MEETING THE CHALLENGE OF DIABETIC BLINDNESS IN THE 90's

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ABSTRACT

Diabetic retinopathy is a leading cause of blindness in adults in Singapore and it is increasing in incidence. The difficulties and problems of screening for diabetic retinopathy were discussed as well as strategies laid out for overcoming this disease of national importance. Cost considerations and savings in health costs were also discussed.

The authors suggested ways of instituting a nation-wide Diabetic Screening and Education programme with hospital diabetic centre based clinic as well as a mobile screening service. A five-year screening plan as well as the costs and equipment necessary for such a programme were examined.

Keywords: *Diabetic retinopathy, diabetic screening programme, diabetic blindness, ophthalmoscopy, non-mydriatic fundal camera.*

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INTRODUCTION

Diabetic retinopathy is well documented as a leading cause of visual loss in adults in developed countries. Singapore is not spared this devastating diabetic complication.

An island-wide diabetic survey in 1975[1] found a prevalence rate of diabetes of 1.99% in the Singapore population aged 15 years and above. Based on a population of 2.25 million then, the number of diabetics was estimated to be 46, 307.

A more recent study done in 1985[2] reported the prevalence rate of diabetes to be 4.7%, representing a 135% rise over the 10-year period between the two studies. In this study, it was stated that the prevalence rate of diabetes in the 1975 survey[1] was probably an underestimate as glycosuria was used as a screening method.

With an increasing population size and a rising prevalence of diabetes, one can expect the estimated total number of diabetics to be very much more than the 1975 estimate of 46,307. This growing problem of diabetes is significant and a cause for concern.

The prevalence of diabetic retinopathy varies from 8.5%[1] (using direct ophthalmoscopy) in a general population cohort to hospital-based figures of 18.8%[3] (using fundal photography) and 38%[4] (using direct/indirect ophthalmoscopy). Even if the lowest prevalence figure is reflective, diabetic retinopathy is still a leading cause of blind registrations in adults.

In another hospital-based diabetic retinopathy screening programme conducted in Alexandra Hospital from 1987 to 1989[5] (using direct/indirect ophthalmoscopy), a significant 13.3% of eyes with diabetic retinopathy had sight threatening retinopathy. Left undetected, many of these potentially treatable eyes would have been lost.

Improved medical care, longer life expectancy and affluence mean that the problem of diabetic retinopathy which is time related will become a more acute problem.

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DETECTING DIABETIC RETINOPATHY - THE PROBLEMS

1. The majority of diabetics are being treated at the primary health care level (general practitioners and outpatient departments.) The only widely available instrument in such practices is the direct ophthalmoscope. Diabetic fundi are, however, very difficult to visualize with the direct ophthalmoscope. The small field of view coupled with frequently associated cataracts and poorly dilating pupils add to the problem of detecting diabetic retinopathy.
2. The sheer number of diabetics in Singapore also means that hospital based screening efforts will only reach a small percentage of the diabetics. The present system in most hospitals where the diabetic fundus is screened only by ophthalmologists and physicians in the setting of a busy clinical practice is again unsatisfactory.
3. Many diabetics are not aware that diabetes can potentially blind the eyes. The implications are that unless they are referred for screening, they will not do so on their own.
4. Diabetics with good vision are often not sufficiently motivated to go for fundal examinations. Those with impaired vision who do get screened are often beyond the stage of medical help[6].

THE HIDDEN COSTS OF DIABETIC BLINDNESS

The economic cost of diabetic blindness must run into millions of dollars every year. This includes the costs of complicated and expensive eye surgery for late stage diabetic eyes, the cost of rehabilitation of a blind diabetic, the loss to the economy of a previously active contributing member of the work force.

For the price of a single expensive eye procedure (vitrectomy) for treating late stage diabetic retinopathy, up to 1,000 diabetic patients can be examined and screened by the use of fundal photographs. Retinal photography offers a reasonably reliable means of detecting diabetic retinopathy[7,8].

If 10% of the diabetics can be prevented from going blind, the cost savings to the nation will be most significant. Considering the number of diabetics in Singapore, the rising diabetic

prevalence rate with duration of diabetes as well as the increased prevalence of diabetes itself, the reduction in health costs will be staggering with an effective Diabetic Retinopathy Screening Programme.

