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AGEING: A GLOBAL PERSPECTIVE

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A Life Time of Ageing

Ageing can be defined as the life-long process of progressive change in biological, psychological and social structures of a person. For statistical purposes, 'ageing' is commonly referred to specific age groups, for example, those aged 60 years and above. However, the ageing process begins even before we are born, and continues throughout life.

Although some associate 'ageing' with mental decline and physical impairment, this is a misconception, as the majority of older people enjoy good health and lead active lives. While the functional capacity of biological systems (e.g., muscular strength, cardiovascular performance, etc.) declines after peaking in early adulthood, health and activity in older age are largely determined by the exposures and actions of an individual during the whole life span. Thus, individuals are able to influence how they age by adapting to ageing-associated changes and by adopting healthier life styles.

An Ageing World

One of the major public health achievements this century has been the sharp decline in premature mortality from many communicable and non-communicable diseases. This is largely due to improvements in sanitation, housing, and nutrition as well as to medical innovations, including vaccinations and the discovery of antibiotics. Consequently life expectancy has risen, andisexpected to continuetorise, in virtually all populations throughout the world (Fig. 1), leading to a steep increase in the number of people reaching older age.

The sharp increases in life expectancy have been followed by substantial falls in fertility world-wide in developed and developing countries (Fig. 2), mainly due to availability of modern contraceptive methods. In India, for example, total fertility rates (TFR) – that is, the total number of children a woman is expected to have at the end of her reproductive years – have decreased from 5.9 in 1970 to 3.1 in 1998.[1]

towards a society for all ages
Participating in
International Year of Older Persons

'The majority of older people enjoy good health.'

Photo: Murray McGavin

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In This Issue . . .

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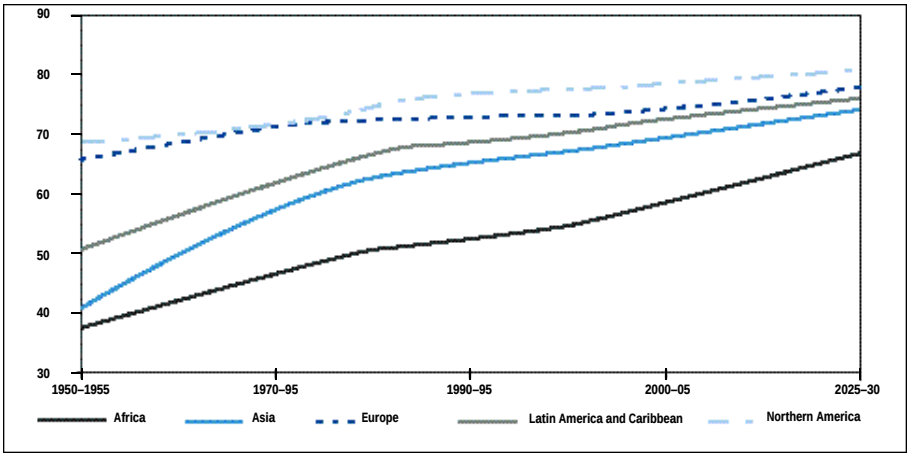
This decline is even more pronounced in China, where the 'one-child-per-family' policy was officially introduced in 1979. Total fertility rates fell from 5.5 in 1970 to the current 1.8, which is below the 2.1 replacement level.[1] By 2020 differences in TFR between countries will have virtually disappeared – a powerful determinant of population ageing, as the number of children and young people 'joining' the population gradually decreases.

This demographic transition from a pattern of high mortality/high fertility to that of low mortality/low fertility, is commonly referred to as 'population ageing', and will be compressed to an unprecedentedly short period of time in developing countries. While it has taken France 115 years for the proportion of older people to more than double from 7 to 14%, it will take China only 27 years to achieve the same between 2000 and 2027.[1] Figures 3a and 3b illustrate this shift in age structure for the world population from 1995 to 2025.

Figure 1: Life Expectancy at Birth

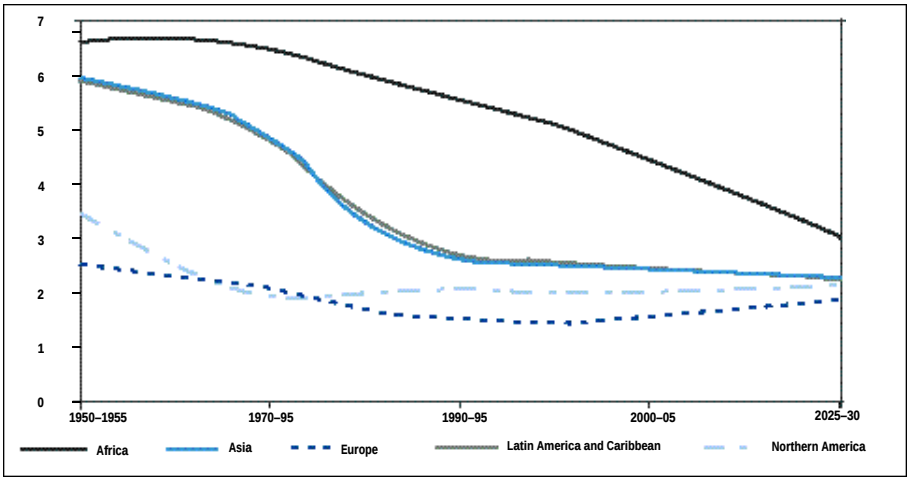


Source: UN World Population Prospects, 1996 Revision

Implications of Rapid Ageing

There are currently about 580 million older people (60 years and above) in the world, with 355 million in developing countries.

Figure 2: Total Fertility Rates



Source: UN World Population Prospects, 1996 Revision

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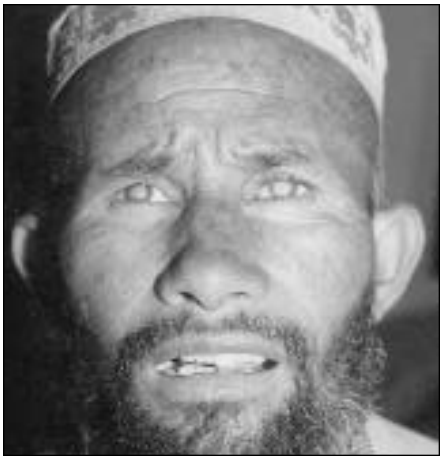

Bilateral mature cataracts (dilated pupils) in Central Asia.

Photo: M Farrahmand

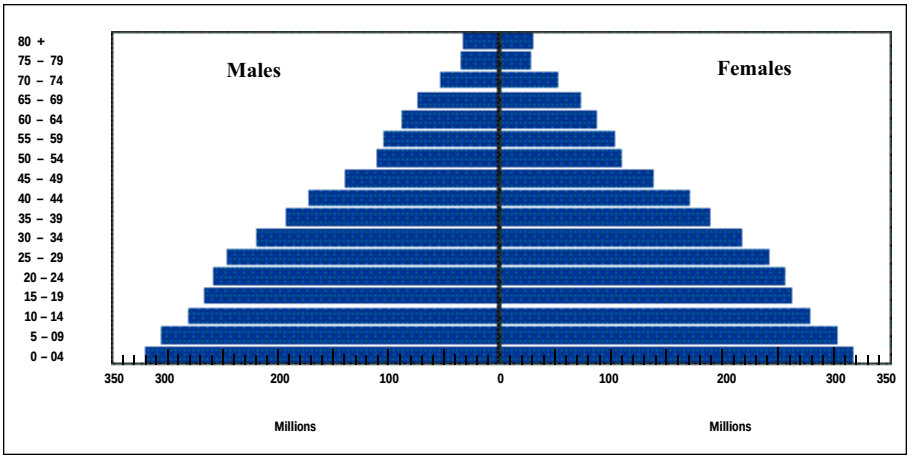

Figure 3a: World Total, 1995

By 2020 the figures will reach 1,000 million, and over 700 million, respectively.[1]

With this rapid growth in the proportion of older people, more people will enter the age of higher risk of developing non-communicable diseases (NCDs). This in turn may result in disability. In fact, NCDs including cardiovascular diseases, diabetes and cancer are predicted to be the main contributors to the burden of disease in developing countries by 2020,[2] and will be responsible for over three quarters of all deaths. At the same time, communicable diseases – although declining – will not have disappeared in those regions,[2] thus leading to the so-called 'double burden'.

It is projected that in countries with fertility rates below replacement level, the proportion of older people will exceed the proportion of the very young (aged up to 19 years) by 2050. This implies that in future one child may have to care for several elderly relatives, and the 'younger old' may be looking after the 'older old'.

