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Trachoma and blindness in the Nile Delta: current patterns and projections for the future in the rural Egyptian population

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SUMMARY A population based survey of trachoma and blindness was conducted in a rural Nile Delta hamlet. Trachoma remains hyperendemic in this region. Active trachoma was common among preschool children; over half had moderate to severe disease. Of residents 25 years old 90% had substantial conjunctival scarring. Severe conjunctival scarring was commoner among women (84%) than men (58%), and three-quarters of older women had trichiasis/entropion compared with 57% of older men. Males and females had equivalent age specific rates of inflammatory disease. Blindness was associated with old age; 17% of residents aged 50 and over were blind. Estimates of blindness based on this survey and other surveys in Egypt indicate that blindness is still a serious public health problem in rural Egypt. The number of blind persons in Egypt will increase from an estimated 420 000 in 1980 to 868 000 by the year 2020. The current crude blindness rate of 1·8% is expected to increase to 2·3% in the year 2000 and to 3·2% in 2020.

As a part of an effort to develop a comprehensive approach to preventing blindness in Egypt we assessed the magnitude of trachoma and trachoma induced blindness in a rural community in the Nile Delta. The survey included environmental characteristics and behavioural observations.

Trachomatous inflammatory disease of the conjunctiva is characterised by the presence of follicles and papillary hypertrophy. Extension of blood vessels (pannus) over the cornea and conjunctival scarring are manifestations of chronic disease in susceptible individuals. Scarring of the conjunctiva produced by chronic inflammation during childhood causes the eyelids to deviate inward (trichiasis/entropion) long after the inflammatory disease has subsided. Constant abrasion of the eye by eyelashes causes corneal scarring and loss of vision in adult life.

Trachoma is considered to be the world's leading cause of preventable blindness. An estimated 500 million people have trachoma, with six million blind.[1] The condition has been endemic in Egypt since antiquity.

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Material and methods

From January to March 1987 demographic, environmental, and clinical data were collected in the hamlet of Kafr* (population 1138) in the lower Nile Delta. Winter (December–March) is generally recognised to be the season with the lowest occurrence of eye infections (conjunctivitis) in Egypt.

Demographic data collected included age, sex, occupation, education, and religion. Socioenvironmental data collected included number of rooms (and sleeping rooms) in the household, construction material used, toilet facilities, animal and fedan (acreage) ownership, and television and radio ownership.

All residents were encouraged to undergo an ocular examination. In Kafr the response rate was 93%. In marked contrast, the response rate in Gamileya,* a second hamlet of equal population,

*Fictional names have been substituted for the two study sites.

which was examined in the previous winter, was only 62%. Reasons for refusing eye examination in Kafr were almost always related to fear of examination. In Gamileya the lack of clear hamlet leadership also contributed to a reduced response rate. Similar results were observed in Gamileya, but owing to the substantial non-response rate in this hamlet data from Gamileya will not be presented in this paper.

CLINICAL EXAMINATION

Visual acuity was assessed at 6 m by a Landolt C eye chart. Clinical observations of trachoma were carried out with a Zeiss portable slit-lamp or loupes for children less than 1 year old. Scoring of the inflammatory and cicatricial signs of trachoma was carried out according to World Health Organisation recommendations.[2] These signs included trichiasis and/or entropion (inturned eyelids), lymphoid follicles and papillary hypertrophy on the upper tarsal conjunctiva, conjunctival scarring, and corneal scarring. For each individual the intensity of inflammation (a measurement based on the degree of both lymphoid follicles and papillary hypertrophy) and degree of scarring were defined by the clinical disease in the worse eye.[1 2]

