

DIABETES MELLITUS: A CHALLENGE FOR THE COUNTRIES OF THE REGION¹

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Concerned about the rising diabetes morbidity and complications in the Americas, PAHO recently convened a committee of experts to study the problem. This article reviews the events underlying PAHO's concern and presents the committee's recommendations as to what should be done.

Introduction

Communicable disease control, increased life expectancy, and cultural and environmental changes linked to accelerated urbanization and industrial development in the countries of the Hemisphere are contributing to a notable increase in chronic disease.

We can assume, on the basis of available morbidity and mortality data, that the specific problem of diabetes mellitus will grow over the next 10 or 15 years in terms of both disease incidence and the frequency of complications. Right now the seriousness of the problem is reflected by the large number of diabetics who suffer, die, or become invalids as a result of their disease, the chronic nature of which often entails long periods of medical care and supervision. This situation involves extensive human and economic waste, since the disease can be prevented or treated specifically in most cases.

Data from the Inter-American Investiga-

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tion of Mortality, conducted a few years ago under auspices of the Pan American Health Organization, provided a basis for comparing mortality patterns in 10 Latin American cities, in San Francisco, U.S.A., and in Bristol, England. The investigation revealed high death rates from diabetes mellitus and from arteriosclerotic heart disease in diabetic patients—fatalities considered largely preventable because effective treatments for these diseases were known (1).

All these considerations led to a recommendation by the III Special Meeting of Ministers of Health of the Americas that was included in the Ten-Year Health Plan for the Americas covering the years 1971-1980. This recommendation affirmed that the present tendency toward a rising prevalence of diabetes mellitus should be reduced, within the context of control programs aimed at this and other chronic diseases associated with overweight—such as obesity and atherosclerosis (2).

As a result, the Pan American Health Organization convened a committee of experts from the Region for purposes of drawing attention to the importance of diabetes mellitus as a health problem and preparing appropriate recommendations for establishing and implementing control programs (3).

Prevalence of the Disease

Finding the true prevalence of diabetes mellitus is difficult, since our current concept of the disease involves more than an acute metabolic disorder. The tendency of elderly population groups to grow as life expectancy increases, together with advances in methods for diagnosing and treating diabetes, have altered the characteristics of the disease and have shed light on the importance of its complications. Hospital discharges, which reflect only part of the morbidity problem, show that the diabetes-related discharge rate per 100,000 inhabitants has shot up 15 to 20 times over the last 50 years, whereas the overall rate of hospital discharges (from all causes) has merely doubled (4).

Many countries of the Region possess little information on the prevalence of diabetes. Furthermore, in most cases the studies that are available do not reflect the real magnitude of the problem, due to difficulties of interpretation. For example, a study by Poon-King, *et al.*, in Trinidad (5) showed an overall prevalence of 1.89 per cent, but a prevalence exceeding 5 per cent among those over 40 years of age. Thus, as Table 1 also demonstrates, prevalence studies do not

adequately describe the characteristics of the populations surveyed, and if the diagnostic criteria used by different investigators are not the same, it is hard to draw valid conclusions or to compare the results obtained (6).

Besides the methods cited in Table 1, Mateo de Acosta in Cuba estimated diabetic morbidity using the Registry of Anti-Diabetic Drug Consumers. He found that in 1970 there were 44,808 registered diabetics, a total corresponding to 0.53 per cent of the population (7).

The optimum design for incidence and prevalence studies will vary according to the resources available, the types of tests used in screening or in confirming a diagnosis, and the established aims of the program involved. Mass screening of an entire population may be appropriate if resources and follow-up capabilities are adequate. If not, programs may be selected that will obtain a higher yield by concentrating on high-risk subgroups: close relatives of diabetics; obese subjects; pregnant women (especially those with a previous pregnancy that ended in perinatal mortality or a high birthweight infant); persons under 50 with a history of coronary heart disease or of peripheral or encephalic vascular disorders; subjects with hyperlipidemias; or, in general, persons over 35 years of age.