Given this populationageing,itisbecoming increasingly critical to ensure that populations will grow older enjoying the highest possible health status. In this respect it is encouraging to see increasing evidence from developed countries that people are maintaining better health in later life than ever before. It is now known that the health status of older people in the USA has been improving since the early 1980s.[3] It is estimated that because of this, there are now 1.4 million fewer disabled people in that country than there would have been otherwise.

Ageing and Vision Worldwide

The number of blind people in the world today is about 45 million, and a further 135 million have severely impaired vision.[1] Most of them are older people, as visual impairment and blindness increases with age. This is mainly due to age-related disorders such as cataract, macular degeneration, and glaucoma, which together are responsible for about 60% of the world's blindness.[4]

In most countries of Asia and Africa cataract alone accounts for over 40% of all blindness.[1] Diabetes and smoking, among others, are thought to be risk factors for the development of cataract. With the predicted increase in the rates of diabetes and tobacco use in developing countries, the burden of blindness from cataract may soon reach even higher proportions.

The Response to Population Ageing

Rapid population ageing poses immense challenges to health and social services. Such challenges will be daunting to developing countries, which are still faced with infrastructural development problems and scarce resources. We have seen how advances in medical technology have offered solutions to specific ageing related problems – a situation which is likely to continue. However, these measures are often unaffordable to developing countries. For this reason, and considering the pace of global ageing, radical answers urgently need to be worked out by those societies.

In acknowledgement of this, WHO established in 1995 its 'Ageing and Health' Programme. This is a cross-sectional programme, which promotes health and a high level of functional capacity throughout the life span. It is in the process of establishing substantial collaborative work with acade-

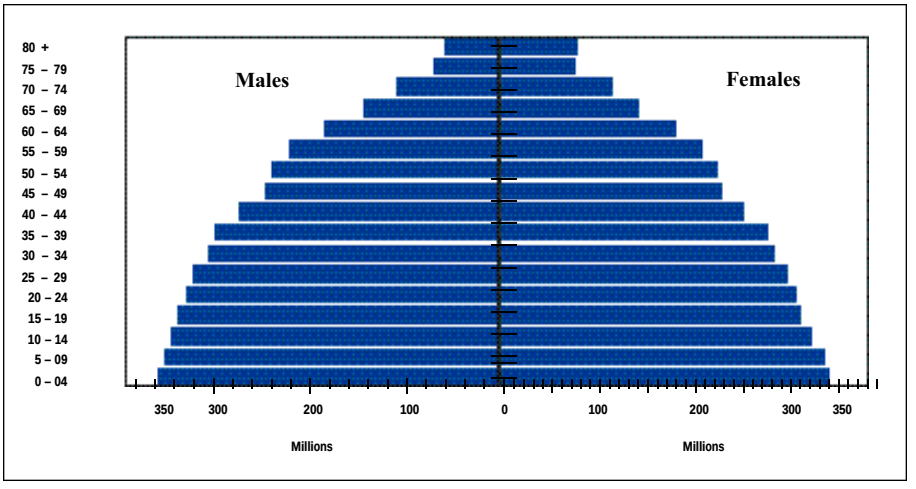

Figure 3b: World Total, 2025

Before cataract surgery

Photo: Murray McGavin

mic institutions and non-governmental organisations world-wide. Its main aim is to ensure the highest possible level of quality of life in older age, by investing in factors which are known to influence health throughout the life course. For those who experience loss of function in later life, efforts should be targeted at restoring and/or maximising functional capacity. It is a clear WHO priority to promote the availability of cost-effective rehabilitation programmes.

The United Nations is committed to the principle of 'active ageing'. For this reason, it has declared 1999 to be the International Year of Older Persons. The UN calls for a 'culture' of ageing, in which older persons are seen to contribute to development as well as benefiting from it; which promotes solidarity between the generations; and which encourages life-long development.

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The Epidemiology of Ageing and the Eye

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The probability of an adult dying doubles every six or seven years. At the moment the progression is somewhat slower for women than for men. The 'law' describing the 'nature of the function' relating to human mortality was first reported by Gompertz in 1825. More recent studies have shown that the Gompertz 'law' is valid only within limits, breaking down in the upper age range.

This implies the following. On the basis of the 'law' one would predict tentatively that there is a fixed human lifespan (a maximum length of life) of about 120 years. More recent analyses see this number only as a most probable one, with a longer longevity not being excluded.[1] Indeed, the latest statistics on the 'oldest old' show a clear deviation from the Gompertz prediction: although late mortality has not yet reached theoretical predictions, perhaps because even the oldest old have included smokers and others subject to noxious environmental effects. The former concept of a maximum lifespan may have to be replaced by one of 'maximum likelihood'.

Amongst developed countries – and the longest-lived by no means include the richest in the world – the rate constant is about twice as great as amongst less developed countries, which indicates that their life expectancy, a sort of average, is almost 20 years longer than is true of the less developed countries. From a biological point of view, at least two explanations of the marked differences between populations in developed and less developed countries can be considered: either people in less developed countries age faster, or the biological variance amongst them is greater than is true of people in developed countries. Theoretical considerations and those of genetics support the second possibility.

Several other indicators seem to correlate with the age-related increase in mortality. The senescence of the skin is one example, and the incidence of cataract another. This emphasises that environmental factors need to be identified with precision if the aetiology of age-related conditions is to be understood. If the human genome is as uniform as most experts believe at present, then, for example, the much earlier age of onset of cataract in warm countries, as compared with temperate ones, is unlikely to be mainly genetic in nature.

But what are age-related conditions? The immediate answer is those which increase in incidence with age, but, in some instances, one can be more specific. In the case of cataract, a law similar to that of Gompertz has been observed,[2] and, as with mortality, the chance of cataract appearing in a cohort doubles every six or so years. Although apparently not true of glaucoma in general, a similar rule holds also for some of its associated findings, such as arcuate scotoma and an IOP>20mm. The problem faced by the epidemiologist is that these facts are known principally for developed countries, but data for the least developed ones are lacking, and, therefore, urgently required.

Our ignorance as regards geographical variations is not confined to accurate age-related variations of the most common ophthalmological conditions. More fundamentally, it extends to a knowledge of anatomical detail and relevant biological

Presbyopia occurs earlier in warm climates
Photo: Murray McGavin

variables, which have been established with some reliability mainly for Caucasian eyes. This matter is most important for the understanding of the variation of some wide-spread conditions, and for their potential prevention or cure.

For example, some twenty years ago a tentative geographical link was established between the prevalence of angle-closure glaucoma and the thickness of the eye lens. Normal Bantu have lenses around 9% thinner than similar populations in Denmark, and also a much lower prevalence of angle-closure glaucoma.[3] Now it would be unwise to look for a gene amongst the Bantu which would protect them from glaucoma, and be lacking amongst the Danes. A more likely explanation is that the Bantu have thinner lenses than the Danes. The lower prevalence of angle-closure glaucoma is then an accidental result of an evolutionary phenomenon of the Bantu, namely a thin lens. It may be mentioned in passing that, in a British study,[4] patients with angle-closure glaucoma were found to have lenses thicker than those of normal controls: however, an additional measurement, the reduced height of the cornea was also shown to be important.

As regards lenses in Southern countries, there is much that is unknown. A great deal about age-related changes in (Caucasian) lenses is known. The most wide-spread of them, namely presbyopia, appears to be due to a number of causes.[5] It tends to

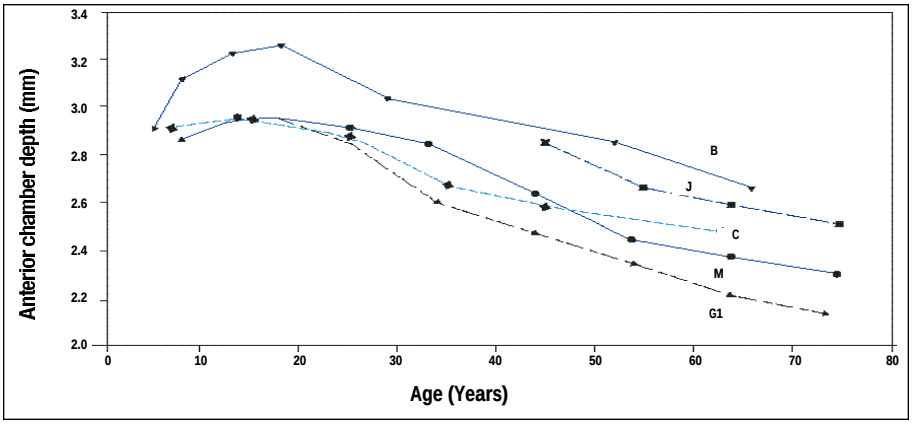

Fig. 1: Variation of mean anterior chamber depth as measured with optical pachymetry (after[6]). B: Belgians; J: Japanese; C: Chinese; M: Mongolians; GI: Greenland Inuits (courtesy P Foster et al, Am J Ophthalmol).

occur much earlier in warm than in temperate countries.[6] The changes with age of 'British' lenses have been studied.[2] There are important changes in the concentration of calcium (which may be high in human cataractous lenses), and a progressive decline in glutathione which serves to maintain the transparency of the lens. But what are the concentrations and the rate of decline in 'tropical' lenses? Is the decline faster there, thus accounting, at least in part, for the earlier incidence of cataract in warm countries?