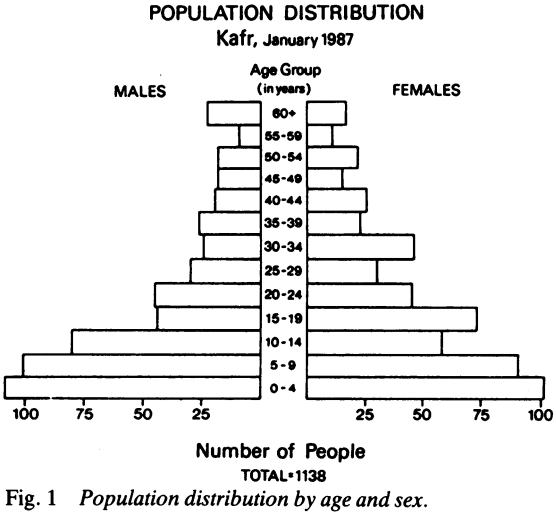

Fig. 1 *Population distribution by age and sex.*

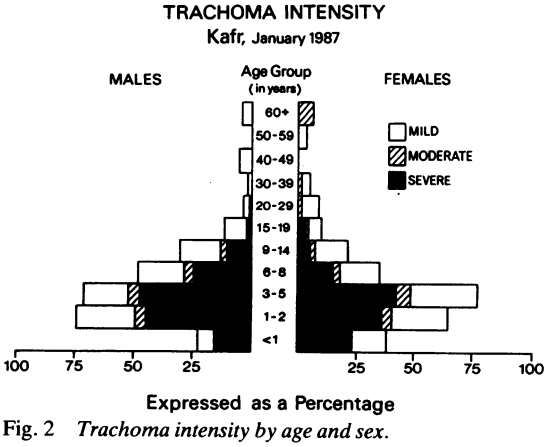

Fig. 2 *Trachoma intensity by age and sex.*

ANALYSIS

Data were analysed by the statistical package SPSS. Statistical representation of the cross-sectional data is presented in terms of disease prevalence and difference in prevalence (excess prevalence) by sex.

Results

POPULATION STRUCTURE

The age structure of the hamlet was pyramidal in shape: 25% of the population were under 6 years of age, 50% under 16 years, and only 10% over 50 years (Fig. 1). This age structure, which is characteristic of the current age structure of rural Egypt and of many

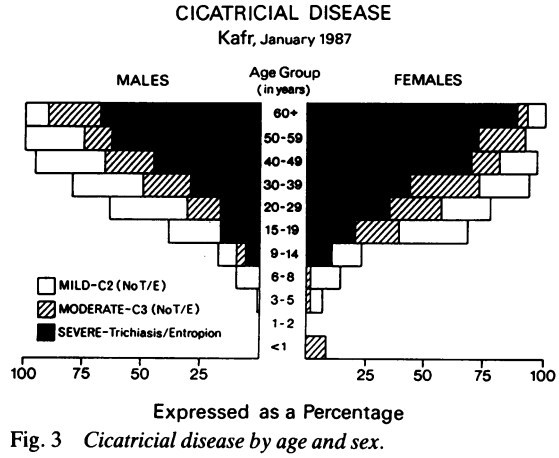

Fig. 3 *Cicatricial disease by age and sex.*

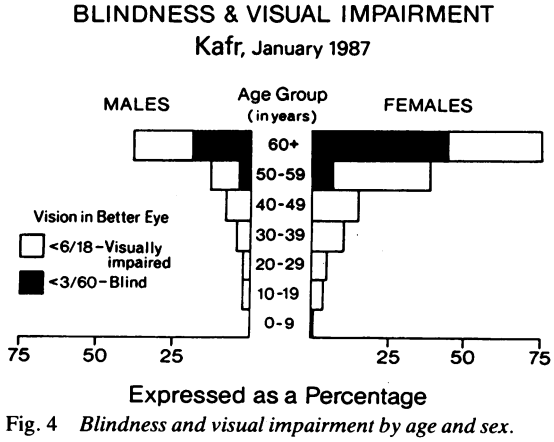

Fig. 4 *Blindness and visual impairment by age and sex.*

other developing countries, reflects the high birth rate. Size of households ranged from one to 35 family members with a mean of eight.