The diagnostic method recommended for the initial examination is determination of the patient's blood-sugar level two hours after administration of an oral carbohydrate load. This method has certain advantages over the alternative—detection of glycosuria—in that it is more sensitive and permits quantification of the results. In this regard, the Cleveland Diabetes Association, in a comparative study of cases found by detecting glycosuria and by measuring the blood-sugar level in the capillary blood two hours after a carbohydrate load, found that the latter method successfully identified twelve times more cases of diabetes than the former

TABLE 1—Results of some studies on diabetes morbidity in Latin America and the Caribbean area

Country or territory	Year	Prevalence (%)	Population surveyed	Detection methods used
Argentina	1967	6.0	37,000	O and PPG
Brazil	1966	2.7	1,000	PPG
Chile	1958	1.2	16,306	O and PPG
Colombia	1971	6.8	10,293*	PPG
Cuba	1970	3.8	8,186	PPG
Jamaica	1961	1.3	4,516	O and PPG
Mexico	1970	4.5	53,285	O and GTT
Trinidad	1961-1967	1.9	23,700	O and PPG
Uruguay	1966	6.9	484	GTT
Venezuela	1970	2.7	6,000	O

Source: S. Valiente and J. Behnke (6).

O—Glycosuria test

PPG—Postprandial glycemia test

GTT—Glucose-tolerance test

* Relatives of diabetics.

TABLE 2—A comparison of diabetes mellitus detection programs.

	Examination of urine ^a	Examination of capillary blood ^b
Total No. of subjects screened	802	3,810
No. of positive screening results	8	450 ^c
Glucose tolerance test: cases tested	5	382
Glucose tolerance test: positive results	4	242
Percentage of positive subjects	0.5%	6%

^a Clinistix, glucose oxidase.

^b Two hours after carbohydrate load.

^c Over 140 mg/100 ml.

(see Table 2). Nevertheless, local conditions, especially as they affect the resources that happen to be available, must in the final analysis determine the method used.

Design and interpretation of the blood-sugar test also require a certain uniformity of criteria. The American Diabetes Association has recently formulated guidelines (8) that involve four readings (one after fasting and the others one, two, and three hours after receiving a carbohydrate load). These classify plasma glucose values of 185 mg/100 ml after one hour and 140 mg/100 ml after two hours as abnormal, but recommend that these diagnostic levels be raised by 10 mg/100 ml per decade for subjects over 50 years of age.

The two-hour reading is the most discriminating. Two-hour values above 230 mg/100 ml generally correspond to subjects who have reduced glucose tolerance, while subjects with levels below 140 mg/100 ml rarely have abnormal tolerance. Various facts indicate that it is desirable to use relatively high levels for purposes of diagnosis. For one thing, it is necessary to consider the cost of repeating the test in doubtful cases, and for another there is uncertainty as to whether current therapy is effective in treating some types of patients with mild glucose intolerance.

Morbidity and Mortality

All available data indicate that the diabetes problem will grow in future years. Moreover, improved understanding of the disease and progress made in treating its metabolic defect have shifted attention to its chronic vascular and microvascular complications. These latter are important causes of blindness, amputations, kidney disease, neuropathies, and infection. In addition, there is a significant relationship between diabetes and cardiovascular diseases such as myocardial infarction, encephalic vascular problems, and arterial hypertension. In Chile, for example, diabetic patients spend 53 per cent more days in the hospital, on the average, than nondiabetics (4).

Mortality from diabetes is the indicator most often used to assess the importance and distribution of the disease. Nevertheless, mortality figures reflect only part of the problem. For one thing, the proportion of deaths that are medically certified is not uniform; for another, the Sixth International Classification of Diseases and Causes of Death (10) requires that only one disease be listed as the underlying cause of death, even when other diseases were directly related to the event. Thus, in the case of diabetes mellitus the disease is not usually listed as the underlying cause of death because other more obvious causes were present, even though these were often a direct or indirect consequence of the diabetes.

Tokuhata, *et al.* (11) have recently brought this problem into focus. A review of 1968–1969 death certificates in the State of Pennsylvania showed that the rate of death attributed to diabetes was only a fraction of the true rate, if one analyzed other conditions clearly related to that disease that were cited as the underlying cause of death, and if the 8 per cent of the diabetics whose disease was not mentioned on the certificate were also taken into account. This investigation showed that of 20,000 deaths occurring among diabetics in one year, only 2,700

TABLE 3—Crude and age-adjusted death rates per 100,000 inhabitants in 22 countries of the Americas.

Country (in order of decreasing crude death rates)	Ranking in terms of crude mortality	Crude mortality rates	Age-adjusted rates
Barbados, Trinidad and Tobago, Jamaica, Uruguay and Argentina	1-5	39.0 to 20.3	33.8 to 11.0
United States, Mexico, Canada, Costa Rica, Chile, and Cuba	6-11	18.7 to 10.3	16.9 to 7.0
Panama, Venezuela, Paraguay, Colombia, and Nicaragua	12-16	9.5 to 5.0	10.6 to 6.3
Dominican Republic, Ecuador, El Salvador, Guatemala, Peru, and Honduras	17-22	4.7 to 2.5	5.6 to 3.4

Source: Pan American Health Organization. *Health Conditions in the Americas, 1969-1972*, Washington, D.C., 1974, p. 151 (PAHO Scientific Publication, No. 287).

were attributed to diabetes, thus revealing that the certificates clearly failed to reflect the true magnitude of the problem.