More fundamental considerations may play a role. Consider the pupil. This shows well-known age-related constriction – senile miosis – and its permanent mean diameter appears to vary inversely with the ambient annual illumination.[6] While the apparent reason for this is almost self-evident, if we wish to understand mechanisms, then looking at a hole is not much good. It is more important to seek the cause of an age-related failure of the dilator iridis, and its relative weakness (or the greater strength of the sphincter) in tropical countries. Do smooth muscles atrophy in warm countries faster than they do in temperate ones? Are there geographic differences in the age-related changes of the sympathetic and parasympathetic nervous systems? It remains to be seen whether answers to these and related questions may not also help to throw light on the relation between glaucoma and geography.

The recent analysis of the anterior chamber depth amongst one type of Mongolians and its comparison with other studies (Fig. 1) provides another example.[7] The anterior chamber is simply a space between the posterior surface of the cornea and the anterior surface of the lens. Consequently, its age-related variation indicates the relative positions of these two surfaces.[4] All studies covering teenage young people show a maximum anterior chamber depth, most probably because the front of eye has reached its maximum dimensions. Thereafter the lens thickens and the anterior chamber depth decreases. But the lens grows fairly uniformly, whereas the anterior chamber depth exhibits variable rates. As we move from the Belgians to the Inuit (Fig. 1) the slow-down tends to move to later ages. The original Mongolian data extend to an age of 85 years, and the slow-down changes to a measurable increase in depth both for men and women. The occurrence of myopia in the upper age groups has been reported more than once and, without corroborative evidence,[8] it has been attributed to the presence of (incipient) cataracts, despite the customary assurance of 'no known pathology'.

It is of no benefit to speculate whether the effect is due to life-style or other environmental factors, or genetic factors. But it illustrates that we lack the fundamental biological information to understand the underlying mechanisms and explain some of the age-related ophthalmic complications. More importantly, this ignorance inhibits serious attempts to project their prevalence in relation to currently increasing life expectancy.

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Delivery of Eye Care to the Elderly: Practical Considerations

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Introduction

The incidence of visual impairment greatly increases with age because most of the commonest blinding conditions occur in older age. Cataract is, of course, the main problem but glaucoma, diabetic retinopathy and macular degeneration are also important. Studies which examine the prevalence of visual impairment according to its causes have been done in both developed and less economically developed countries. They invariably find much unmet need in elderly population samples, in terms of avoidable or treatable conditions. In fact, elderly people often do not express the need to have anything done about their poor eyesight. A memorable example of this occurred during a home visit in a survey we carried out in inner London. The elderly couple were housebound. The husband was glad of our visit because he said his wife's eyes were very bad. We did indeed find this to be so but were surprised to find that he was worse – apparently unaware how poor his eyesight had become. Not surprisingly, cataract was the cause.

In many parts of the developing world, a similar situation exists. Areas where the prevalence of blinding cataract is high do not seem to have an overwhelming demand for surgical services. In Aravind Eye Hospital, South India, research has investigated what needs to be done to increase demand and reduce the backlog of avoidable blindness. There, and in Bangladesh, patients who have already had surgery (aphakic motivators) have been employed to increase the demand for cataract surgery, with some success. At the same time qualitative research has been carried out to discover the reasons why less than half the treatable blind come forward for surgery. The reasons will vary from person to person and from place to place but there are common themes shared by the elderly visually impaired across the world. For a prevention of blindness programme to have its desired impact, these issues must be understood and dealt with.

Expectation

Elderly people are 'programmed' to anticipate a reduction of physical strength, agility and sensory awareness, which results in the gradual loss of their dominant role in the family. They accept that they will become, ultimately, totally dependent. Grandparents, while still able to function , provide an important indirect economic role by minding the children while the parents work. When the sight fails though, they become more dependent than the children and roles are reversed. But because this natural decay has been observed for so long, there is a resistance to accept that things might be otherwise.

Awareness and Demand

Because ophthalmic services are often so poorly accessible, rural communities will have little or no up to date information about what can be done for failing sight in elderly people. Knowledge will come from their own experiences of their own parents' loss of function in old age and (which is perhaps worse) from the fact that nothing was done about it a generation before. There is a natural suspicion of what the modern city folk might offer, because there are major social and cultural differences between urban and rural communities. In the Aravind research, it was clear that rumours of poor outcome spread much faster and further than those of success – a result of the natural suspicion that rural communities have of the distant urban culture. But the same kind of phenomena were noticed in inner London; stories of a particular person who failed to benefit from surgery dominate reports of a miraculous cure which may have happened to many more. Elderly people need a conviction that they too can benefit. Such conviction may be easily lost when so many other troubles – aches and pains, incontinence, deafness – are not amenable to treatment and are always put down to 'old age'.

When there is no prior expectation of benefit, there will be no demand. Imposing the expectation from 'above' does not work. The offer of an operation will result in fear rather than hope and the option of leaving well alone and struggling on will usually be preferred.

Elderly people may be anxious about requesting help from the eye care worker
Photo: Murray McGavin

Creating Demand

Market principles apply. There must be a product which people want. To create such a demand, the product must be of high quality and successful, as well as accessible and affordable. Much thought has been given to these questions especially by the Aravind group. A key issue is the appropriate selection of patients for cataract surgery. Poor selection means many patients undergo surgery without the prospect of significant visual recovery because underlying pathology complicates the surgery, or simply reveals another untreatable problem. Therefore, many people returning to their village after surgery will spread the word that no good came of all the stress and fear involved in undergoing the operation, and the campaign will fail. It is not difficult to anticipate a good outcome from cataract surgery if a little extra care is taken in the preoperative assessment of the patient. But in large screening camps, it might be easy to overlook subtle signs which warn of poor outcome – the unreacting pupil or poor projection of light to a moving source. In the camp, the pressure is there to do as many procedures as possible. The emphasis is on quantity not quality; the outcome is measured by the number of operations performed rather than the number of persons for whom sight was restored.

Quantity and Quality

A greater emphasis on the quality of surgical outcomes will increase demand. This means that outcomes must be measured and recorded. Use of intraocular lenses in cataract surgery will also improve demand so long as the appropriate surgical skills and technology are available. Posterior chamber lens implantation after extracapsular surgery is the ideal, but anterior chamber lenses after intracapsular surgery may offer a safe interim arrangement.

There should, of course, be a suitable balance between quality and quantity. An excessive emphasis on quality will reduce the number of procedures carried out. Spending more time, resources and effort on fewer people may mean that there is less overall benefit to the population. In fact, quality and quantity can improve together as long as efficiency and accuracy are maintained. Pushing too hard for quantity will inevitably degrade quality and vice versa.

Compliance

Successful treatment of chronic blinding eye conditions such as glaucoma or diabetic retinopathy depends on the compliance of the patient. In both cases treatment is required before there is an obvious problem for the patient. This means that the doctor must carefully explain the purpose of the treatment in terms which the patient can understand. It is all too easy for the doctor to blame the patient for failure to comply but it is the doctor's responsibility to ensure that the chosen treatment is acceptable and its purpose fully understood. Elderly patients from rural communities may have considerable difficulty in accepting the word of a strange doctor that, unless something is done, worse will follow. Many of the patients attending the glaucoma clinic in Queen Elizabeth's Hospital, Bridgetown, Barbados preferred to 'put their trust in the Lord' than to do as the white doctor ordered and use pilocarpine four times a day.

Thus medical treatment of glaucoma is so often unsuccessful. Patients may be happy to comply with a 'course' of treatment for a definite time, but long term treatment is not an attractive proposition, especially when the patient is unaware of benefit. Given that facilities for follow up are often so poor, one time surgical intervention is often the only real option. But every effort must be made to ensure that the patient fully understands the purpose of the operation before surgery, and that there is no expectation of seeing better after surgery.