PREVALENCE OF INFLAMMATORY DISEASE

Active trachoma (severe and moderate intensity) was most common in the younger age groups (Fig. 2). Clinically active conjunctivitis was detected in infants as young as 2 months of age. One-third of the infants had inflammation of the upper tarsal conjunctiva before 2 years of age. The prevalence of active inflammation peaked at 59% among children 3 years of age and dropped off rapidly after age 5. Boys had a slightly higher prevalence of active trachoma than did girls. Among the adult population the prevalence of inflammatory disease was low.

PREVALENCE OF CICATRICIAL DISEASE

Scarring of the conjunctiva was present in children as young as 2 years of age. The prevalence and severity of scarring increased with age, reflecting the cumulative nature of this sign (Fig. 3). By the age of 10 approximately one-half of the children had conjunctival scarring. Approximately 90% of all residents aged over 25 had moderate or severe scarring of the upper conjunctival plate. While no difference in overall scarring rates was detected between the sexes, 66 of 79 (84%) adult women had severe scarring compared with 46 of 79 (58%) adult men ($p<0.005$). Inturned eyelashes (trichiasis/entropion), resulting from conjunctival scarring, was detected in 9- to 14-year-olds. Trichiasis and/or entropion was common among elderly residents; 59 of 79 (75%) of adult females had trichiasis and/or entropion compared with 45 of 79 (57%) adult men ($p<0.02$).

BLINDNESS

Blindness was evaluated by the rigorous WHO criteria of <3/60 in the better eye.[3] Blindness was associated with increased age; only one individual less than age 50 had vision in the better eye of less than 3/60 (Fig. 4). Among men aged 50 and above 11% were blind. In terms of blindness in the community the oldest 10% of the population (aged 50 and over) accounted for 94% of all blindness. Corneal opacities accounted for 40% of the blindness; cataracts accounted for the remainder. Not unexpectedly, women were 2·5 times more likely to have corneal opacities than were men.

Discussion

Research by our group demonstrates that blinding trachoma is still hyperendemic in Egypt. Contrary to the belief in the late 1960s that the introduction of chemotherapeutic agents and antibiotics would succeed in preventing many of these 'ophthalmias', active trachoma remains a common disease in rural Egypt.[4,5]

Endemic trachoma was documented in Egypt as early as the 19th century BC.[6] Cross-sectional studies in Egypt in the 1920s[7] gave prevalence rates of 25% among infants under one year of age and 64% among children aged 1 to 2 years, findings that are similar to ours. Among older children and adults the rate of inflammatory or cicatrising disease ranged between 84% and 99%. Attiah and El Togby reported an overall prevalence of infectious trachoma of 97%.[8] Among a probability sample of 16 hamlets in a recent unpublished population based survey (1979–80) in Beheira governorate the level of inflammatory disease also was similar to that observed in the 1920s. More than one-quarter (28%) of the children aged 1 to 2 years had moderate to severe inflammatory trachoma. The rate of active trachoma dropped off rapidly after six years of age.

Investigations in the 1960s and 1970s demonstrated the endemicity of blinding trachoma in a number of neighbouring countries, including Morocco,[9] Jordan,[10] Tunisia,[11–13] and Sudan.[14] Yet, with the notable exception of Tunisia, trachoma and blindness prevention still have not been identified as a priority by national health ministries in this region.