Counteracting diabetic blindness

Measures to significantly reduce the incidence of blindness from diabetes would have to be through various fronts, notably:

1. establishing a nation-wide diabetic screening programme
2. education and training (of medical staff and patients)
3. adequate treatment and follow-up facilities.

A Nation-Wide Diabetic Screening Programme

A hospital-based or Diabetic Centre based screening clinic coupled with a mobile clinic can be established as an initial measure.

Initial screening efforts should be targetted at the high risk groups to ensure maximum benefits in terms of those with sight threatening diabetic retinopathy.

A. Hospital/Diabetic Centre Based Clinic

a) Establish a centralised screening clinic located preferably in a multidisciplinary Diabetic Centre set up. Physicians, ophthalmologists, orthopaedic surgeons, nutritionists, occupational therapists, podiatrists, nurse educators and other professionals involved in diabetic care can come together to provide quality diabetic care and counselling in a conducive environment. Alternatively, hospital based screening programme can be expanded and centralised.

b) Establish and publicise a "hot line" where diabetics can phone in for screening appointments.

c) Computerise records of diabetic patients so that appointment reminders can be sent to patients. Programme "defaulters" can also be reached and encouraged to get back into the programme.

d) The possibility of setting up a National Diabetic Register should be explored (ie making diabetes a registrable medical condition). A health-booklet containing dosages, medical findings, test results and appointments can be given to each diabetic patient (akin to the maternity and child health booklet).

e) Establish screening referral guidelines so that high risk groups, especially those with long duration of diabetes are reached. At a later stage, when resources allow, all diabetics should be screened at least once a year.

B. Mobile Screening Service

a) Provide regular screening services covering the various constituencies. A publicity programme can be co-ordinated by each constituency to ensure maximum coverage of the high-risk group. Liaison should be made with voluntary organisations involved in diabetic eye screening so as not to duplicate services.

b) A mobile exhibit to educate diabetics on diabetic care and complications can be launched at the same time during the screening programme. This can be in the form of posters, educational videos, distribution of information pamphlets and self testing vision charts.

c) The Diabetic Retinopathy Screening Programme can be conducted together with other health and counselling programmes like cholesterol tests, blood pressure checks, talks and seminars.

A FIVE-YEAR SCREENING PLAN

1. Projected Coverage (First Year)

a) Hospital based/Diabetic Centre screening clinic

Thirty patients per day (x5 days/week)
= Six hundred patients per month

b) Mobile clinic

Forty patients per day (x5 days/week)
= Eight hundred patients per month

Projected total number of patients screened (first year) is 16,800 persons.

2. Projected Coverage (Next 4 Years)

a) With adequate staffing and publicity, the number screened can be expected to increase by 10% annually.

b) Five year projected coverage (previously unscreened patients)

	New Patients
First year	16,800
Second year	18,480
Third year	20,328
Fourth year	22,360
Fifth year	24,596
Total number screened	102,564

c) The majority of the unscreened patients can thus be reached within the first five years if the programme is implemented fully. With more resources and manpower the same results can be achieved within a shorter period of time. Adequate resources and manpower will also need to be provided for follow-up and treatment of screened patients.

3. Costs Considerations

A detailed cost analysis of the hospital based/diabetic clinic based programme as well as the mobile clinic based diabetic retinopathy programme would be necessary before implementation.

Cost of equipment, its maintenance, the polaroid films as well as staffing costs will need to be considered. Essential equipment include the direct ophthalmoscope, the indirect ophthalmoscope, the non-mydriatic fundal camera, the tonometer, a refractometer and a slit lamp microscope.

A mobile display system for displaying educational materials and a video system for screening educational videos would also be necessary.

An estimate of the fixed and recurrent costs (at current prices) of implementing the screening programmes shows that the hospital based/diabetic clinic based and the mobile clinic based programme would cost in the region of $150,000 (Singapore dollars) each for the first year. The costs of equipment account for the major expenditure in the first year and is non recurrent, apart from the maintenance cost.