Although treatment at present is very rarely effective in preventing sight loss from age-related macular degeneration, much can be done to rehabilitate the affected person. Again, for this to work, the patient must be willing and motivated to benefit from the support offered. An elderly person who has lost sight is often, not surprisingly, depressed. This must be overcome if the rehabilitation is to be effective. In dealing with this type of problem, the doctor must understand the impact of loss of sight. Much of this is similar to the stages of bereavement in the loss of a loved one: denial, anger, profound sorrow and self pity, despair and hopelessness. This was well described in a recent article by Fitzgerald and Parkes.[1]

The Elderly Person's Perspective

If we wish to be successful in improving the quality of life of our ageing populations, we must be careful to view things from their perspective. Elderly people are usually cautious and conservative; they tend to distrust new and unfamiliar things. They are aware of their vulnerability and while they may have been prepared to take risks when they were younger, they do not want to let anyone take advantage of them when they have so little to fall back on. They have survived a long and hard life and believe they know much about the world. Usually they will be happier to let another undergo an operation and wait and see the outcome before making a decision about themselves.

We must respect and understand this attitude and not be surprised that it takes time and effort to gain acceptance for something we implicitly believe in.

Dr Diana discussing post-operative care with a patient in Bangladesh

Photo: Murray McGavin

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The age distribution of primary open angle glaucoma

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Prevalence data for primary open angle glaucoma (POAG), taken from eight population surveys,* was smoothed by curve-fitting to derive composite estimates with respect to quinqennial age groups from 40–44 to 85–89 years. These were applied to national population figures to provide a distribution of cases with respect to age.

Estimated prevalence for age 40-89 years in mainly white Caucasian people was 1.2%, rising from 0.2% for those in their 40s to 4.3% for those in their 80s. Of the total cases, 7% were less than 55 years old, 44% were aged 55-74 years, and 49% were older. 'Implied incidence' was estimated from the prevalence results, being 0.11% per year in people aged 55 to 74 years.

The analysis applied to relatively narrow definitions of POAG. If 'probable' cases and also 'ocular hypertensives requiring treatment' (of relevance for glaucoma screening) were included, the prevalence would be almost twice as high. Also, a larger proportion of potential cases for a screen would be less than 55 years old, partly because the average age of incident (i.e., newly developed) cases is less than that of prevalent (i.e., all existing) cases.

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*** Ferndale, Wales (1966): Framingham, USA (1977): Baltimore, USA (1991): Beaver Dam, USA (1992): Roscommon, Eire (1993): Rotterdam, Netherlands (1994): Casteldaccia, Sicily (1995): Blue Mountains, Australia (1996).**

EPIDEMIOLOGY IN PRACTICE

We have not been able to publish the next article in the series in this issue of the Journal. We will continue the series with two articles in following issues. These will discuss **Screening** and **Qualitative Methods**. **Editor**

Age-Related Macular Disease: Aetiology and Clinical Management

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Caucasian Communities

Age-related macular disease (AMD) accounts for about 50% of registered blindness in England and Wales, and this high prevalence is likely to exist in all economically developed Caucasian communities. A recent analysis indicates that the prevalence appears to be increasing at a rate not fully explained by the increasing age of the population, and, as a cause of visual loss, AMD is as common now as diabetes and glaucoma during working life.[1] Despite the early expectations, it is now evident that the present techniques of laser treatment will not have a major impact on blindness due to AMD.[2] Other forms of treatment are under trial, such as ionising radiation and photodynamic therapy, but they may not be vastly more successful than photocoagulation. This means that our knowledge of the behaviour and pathogenesis of the disorder must be re-examined in the hope that alternative approaches to management can be identified.

Twin and sibling studies provide good evidence of genetic predisposition in AMD, and it is believed that the predisposition becomes manifest in the presence of appropriate environmental influences. It is likely that more than one gene is involved although the number is probably small. In these respects AMD is similar to other complex traits. It follows that ageing at the macula would vary qualitatively within a community, occurring in those with the most severe genetic predisposition and environmental pressures. The high prevalence of clinically detectable age-related maculopathy (ARM) in those over the age of 65 years implies that the causative genes are common in industrial societies.

Non-Caucasian Communities

In the past AMD was rarely recognised in Japan. However, disability due to macular disease in middle or late life,[3] and hospital referrals with this disorder, suggest that AMD has become common in the last two decades, at least in urban communities. A similar trend is appearing in other parts of Eastern Asia. There is also a strikingly high prevalence of macular disease in elderly Inuit in Greenland.

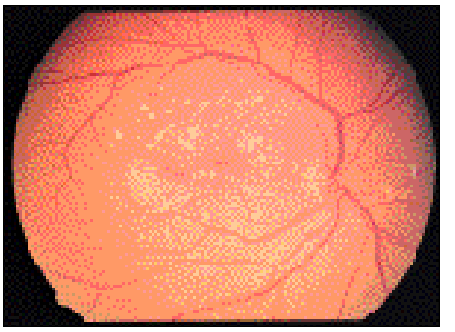
The phenotype (clinical appearance) of AMD appears to vary in different communities. In Japan the impression is that polypoidal choroidopathy is common, whereas, in Caucasians, the growth of new vessels is the most prevalent complication. In the Inuit population the characteristic process is atrophy. In both Inuit and Japanese the visual loss occurs without there being pre-existing recognisable age changes at the level of Bruch's membrane, such as soft drusen. In neither has genetic predisposition been sought so far, although the increasing incidence implies environmental factors are important.

Future Research

Cross sectional studies in populations with different genetic backgrounds but similar environment, and populations with similar genetic background with different environments, would serve to prove that both influences are important.

Future research seeking the abnormal genes is likely to be rewarding. The techniques of linkage dysequilibrium and sibling pair analysis have been well worked out, and have met with success in other complex disorders such as multiple sclerosis, diabetes, bipolar illness and schizophrenia. Both investigative techniques benefit from knowledge of candidate genes. Candidate genes may be found by recognition of associated characteristics, such as loss of iris colour,[4] or identification of genes causing disorders with phenotypic similarities to AMD such as Sorsby fundus dystrophy and Doyne macular dystrophy, together with knowledge of the disease processes.

In Caucasians visual loss results from choroidal neovascularization, detachment of the retinal pigment epithelium (RPE) or geographic atrophy. It is widely believed that these occur in response to accumulation of debris in Bruch's membrane, which is recognised clinically as drusen and pigmentary changes referred to as age-related maculopathy (ARM). It is believed that the



Drusen and macular disease
Photo: Clare Gilbert

debris in Bruch's membrane is derived from the RPE, which discharges cytoplasmic material throughout life into the inner portion of Bruch's membrane in order to achieve cytoplasmic renewal. It is likely that the material is cleared through the choriocapillaris. Some information exists concerning age changes in the RPE, Bruch's membrane and choroid from laboratory studies of donor eyes. However, the inter-relationship between age change in the different tissues is not established. Clinical and laboratory studies imply that the quantity, distribution and chemical composition of the debris determine both the magnitude of risk, and the type of lesion causing visual loss. From these observations it is possible to speculate on the potential genetic influences that may modulate ageing. Increased outer segment turnover may explain the high levels of RPE autofluorescence in diseases due to mutations in the RDS gene. A similar effect may occur if there is reduced activity of RPE degradative enzymes, or free radical damage to the substrate of degradation. Age change in Bruch's membrane such as cross linkage of collagen would predictably accelerate accumulation of debris. The mechanisms whereby material is cleared from Bruch's membrane may also be under genetic influence. Considerable variation of age changes exists from one donor to another of a similar age, reflecting the complexity of genetic and environmental influences.

Thus, there are potentially many candidate genes influencing ageing at the macula. Whether or not a single gene determines risk in an individual or family is unknown, although the reputed high gene frequency in the population implies that a single gene should not be assumed.

Of the environmental influences smoking has most consistently been associated with increased risk, but surprisingly not all studies have demonstrated this. Dietary intake of carotenoids, other micronutrients and hypertension have also been implicated. However, none of these readily explain the apparent increase in prevalence of

disease with change of life style, suggesting that the most important factors have not yet been identified.

In non-Caucasians relatively little information is available on AMD. There is a need to determine whether or not there is genetic predisposition. The natural history of disease has not been documented. In addition, those structural changes predisposing to visual loss are unknown. They have not been documented in any detail clinically, and there is little histopathological documentation of ageing at the posterior pole. It is important that studies of AMD in Caucasian societies should now be repeated in Eastern Asia.