The World Health Organisation has determined that blindness constitutes a public health problem at the country level when nationwide blindness rates are 0·5% or greater.[15] At the community level a community blindness rate of 1% or greater signifies that blindness is a public health problem. In Kafr the community rate of blindness was 1·5%. Furthermore in the 1960s a probability sample of households in Alexandria and in rural hamlets surrounding the city gave a crude blindness rate of 2·1%.[16,17] Of the rural population 50 years and over 15% presented with visual acuity of <3/60 (20/400) in the better eye. As in our findings, women had a 13% excess prevalence ($p<0.001$) when compared with men. The 1979–80 Beheira governorate survey (sample population of 8000) showed a crude rate of 1·9%, with 21% of the oldest age category (60+) having visual acuity of <3/60 in the better eye. Similarly, in the village of Kafr 30% of this age group was blind. Corneal opacities secondary to infection were the single leading cause of blindness in the Alexandria and surrounding hamlet survey. This was followed by cataract, the leading cause of blindness worldwide. In both the Beheira survey and in Kafr corneal opacities closely followed cataract as the second leading cause of blindness.

In the Egyptian setting blindness is often underestimated. A 1969 study comparing self selected and

Table 1 *Blindness projections: rural Egyptian population*

Year	*Projected population at risk (rural)* (A)	*Projected population at risk 50+ years* (B)	*Percentage population 50+ years* (C)	*Blindness rate* (D)	*Projected rural blind 50+ years* (E)	*Proportion blind 50+ of total blind* (F)	*Projected total rural blind* (G)	*Crude blindness rate* (J)
1980	20·98 m	2·10 m	11%	15%	314 700	93%	338 387	1·6%
2000	32·21 m	4·51 m	14%	15%	676 420	95%	712 021	2·2%
2020	44·66 m	8·93 m	20%	15%	1 339 800	96%	1 395 625	3·1%

Calculations:
1. (A) Rural population×(C) proportion of population 50+ years of age=(B) rural population 50+ years of age.
2. (D) Age specific blindness rate×(B) projected population 50+ years of age=(E) projected blind people 50+ years of age.
3. (E) Projected blind 50+ years of age/(F) proportion of total blind expected to be 50+ years of age=(G) projected total rural blind.
4. (G) Projected total rural blind/(B) projected total rural population=(J) crude blindness rate.

m=Million.

random sampling methods demonstrated underestimation of 130%, suggesting that self selected samples or projections based on self presentation may grossly underestimate blindness.[18] This phenomenon was most prominent among adult women and individuals with postinfectious morbidity characterised by corneal opacities.

PROJECTIONS

While cross-sectional data have limited application to the assessment of risk factors for blindness in which the aetiology may be due to conditions in the distant past, they do allow projection of future levels of blindness. Current rates of inflammatory eye disease among the rural population of Egypt are unchanged from the 1920s. In addition, the age stratified prevalence of blindness in rural Egypt has remained relatively unchanged.

The population of Egypt is now estimated at 50 million. With the present annual growth rate of 2·8%, Egypt's population has been projected at 67 million in 2000 and 94 million in 2020.[19] Life expectancy at birth is 57 years, and 10% of Egypt's population is 50 years of age or older. It is projected that this age group will account for 14% of the population in the year 2000 and 20% in the year 2020.

Childhood inflammatory trachoma has already produced conjunctival scarring—which will lead to adult onset trichiasis and blindness—in the current population over 15 years of age. It is not clear why inflammatory disease is more prevalent among young males and cicatricial disease is more prevalent among adult females. As this cohort ages, age specific rates of blindness can be expected to resemble current rates. In addition the age specific rate of blindness among adults 50 years of age and older can be expected to contribute to an increased crude prevalence of blindness. For the Egyptian rural population an age specific (50+ years) rate of blindness of 15%, as demonstrated in a 1969 survey of Alexandria and surrounding rural areas,[16] an unpublished survey of Beheira governorate, and our current work, will mean that up to 676 000 adults will be blind in the year 2000 and 1·3 million adults in the year 2020 (Table 1). Thus current crude blindness rates will increase from approximately 1·6% to 2·2% in the year 2000 and to 3·1% in the year 2020. In short, until prevention and treatment are more effective, blindness, at present a leading public health problem in rural Egypt, will increase substantially in frequency.

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