As projected earlier, with the full implementation of both programmes, it is possible to screen 16,800 diabetics in the first year and at least 10% more in each subsequent year. All things considered, the cost of screening is not excessive. It would cost much more to treat late stage diabetic retinopathy and rehabilitate the blind diabetics. There is also a great loss to the nation of many economically active diabetics in the prime of their careers.

4. Education

a) Through mobile exhibits (as part of the mobile screening programme).

b) Publicise the screening services through various media, such as the television, newspapers, magazines and journals like the "Discipline" (publication of the Diabetic Society of Singapore).

c) Conduct regular public talks and seminars on diabetes through various channels (eg community centres, Diabetic Society of Singapore, etc).

d) Establish a permanent "Diabetic Education Museum" in the set up of a Diabetic screening centre.

5. Training

a) Regular updates on "Recognising Diabetic Retinopathy" for doctors involved in the management of diabetic patients.

b) Train interested medical practitioners in the use of the binocular indirect ophthalmoscope, a simple, effective and time-honoured means of diagnosing diabetic retinopathy. This instrument is superior to the commonly used direct ophthalmoscope and should be made available to medical units, especially to Endocrinology departments.

c) Training a regular core of nurses, nursing aides, interested volunteer workers in vision checking and the use of the non-mydriatic fundal camera and other available equipment.

6. Adequate Treatment And Follow Up Facilities

Laser is still the mainstay of treatment for patients with sight-threatening retinopathy. Although available in most major hospitals, more laser facilities would have to be provided in tandem with the screening efforts. It is also necessary to ensure that existing laser facilities are efficiently utilised.

Patients who are newly screened will need to have regular follow-up to ensure the continual success of the blindness prevention programme. This also means that the screening workload will increase with time.

Decentralisation offers a possible solution to the future problem of heavy demand for screening services. Diabetic screening centres in various "zones" manned by trained outpatient doctors can help to alleviate the workload on the centralised screening and treatment facilities manned by ophthalmologists and diabetic physicians.

CONCLUSION

Diabetic retinopathy blindness is a largely preventable condition. The tragedy lies in the fact that early detection and treatment can save more than 50% of eyes[6], yet the number of needless blindness is rising year by year.

A well-organised and co-ordinated nation-wide diabetic screening and treatment programme will do much to reduce the incidence of diabetic blindness. A multi-disciplinary and well co-ordinated diabetic team in the same token is essential if we are to see a reduction in the number of various diabetic complications.

REFERENCES

1. Cheah JS, Lui KF, Yeo PPB, Tan BY, Tan YT, Ng KY. Diabetes Mellitus in Singapore: Results of a country-wide population survey. In: Cheah JS. ed. Proceedings of 6th Asia and Oceania Congress of Endocrinology 1978:227-38.
2. Thai AC, Yeo PPB, Lun KC et al. Changing Prevalence of Diabetes Mellitus in Singapore over a Ten Year Period. J Med Assoc Thai 1987:63-7.
3. Chew SJ, Hart PM, Ang BC. Ocular Findings in an Ophthalmic Survey of Diabetics in Singapore. Transactions of Asia Pacific Academy of Ophthalmology, XI Congress, 1987.
4. Khoo DHC, Tan KT, Yeo KT, Chew W, Wong V, Tan YT. Diabetic Retinopathy - Results of a Two Year Screening Programme in two Medical Units in Singapore. Ann Acad Med, Singapore Endocrinology 1990;19:484-8.
5. Yeo KT, Yong V, Ng SH, Cheong P, Khoo D, Tan YT, el al. Results of Diabetic Retinopathy Screening in Alexandra Hospital. J of the Asean Federation of Endocrine Societies 1991;10(2):104-6.
6. Lim ASM, Jones BR. World's Major Blinding Conditions. Section II: Diabetic Retinopathy. 2nd ed. Singapore XXVI International Congress of Ophthalmology Singapore 1990:162-73.
7. Rogers D, Bitner - Clindzicz M, Harris C, Yudkin JS. Non-mydriatic retinal photography as a screening service for general practitioners. Diabetic Med 1990; 7:165-7.
8. Klein R, Klein B, Neider MW, Hubbard LD, Meuer SM, Brothers RJ. Diabetic retinopathy as detected using ophthalmoscopy, a non-mydriatic camera and a standard fundus camera. Ophthalmology 1985; 92:485-91.