What benefits would there be from this new information? Defining the genetic influences would point to the relevant pathogenic mechanisms involved, and identify those at high risk of visual loss. If the environmental pressures conferring risk were known, public health measures could be taken. New therapeutic measures may come to light, and those most likely to benefit from such measures would be identified. The high prevalence of the disease in Caucasian communities, and the apparent rise in the prevalence in communities previously not considered to be at risk, highlight the urgency for an increasing level of research. Over the last 5 years there has been steadily increasing research activity investigating the pathogenesis of AMD, and the hope is that this continues.

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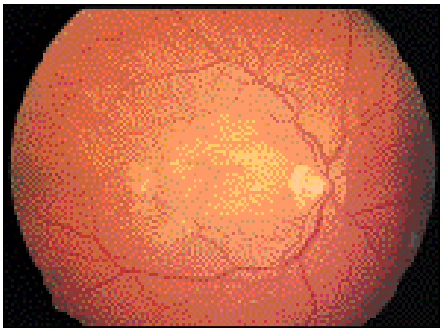

Early subretinal neovascular membrane in a Caucasian eye

Photo: Clare Gilbert

Age-Related Macular Disease: Intervention Possibilities

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Introduction

Age-related maculopathy (ARM) is a degenerative disorder of the central retina typically with an age of onset after the fifth decade. It is characterised in the early stages by drusen, pigmentary changes and degeneration of the retinal pigment epithelium (RPE). In the later stages there is atrophy of the photoreceptors and RPE (geographic atrophy or dry form) and choroidal neovascularisation (CNV or wet form); the latter resulting in the typical disciform scar. Only the later stages of ARM (termed AMD) featuring geographic atrophy and/or CNV result in moderate or severe loss of vision.

Some of the hypotheses for the development of CNV are that

(a) tissue barriers to blood vessel growth are disrupted by degeneration
(b) inflammatory cells incite the neovascular response
(c) decreased choroidal perfusion and impaired oxygen transport result in ischaemia and neovascularisation

The only proven treatment for choroidal neovascularisation is focal laser photocoagulation.[1] Less than 20% of lesions are eligible for laser treatment at clinical presentation and even in these the benefit is modest. Thus, many different therapeutic approaches are being investigated which include preventive strategies and methods to manage established disease.

Preventive Strategies

CNV in the expanding elderly population brings a high level of visual disability and social cost. Thus, there is great interest in preventing the ingrowth of new vessels before there is severe loss of visual function, particularly since there is no treatment for the atrophic form and existing therapies are of minimal benefit for CNV. A number of preventive strategies are therefore under consideration.[2] As oxidative stress has been suggested as playing a role in macular tissue damage leading to ARM, dietary supplementation with antioxidants is being tested in a randomized controlled trial. The National Eye Institute, USA, is sponsoring the Age-Related Eye Disease Study (AREDS): a multicentre, clinical trial to evaluate the role of antioxidant vitamins (with or without zinc supplementation) in the prevention of age-related macular degeneration and cataract.[3] As the development of these degenerative disorders is often a long process, any beneficial effects in the treated group are unlikely to become apparent for at least another 5 years.

Within the past several years, there has also been significant interest in the role of low intensity laser treatment to eyes with large diffuse drusen in the prevention of CNV and loss of vision. Pilot studies have reported a decreased incidence of CNV and a lower rate of loss of vision among treated eyes. Initial results from a large randomized clinical trial (The Choroidal NeovascularizationPrevention Trial; CNVPT)[3] are now available. Essentially this study enrolled patients into one of two groups. The first group consists of patients with established neovascularisation in one eye with soft drusen in the fellow eye (Fellow Eye Study).[3] The second group consists of individuals with bilateral soft drusen (Bilateral Drusen Study). Prophylactic argon laser photocoagulation was performed in the fellow eye in the Fellow Eye Study and in one eye in the Bilateral Drusen Study. Interim analysis has demonstrated increased rates of CNV but decreased rates of vision loss in fellow eyes treated with laser in the Fellow Eye Study. Among patients with bilateral drusen, treated eyes and observed eyes had similar rates of CNV and loss of vision. Thus, there is a possibility that some interventions may succeed in reducing the rate of visual loss but all the indicators suggest that the effects, if any, will be modest.

Current Status of Clinical Trials for CNV of AMD

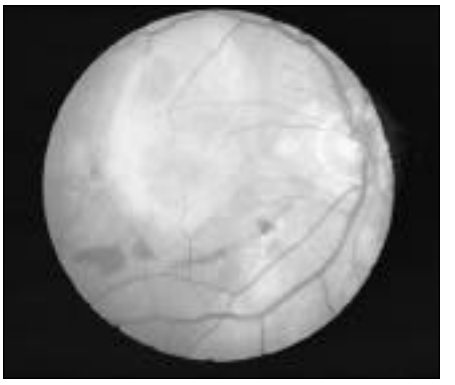
While prevention remains a primary goal, a significant proportion of the ageing population exhibits fully developed disease. Various new therapeutic approaches are under investigation in their management. These include the use of photodynamic

therapy (PDT),[4] radiotherapy and surgical excision. The TAP study (Treatment of AMD with PDT) involving 609 patients at 22 centres in the USA and Europe is a phase 3 clinical trial where patients with subfoveal CNV are randomized to visudyne or placebo. In this study a drug (a derivative of benzoporphyrin) was used to sensitize the neovascular tissue, following which the tissues were irradiated using a diode laser. The verteporfin in the Photodynamic Therapy Study (VIP study) uses a different photosensitizer but also includes many patients with subfoveal CNV who do not fit the criteria for the TAP study. The 12 month result of the TAP study has shown that patients treated with visudyne therapy were more likely to have stable vision or improved vision compared with those treated with placebo (<.0002). Analysis has revealed that 61.4% of patients treated with visudyne and 45.9% of patients treated with placebo had stable vision (CIBA Vision press release). Thus, while the treatment offers some hope for those already showing signs of advanced disease, the overall benefit is small.

Another treatmentcurrently under investigation is the possible role of radiotherapy in the prevention of severe visual loss in subfoveal CNV.[5] A number of phase 3 randomized controlled clinical trials are expected to announce their results within the next year. Of these the UK multicentre clinical trials (SFRADS) has enrolled 200 patients with subfoveal CNV, half of whom have been assigned to treatment with the other half assigned to observation only. Other trials include the German RAD study and the ROARMD study in Georgia, USA.

Experimental Strategies

A variety of other therapeutic approaches are under investigation at the experimental stage.[2] These include using techniques of photoreceptor rescue in animal models of macular degeneration, retroviral gene transfer, retinal pigment epithelial transplantation and studies of a variety of anti-angiogenic agents that prevent or suppress neovascularisation. In the long-term, studies are needed to identify the molecular pathways which result in the death of the photoreceptor, RPE cell and the choriocapillaris. In the medium term, the benefits of identifying modifiable risk factors are unlikely to affect the prevalence of AMD over the next few decades. However, significant research is continuing for the prevention and treatment of wet AMD and may result in improved treatment which could influence and prevent severe visual loss. Finally, research is needed to identify the optimal management strategies in those who have already developed AMD and address the value of visual rehabilitation and visual aids.



Age-related disciform macular disease

Photo: Clare Gilbert

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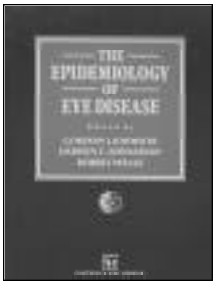
Book Review

The Epidemiology of Eye Disease

Edited by: Gordon J. Johnson, Darwin C Minassian and Robert Weale



Publisher: Chapman and Hall Medical

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Fax: 00 44 (0)171 250 3207;
E-mail: eyeresource@ucl.ac.uk

Price: UK£34/US$62 in developing countries. UK£45/US$82 elsewhere.

Ordering information: Please make international cheques/orders payable to **University College London**. Only cheques drawn on UK£ or US$ banks can be accepted. Post & Packing: Please add £2.50/$5 (surface) or £5/$9 (airmail).

Review

This splendid and much needed book was written to answer the needs of postgraduate students on courses at the International Centre for Eye Health. It will be of great value to clinical and public health personnel involved in prevention of blindness and eye care programmes worldwide. The subjects covered are applicable in both developing and industrialised economies.

