only light perception                              |
| 5. Blind                    | No light perception                                          |
| 6. Undetermined or unspecified |                                                           |

**WHO Classification of Visual Impairment And Blindness**

**STATISTICAL ANALYSIS:** Data was analysed using EPI INFO 6 software programme with internal consistency check. Statistical Analysis was performed using relevant tests.

**OBSERVATION AND RESULTS:** Out of the 1400 individuals, 664 (47.4%) were males and 736 (52.6%) were females. The mean age of the survey population was 60±7.5 years. (Range 40-85 years). Mean age of females was 59±7.3 years. Mean age of males was 61±7.6 years. Majority of the population 1174 (83.9%) were in the age group 50-69 years.

Out of 2800 eyes of 1400 individuals, posterior segment disorders were diagnosed in 13 eyes which include Diabetic retinopathy, ARMD and retinal detachment.

**DIABETIC RETINOPATHY:** Among them three eyes of two individuals were diagnosed to have Diabetic Retinopathy. As per the presenting visual acuity, only one (33.4%) eye of one (50%) person was blind (0.03%) accounted to 50% of blindness and it also did not improve after best corrected refraction. Two eyes were in the age group of 60-69 years had Visual Impairment. Only one eye was blind due to Diabetic retinopathy in the age group of 50-59 years.

The Prevalence of Diabetic retinopathy in individuals was 0.14% and in eyes was also 0.10%. The Prevalence of Blindness due to Diabetic Retinopathy in 1400 individuals was 0.07% and 0.035% in 2800 eyes.
ORIGINAL ARTICLE

AGE RELATED MACULAR DEGENERATION: In ARMD, six individuals with nine eyes were diagnosed to have ARMD. According to Presenting Visual Acuity, three (50%) persons with six (66.7%) eyes had Visual Impairment. 1(16.6%) persons with one (11.1%) had severe visual impairment and 2(33.4%) persons with 2(22.2%) eyes were blind. There was no improvement after best possible refraction.

The Prevalence of ARMD in persons was 0.42%. The Prevalence of blindness due to ARMD in persons was 0.14%. The Prevalence of ARMD in eyes was 0.32%. The Prevalence of blindness due to ARMD in eyes was 0.07%.

RETINAL DETACHMENT: In retinal detachment, only one patient and one eye in the age group of 80-89 years was diagnosed to have Retinal Detachment. The Prevalence of Retinal Detachment and Blindness due to Retinal Detachment in person was 0.07%. The Prevalence of Retinal Detachment and Blindness due to Retinal Detachment in eye was 0.035%.

| Posterior segment disorders | Prevalence of visual impairment | Prevalence of blindness |
|----------------------------|--------------------------------|-------------------------|
| Diabetic retinopathy       | 0.007                          | 0.035                   |
| ARMD                       | 0.25                           | 0.07                    |
| Retinal detachment         | -                              | 0.035                   |

DISCUSSION: Posterior segment disorders are recently found to be important cause of blindness in India. Most of the studies on posterior segment disorders consisted of diabetic retinopathy, ARMD and RD in the urban population of India. There are very few studies on prevalence of posterior segment disorders in rural population of India. To eliminate blindness, it is essential to develop suitable strategies which should be based on current data of blindness. We have done the cluster sampling in villages so it was not possible to do the fundus photographs of the patients. Fundus examination was done on the dilated eyes with ophthalmoscope. It is possible that we may have under estimated the prevalence of posterior segment disorders.

Vijaya et al. had examined 3934 subjects aged 40 years in rural population based survey and above and the mean age of study population was 53.78 years and 55.1% were women.

PREVALENCE OF DIABETIC RETINOPATHY: Nirmalan. et al. carried out cluster sampling to identify individuals 40 years and older in Tamil Nadu in southern India. 4917(95.5%) of the 5150 persons examined. The prevalence of diabetic retinopathy was 0.5% (95% CI, 0.3%-0.7%) in the general population. Dandona et al. 2522 subjects in Hyderabad city in southern India, underwent detailed dilated eye examination. A total of 1399 persons were ≥30 years old, and 1347 female and 23 males subjects were examined. DR was present in 28 subjects all ≥30 years old, an age-sex adjusted prevalence of 1.78% (95% CI 1.09-2.48%, no design effect) in those ≥30 years old and 0.56% (95% CI 0.23-0.89%, design effect 1.25) for all age groups considered together. No eye was blind due to diabetic retinopathy.
ORIGINAL ARTICLE

PREVALENCE OF AGE RELATED MACULAR DEGENERATION: Vijaya et al.\(^3\) conducted a population based functional study in Thiruvallur and Kanchruram. The prevalence of blindness due to ARMD was in one eye was 5(1.89%) and in both eyes was 2(1.7%). Nirmalan et al.\(^5\) carried out cluster sampling to identify individuals 40 years and older in Tamil Nadu in southern India. Complete retinal data were available for 4917(95.5%) of the 5150 persons examined. The population-based age-adjusted (adjusted to the US population of 2000) prevalence of ARMD to be 3.8% (95% CI: 3.28, 4.32) in a rural southern Indian population aged 50 years (unpublished data).

The prevalence of ARMD varies from 1.2% to 29.3%.\(^5,7\) Three population based studies-the Beaver Dam Eye Study,\(^8\) Blue Mountain Eye Study,\(^9\) and the Rotterdam Study.\(^10\) report the prevalence rates to be 1.7% in US, 1.4% in Australia and 1.2% in Netherland respectively. Earlier studies reported ARMD to be unusual in colored races, but now it is well established that it is not so infrequent in these races and the prevalence varies from 1.1% in South India,\(^11\) to 17.4% in Africa.\(^12\) Another study from North India reports the prevalence rate to be 4.7%.\(^13\) In China the incidence in a observational series was 5.88% and that for per for persons more than 65 years was 16.83%.\(^14\)

PREVALENCE OF RETINAL DETACHMENT: In population based survey, the Prevalence of Retinal Detachment and Blindness due to Retinal Detachment in person was 0.07%. The Prevalence of Retinal Detachment and Blindness due to Retinal Detachment in eye was 0.035%. Nirmalan et al.\(^4\) The Aravind Comprehensive study was a population based prevalence study in rural population of Andhra Pradesh, 40 years and older. 4917 persons were examined. The prevalence of retinal detachment was 1.9%.

In SW England, 2% of blind registration is due to retinal detachment.\(^15\) In Andhra Pradesh, 0.5% of blindness is caused by RD.\(^16\) Given that the prevalence of blindness (<6/60) is 1.84% in Andhra Pradesh, and approximately 0.4% in the UK, it is likely that the prevalence of blindness from RD is similar in India and England.

CONCLUSION: This is a rural based study in a developing country. Sample size was limited. We did not have portable instruments to be carried to the rural areas like indirect ophthalmoscopy & slit lamp biomicroscopy so examination with 78D or 90D was not done. As this was not done, the peripheral retinal detachment or shallow RD’s and CSME would also may have been missed. Fundus photography was also not done.

Determination of retinal disorders was done only on clinical evidence (no investigations) because of cost and logistics. Therefore the total prevalence reported may have been underestimated.

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