There are three sections to the book. The first section deals with epidemiological methodology, starting with basic principles and guidelines, through calculating sample sizes and planning an eye survey to data analysis and reporting.

The middle and largest section covers the epidemiology of specific diseases with a chapter on each one. The conditions are cataract, trachoma, glaucoma, vitamin A deficiency, onchocerciasis, leprosy, HIV/AIDS, diabetes and age-related macular degeneration. Other subjects which also have their own chapters are childhood blindness, eye injuries and conditions of the outer eye excluding those mentioned above.

Section three is a practical guide on how to get going on prevention of blindness programmes. The processes are detailed for planning, management and evaluation of eye-care services and each stage is illustrated with practical examples. The book is rounded off with the roles of both the WHO programme for prevention of blindness and the international non-governmental organisations. Finally the scene is set for intervention in industrialised countries.

Denise Mabey FRCOphth

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Road Traffic Accidents and Ocular Trauma: Experience at Tripoli Eye Hospital, Libya

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Road traffic accidents (RTA) are common occurrences every day. With the ever increasing number of various road transport vehicles, and the increasing number of new drivers, traffic accidents keep on increasing, causing mild to severe human injury, including injuries to the eyes.

Eye injuries, often resulting in some visual loss, create enormous costs both to the victim and to society. There is great need for more active interest in the prevention of eye injuries. It is necessary to accumulate relevant data of damage caused by road traffic accidents (RTA) and, also, to evaluate the present situation in Libya.

The Casualty Service of the Tripoli Eye Hospital, which receives trauma cases, is open day and night. Many cases of eye injuries are sent from the Trauma Centre, Central Hospital, Tripoli.

Ocular involvement in road traffic accidents may involve the eyelids, lacrimal canaliculi, orbital wall, conjunctiva, cornea, sclera and the extra-ocular muscles. There may be prolapse of uveal tissue, vitreous loss, traumatic cataract, retinal detachment, vitreous haemorrhage, choroidal rupture, optic nerve avulsion or a ruptured globe.

This two year study, from 1 October 1993 until 30September 1995, reports the ocular trauma caused by road traffic accidents in patients attending or referred to the Tripoli Eye Hospital.

Material and Methods

Twelve hundred and ten patients were included in this study of eye injuries of all types, of which 248 (20.5%) patients (276 eyes) were found to have been caused by road traffic accidents. These patients were seen in the Casualty Service, Eye Outpatient Department and then later admitted for treatment in the inpatient department of the Hospital. Demographic data and details of the injury were obtained. Information regarding time, location, type and mechanism of eye injury and use of spectacles (or other protection) was recorded. Any offending broken pieces of windscreen glass, spectacle trauma, steering wheel or dash board impact were noted. The mechanism of injury was then categorised as blunt, sharp, projectile or combined. The question was asked if the car-safety belts were in use at the time of the accident.

An eye examination was performed on each patient and visual acuity, examination findings, diagnostic tests required, diagnosis and medical and operating treatment were recorded. Due to inadequate compliance with follow-up, the final outcome has been reported in only about half of the patients.

Results

This study is a statistical analysis of 276 traumatised eyes of 248 patients. One hundred and eighty six (75%) patients were male and 62 (25%) were female. The mean age was 32.5 years – the youngest child was 2 years old and the oldest person was 68 years. One hundred and sixty-one patients were adults (65%) and 87 (35%) patients were categorised as paediatric (younger than 16 years). In the paediatric group 58 (66%) were boys and 29 (34%) were girls.

The right eye was injured in 116 (42%) patients and the left eye in 104 (37.7%). Both eyes were affected in 28 (20.3%) patients.

Patients younger then 33 years account for 82% of all the RTA ocular trauma.

The time of presentation at the Hospital, after the injury, was usually within 24 hours (73%). Table 1 gives the 'time since injury' which included 15 (6%) patients presenting after 48 hours.

Table 1: Time of Presentation

Time Since Injury	No. of Patients (%)
Within 24 hours	181 (73%)
Within 48 hours	52 (21%)
Within one week	8 (3%)
Longer than one week	7 (3%)

Severe lacerating injury involving the eye
Photo: John Sandford-Smith

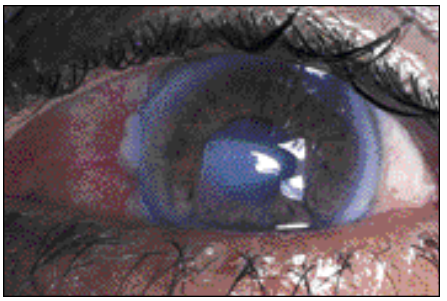
Nature of the Injury

Most of the accidents were due to collision of one car with another vehicle, often in head-on impact overtaking on one-way routes, or at road traffic crossings. At times the injury was caused by a careless driver injuring a pedestrian.

Glass-splinters from the windscreen caused cut wounds to the face, eyelids, conjunctiva and corneas. Rupture of the globe occurred. In some cases the injuries were limited to the external eye only with

Table 2: Types of Injury

Injuries	No. of Patients (%)
Extraocular	
Eyelid bruising	104 (37.7)
Eyelid oedema	98 (35.5)
Eyelid laceration	49 (17.8)
Avulsion of extraocular muscles	12 (4.5)
Orbital rim fracture	3 (1.1)
Anterior Segment	
Subconjunctival haemorrhage	117 (42.4)
Corneal abrasions	84 (30.4)
Corneal perforations	129 (46.7)
Scleral perforation	64 (23.2)
Hyphaema	138 (50)
Iris injury	164 (59.4)
Traumatic angle recession	29 (10.5)
Traumatic cataract	88 (31.9)
Lens dislocation	21 (7.6)
Posterior Segment	
Vitreous haemorrhage	65 (23.6)
Commotio retinae	55 (19.9)
IOFB	
Intraocular foreign body (IOFB)	27 (9.8)
Globe	
Ruptured globe (with prolapse of uveal tissue, lens and vitreous)	27 (9.8)



Angled corneal laceration

Photo: John D C Anderson

superficial abrasion to the cornea. In some instances, for example, pieces of glass and the frame of the spectacles pierced the eye causing a perforating injury. In a few instances the steering wheel and dashboard were struck by the forehead, face and the eye causing severe blunt trauma. Rarely, a fracture of the orbital margin resulted.

Table 3: Operations Required

Operating Procedure	No. of Patients %
Extraocular	
Eyelid repair	49 (17.8)
Anterior Segment	
Canalicular repair	5 (1.8)
Conjunctival repair	19 (6.9)
Corneal repair	129 (46.7)
Sclero-corneal repair	64 (23.2)
Paracentesis	14 (5.1)
Lensectomy	88 (31.9)
Posterior Segment	
Vitrectomy/Retinal detachment surgery	37 (13.4)
Globe	
Enucleation	9

Intraocular foreign bodies or extraocular foreign bodies impacted in the soft tissues of the eyes or adnexae. It was not possible to distinguish whether the glass fragments were from windscreen glass or spectacle glass.

None of the patients was wearing the safety seat belt.

Diagnosis (Table 2)

More than one injury was noted in 174 (65%) of the eyes which had severe trauma. The types of injury sustained by the patients is given in Table 2.

Surgery (Table 3)

Table 3 lists the surgical procedures required following injury.

Visual Acuity (Table 4)

Post-treatment visual acuity was affected directly in proportion to the intensity of the trauma, whether blunt or sharp fragments. Perforating injuries of the cornea and sclera led to gross visual loss (Table 4).

Discussion

The Trauma Centre of the Central Hospital recorded a total number of 18,903 general trauma cases in the 24 months of the study. Of these, 1992 patients were admitted for medical and surgical treatment.

The Tripoli Eye Hospital recorded eye injuries in 5420 persons, of which 1210 were admitted to the Hospital. This total included 552 paediatric patients and 658 adults.

Of the 1210 trauma inpatients, the number requiring admission with ocular trauma due to road traffic accidents was 248 (20.5%). During the same period the Trauma Centre admitted 1922 RTA patients. Thus the percentage of road traffic accidents causing ocular trauma is 12.5%.

Table 4: Post-treatment Visual Acuity in 276 Eyes

Visual Acuity	No of Patients (%)
6/6	84 (30.43)
6/9–6/18	85 (30.79)
6/24–6/60	54 (19.59)
C.F at 5 metres to C.F. at 1 metre (CF = Counting Fingers)	44 (15.94)
No light perception	9 (3.28)

Negrel and Thylefors report that many studies have found over 85% of RTA eye injuries were a consequence of passengers not wearing seat belts.[1] A dramatic decrease in RTA eye injuries was confirmed by studies in the United Kingdom after seat belt legislation was introduced.[2]

Recommendations for the Prevention of Ocular and Orbital Injuries in Road Traffic Accidents

1. Passengers sitting in the front seats more commonly sustain ocular trauma.
   - The use of safety seat belts must be made compulsory.
   - All road vehicles must have laminated glass windscreens.
2. The practice of sitting younger children on the lap of a parent on one of the front seats should not be allowed.
3. There is urgent need for education of the public through the use of news media and television programmes.
   - The requirement of wearing seat belts
   - Observation of the rules of the road
   - Punishment for reckless driving and dangerous overtaking
4. The use of unbreakable plastic spectacles should be encouraged.
5. Road markings, guiding traffic and drivers, need to be re-painted more frequently. Paint should be fluorescent so as to be clearly visible during darkness.

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Setting up an Eye Service in the Republic of Benin

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Objective

The reason for writing this paper is to record the evolution of a new eye service in a West African country. Some of the problems encountered are discussed.

Introduction

The Republic of Benin, formerly Dahomey, is situated on the west coast of Africa, bordered by Nigeria to the east, Togo to the west and Burkina Faso and Niger to the north. Benin is less than half the size of the United Kingdom (112,622 km^2), with a population of around five million,[1] 64% living in rural areas. Life expectancy is estimated at 54 years. The gross national product was 370 US $ per head in 1994.

Health care is provided by the government medical service through hospitals and bedded dispensaries in the towns, by a network of independent and church-based hospitals and by private practitioners (doctors and nurses) in the cities. There is a medical school in Cotonou producing 25 doctors each year. There is no post-graduate speciality training in ophthalmology.

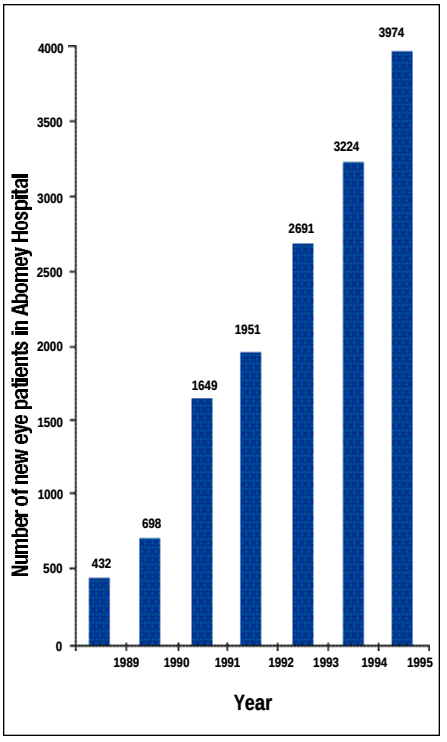

Table 1: New Eye Patients in Abomey Hospital, 1989–1995

Over half the population (56%) lives by agriculture and fishing. The main crops are maize, rice, yams, peanuts and beans. Mangoes and papaya are found throughout the country, and, in the south, citrus fruits, coconuts, bananas, plantains and pineapples are abundant. Cotton and palm oil are exported.

The climate in the south is tropical, warm (23–34°C) and very humid (80–95%) with rain (1100 mm per year) during nine months of the year. The north is drier, less humid, with only five months of rainfall. In December and January, a dry cold wind, full of dust (harmattan) blows, especially in the north.

Ophthalmic services are inadequately developed. In 1990 there were five Beninois ophthalmologists, four based in the University Hospital in Cotonou (economic capital), and one in the regional hospital in Porto-Novo (administrative capital). Both these cities are on the coast and 30 km apart. There were no other ophthalmologists (national or expatriate). However, the church hospitals at Bembereke (530 km north of Cotonou) and at Tanguieta (585 km from Cotonou) both had busy eye clinics. There were no other permanent ophthalmic services. Of approximately 250 cataract operations carried out in 1990, 80% were operated on in these two northern hospitals.

The 200 bed regional hospital in Abomey (130 km north of Cotonou), Centre Hospitalier Départemental, was built in the 1980s. A small ophthalmic consulting room was fully equipped but there was no available ophthalmologist. Once or twice a month an ophthalmologist from Cotonou would hold an outpatient session. The author was seconded by Christoffel Blindenmission (CBM) to the Ministry of Health, from 1990–1996, when national ophthalmologists were appointed to take over the clinic.

Results

1. Training

In 1990 there was one ophthalmic nurse in Abomey who was within six months of retirement. Two young state registered nurses were recruited and began work in 1991. Neither had any prior knowledge of ophthalmology.

At the 'Institut d'ophtalmologie tropicale en Afrique' (IOTA) in Bamako, Mali, there is a two year diploma course for the training of general nurses to become 'Infirmier spécialiste en ophtalmologie'. The diploma is recognised by the 14 francophone states of west and central Africa. CBM provided scholarships for the two nurses, and also for the third nurse who was recruited to cover the study leave of each of the others. The first year is held at I.O.T.A, the second is a year of supervised work at their hospital of origin. Those who benefit most from this training are nurses who have worked for about a year in an eye clinic before beginning formal training and who are eager to learn.

2. Outpatient Work

After a slow start, the number of new patients increased (Table 1) so that by 1995 the team was seeing up to 50 outpatients a day, including 15–18 new patients.

3. Eye Surgery

The number of eye surgeries increased from an average of 7 per week in 1991 to 14 per week in 1993 and 21 per week in 1995 (Table 2). Table 3 shows the major types of surgery performed. Cataract surgery (ICCE) predominated, with 52% of all cases in 1995. Operative treatment for chronic open angle glaucoma is the only practical alternative in rural Africa, as supplies of beta-blockers or pilocarpine are expensive when available and patient compliance over a long period is very poor. Our usual anaesthetic was a retrobulbar block, using 2% plain lignocaine. The complication of retrobulbar haemorrhage occurred in less than 1:200. We could have operated on many more cases of pterygium but our policy was to advise surgery only when the visual acuity was reduced by the pterygium.

The sex distribution in the cases of cataract surgery, showed an equal distribution. The first hundred cases were accumulated over 14 months, whereas four years later it took only three months.

At the beginning there were four male glaucoma patients for every female, but this reduced over time. Table 4 shows the age and sex distribution of the first and last hundred patients having trabeculectomy in Abomey, 1990–1996. The first hundred cases were accumulated over a period of two years and ten months. The last hundred had surgery over a ten month period.

Over the six years, 188 children (under 15 years) underwent eye surgery. Of the 287 operations, 96 (33%) were for cataract and 56 (19.5%) for glaucoma (Table 5). The usual anaesthetic was ketamine, given either by the IM or IV route. There was one anaesthetic death in a girl of four.

Of the 96 cataract operations in children, 42 patients had a bilateral procedure and 60% of the cataract operations were performed in children over the age of five years. Of the 56 trabeculectomies on 22 patients, all but one patient had a bilateral operation. Most eyes (75%) were operated on before the patient was a year old. Five children needed second bilateral procedures and three needed a repeat trabeculectomy in one eye.

4. Outreach work

One day a week was reserved for outreach work. A typical day would involve driving a hundred kilometres to a small town, examining between 70–150 patients and driving home in the afternoon. Clinics were held in dispensaries, small hospitals, schools or village centres. The car was donated by CBM.

Discussion

In March, 1990, a national survey was undertaken by the World Health Organization to measure the prevalence of blindness (visual acuity < 3/60), and visual impairment (<6/18–3/60) and to assess the essential ophthalmic requirements for Benin.[2]

The principle results were:

- Prevalence of bilateral blindness 0.63% = 28,000 people
- Prevalence of visual impairment 2.5% = 120,000 people
- Prevalence of unilateral blindness 1.1% = 51,000 people

Cataract was the principle cause of bilateral blindness (54%) and visual impairment (64%). Glaucoma accounted for 15% of bilateral blindness and corneal pathology was responsible in 11%.

Seventy-two thousand cases of cataract needed surgery, of which an estimated 15,000 were already blind and 580,000 people were in need of spectacles. Trachoma was found in the north of Benin and caused 1% of blindness. However, an estimated 4,000 people have trichiasis and are at risk of losing sight.

The report ended with the following conclusions:

1. The need to establish a national committee for the prevention of blindness.

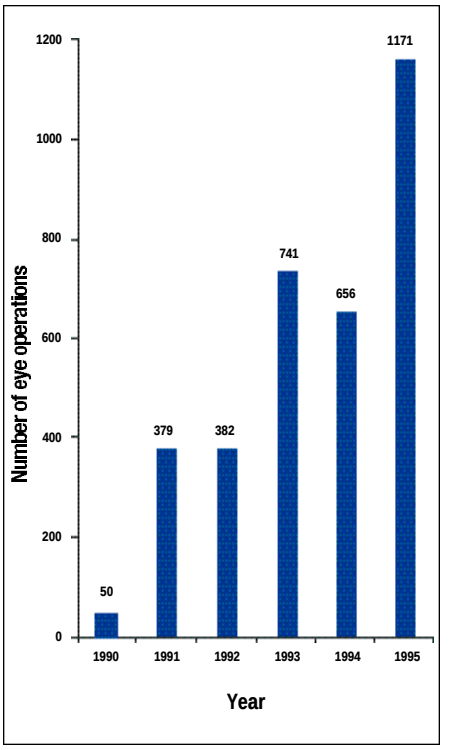

Table 2: Eye Surgery – Abomey Hospital, 1990–1995

2. The need for co-ordinated action to reduce blindness from cataract by developing surgical services in regional hospitals and by the training of personnel.
3. The large need for the provision of affordable spectacles by the creation of optical workshops.

The author's priorities upon arrival in Abomey were therefore:

1. To establish an eye care service to all sections of the community by the use of appropriate technology at affordable prices.
2. To emphasise the surgical treatment of cataract, glaucoma and trichiasis.
3. To train nurses in eye care.
4. To develop an outreach service by holding eye clinics in peripheral towns and to perform eye surgery where suitable facilities existed, as close to the patients' homes as possible.

Many African countries have only one ophthalmologist per million population and they usually work in the major cities. Benin in 1990 was therefore typical in this respect, with nearly five million people and five national ophthalmologists in the capital cities. The number of surgeries performed was low because the cost of surgery to the patient was high and because surgical equipment (instruments, sutures, etc) was hard to obtain. By 1996 Benin had a ratio of one ophthalmologist per 400,000 population.

Table 3: Comparison of All Eye Surgery, 1991, 1993, 1995

	1991	1993	1995
Cataract	173 (45%)	431 (58%)	618 (52%)
Trabeculectomy	66 (17%)	86 (11.6%)	232 (19.8%)
Pterygium	40 (10%)	32 (4%)	37 (3%)
Evisceration	20	26	39
Enucleation	3	4	7
Exenteration	0	1	1
Entropion repair	3	6	18
Optical iridectomy	3	5	10
Peripheral iridectomy	8	5	6
Lateral tarsorrhaphy	3	4	1
All others	60	141	202
Total	**379**	**741**	**1171**
	No retrobulbar haemorrhage	3 retrobulbar haemorrhage	5 retrobulbar haemorrhages 1 anaesthetic death: child aged 4 I.M. Ketalar

Table 4: Glaucoma Surgery in Abomey

	Trabeculectomy			
	First hundred patients		Last hundred patients	
	October 90 – August 93		October 95 – July 96	
Ages	**M**	**F**	**M**	**F**
<19	12	1	2	4
20–39	10	3	10	2
40–59	32	6	24	10
60–79	26	9	27	19
80–	1	0	2	0
Total	81	19	65	35

It is important when setting a scale of patient fees not to erect a financial barrier to the patient. In Abomey we set the cost of cataract surgery at around half a month's average salary. A pair of spectacles was sold for a sum equivalent to three days work. Our spectacles were imported ready-made from India, and the hospital made a small profit on each pair sold which was used to subsidise other eye care services.

The more eye surgery performed, the cheaper each operation may become.[3] CBM provided surgical equipment, medicines and sutures. However it would have been possible to purchase these items using patients' fees. The capital to purchase the vehicle for outreach work however could not have been raised locally. The revenue from a busy surgical eye department can substantially increase the income of a general hospital and cover the salaries of other members of staff.

Although this new service became busy it failed to achieve the targets set by the 1990 WHO report. No progress was made in integrating national ophthalmologists into the project. The aim of making eye treatment accessible and affordable did not appeal to all medical colleagues. There is genuine suspicion of generic prescribing, standard strength spectacles, 'appropriate' technology and outreach work in unsophisticated settings. Motivation is also a factor that needs to be faced.

Table 5 : Eye Surgery – Children Under 15 Years

October 1990 – July 1996		
Cataract	96	(33.4%)
Trabeculectomy	56	(19.5%)
Evisceration	25	(8.7%)
Probe (nasolacrimal duct)	16	(5.5%)
Cut post-cataract membrane	13	(4.5%)
Removal FB	11	
Optical iridectomy	11	
Enucleation	11	
Repair perforation of cornea	10	
Excision conjunctival papilloma	9	
EUA	8	
Incision, drainage abscess	7	
Trichiasis	4	
Chalazion	2	
Orbital lipoma	2	
Others	6	
TOTAL	**287**	

Difficulties that still need to be overcome include the equipping of regional hospitals with surgical and diagnostic materials for eye work, the practical surgical training of ophthalmologists in cataract and glaucoma surgery and the encouraging of such personnel to serve the population from peripheral hospitals, resulting in a more equal distribution of human resources. Salaries for national ophthalmologists are low. Urban private practice thus becomes an attraction and a necessity for ophthalmologists who have families to support.

At present, eye centres are underused by patients. There are several reasons for this. Cost is certainly a major factor. Low incomes and rising inflation mean that eye care is not affordable to the elderly and blind who are often amongst the poorest members of any society. Basic medicines and routine surgery must be realistically priced. Patients who have travelled long distances should be treated promptly or they will return home never to reappear.

Ophthalmology has low priority in most Ministries of Health. In Africa, mother and child health, malaria, AIDS, tuberculosis and vaccination programmes rightly claim political attention. Prevention of blindness may be considered a luxury. To the individual, however, blindness is greatly feared. For it renders the person vulnerable, inactive and a burden on the immediate family.

Conclusions

There is a need for accessible and affordable eye care in rural Africa and Benin is no exception. Large numbers of patients remain blind from cataract because there are too few surgically trained ophthalmologists. There is a need to encourage and to motivate national ophthalmologists to work in regional centres. These centres need equipment. At present it is unrealistic to expect Ministries of Health to provide the finance for this. Non-governmental agencies from the developed world should continue to offer help in training suitably motivated doctors and nurses. Such training should be appropriate to the situation where the doctor or nurse will later work. The existing training programme of IOTA in Mali is insufficient to meet all the needs and new training centres are required.

Bilateral cataract in Africa

Photo: Murray McGavin

Eye care services, and particularly prevention of blindness activities, are important and can be made cost-effective and sustainable, providing policy makers and planners take into account both the needs of the patients and those of the health care providers.

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Endorsement of the Global Initiative Vision 2020: The Right to Sight

Dr Gro Harlem Brundtland
Director-General
World Health Organization

Global Declaration of Support

The Issue

There are 45 million blind people and a further 135 million people with serious visual impairment in the world today.

If urgent action is not taken these numbers will double over the next 20 years. This is unacceptable both from a humanitarian and socio-economic point of view.

Cost-effective interventions are available for all major blinding conditions.

The Problem

The resources available are insufficient to tackle the problem, particularly in developing countries where nine out of ten of the world's blind live. There is a lack of trained eye personnel, medicines, ophthalmic equipment, eye care facilities and patient referral systems.

The Solution

VISION 2020 – an international partnership between those working for blindness prevention has been formed. This is a new initiative to raise awareness, mobilise resources and develop national blindness prevention programmes with governments to prevent an additional 100 million people from being blind by 2020.

Launched in Geneva on 18 February 1999, VISION 2020: The Right to Sight is an unprecedented global partnership aiming to eliminate avoidable blindness by the year 2020. The partnership involves the World Health Organization, the Task Force of the International Agency for the Prevention of Blindness (currently consisting of the International Agency for the Prevention of Blindness, Christoffel Blindenmission, Helen Keller International Inc., ORBIS International Inc., and Sight Savers International), international non-governmental organisations, philanthropic institutions and other bodies and individuals working with national governments.

VISON 2020's mission is:

'to eliminate the main causes of blindness in order to give all people of the world, particularly the millions of needlessly blind, the right to sight.'

Dr Gro Harlem Brundtland

Photo: WHO

Endorsement

In recognition of the fact that 100 million people will needlessly go blind by the year 2020 unless joint global action is taken now, please endorse this initiative by signing below.

Signature: Gro H. Brundtland
Date: **18 February 1999**
Name: **Gro Harlem Brundtland MD MPH**
Position: **Director-General World Health Organization**