Table 3 shows the rates of diabetes mortality reported in 22 countries of the Hemisphere, clearly indicating the importance of the disease in the Caribbean area (12).

Future Prospects

Control of the diabetes problem requires an organized effort by all the countries of the Region. As a first step, consideration should be given to establishing an adequate registration system that would provide a basis for planning control programs. Programs of primary prevention, except for obese subjects, are hard to envisage at present. On the other hand, secondary prevention is feasible and should be stressed—through mass education campaigns for diabetics, their families, health professionals, and the general public; via early detection of cases in high-risk groups; by means of case registration and follow-up; and through development of a system of comprehensive medical care.

Right now it is hard to relate the therapeutic measures taken to control diabetes with prevention of its complications. Nevertheless, special emphasis should be placed on the need to pursue the best course of treatment in each individual case. This assertion has special meaning in Latin America and the Caribbean, where most of the diabetic patients belong to groups with a low social, economic, and cultural status. The forementioned group of PAHO experts has indicated, on the basis of its members' experience, that there is excessive use of hypoglycemic drugs (employed in 60 per cent of the cases) at the expense of diet therapy alone (used for 20 per cent). The latter should play a much more prominent role, especially among the obese adults with a stable condition who constitute most of the cases. The fact that so few patients are treated through diet alone is largely attributable to lack of training among the professionals prescribing treatment, the difficulty of changing ingrained dietary habits, especially among the obese, and problems that arise in adapting traditional diets (which are usually expensive) to the socioeconomic level of the patient.

The subject of hypoglycemic drug overuse must be analyzed carefully on the basis of a survey made by 12 United States groups (the University Group Diabetes Program). This survey pointed toward an association between the use of such drugs and higher mortality from cardiovascular diseases in diabetic patients (13,14). Although it is true that the *ad hoc* Committee of the Biometric Society, recently charged with reviewing the data from the study, has been more cautious in its conclusions (15), these findings should be taken into account and should be used to stimulate development of similar studies.

Although innumerable questions about diabetes remain to be answered, scientific research has made impressive strides over the past decade and has greatly increased our knowledge of the physiopathology of the disease. One of these forward steps was the discovery of proinsulin by Steiner, *et al.* (16), the first indication as to the mechanism of insulin synthesis in the pancreas and the presence of two forms of immunoreactive insulin. More recent studies have confirmed the presence of insulin receptors in liver and fatty tissues and in thymic lymphocytes of rodents by using marked insulin of high specific activity, and have suggested that insulin resistance may be related to a deficiency of these receptors (17). Other studies have provided excellent information on the mechanism by which stress contributes to development of the disease via secretion of growth hormone and production of an insulin-antagonist (18), on the pathogeny of the renal lesion of diabetes (19), and on the possible viral etiology of the disease (20). Great advances have also been made in treatment methods: photocoagulation with laser beams in treatment of diabetic retinopathy (21); employment of glucose sensors in conjunction with an artificial insulin-releasing device (22); and transplanting of insulin-producing cells from the islets of Langerhans (23).

It is clear that these continuing efforts

in the areas of basic and clinical research have added to our growing knowledge about the nature of diabetes mellitus. At the same time, it is clear that health authorities, health professionals, the general public, and the patients themselves confront an important challenge: to face up to the problem posed by a disease that appears widely prevalent and that, in our Region, is revealing more and more the consequences of its chronic nature and complications.

Recommendations of the PAHO Study Group

In seeking ways to meet this challenge, the PAHO Study Group has prepared the following general recommendations:

- Bring to the attention of the health authorities of the Governments of the Region the available background data demonstrating the importance of diabetes mellitus, in association with obesity and atherosclerosis, as a public health problem.
- Organize technical units for dealing with diabetes or noncommunicable chronic diseases at the ministerial or health service level.
- Help to improve knowledge of the real magnitude of the problem by means of a simple system of registration of diabetic patients. This registry would start with known cases in specific areas of countries where diabetes is a serious problem.
- Carry out multinational studies on the prevalence and incidence of diabetes in the countries of the Region, using standardized methods and covering representative population groups.
- Organize programs of comprehensive care for the diabetic patient, in accord with the existing health systems in each of the countries. These programs should be designed to increase coverage through the decentralization of patients from specialized

centers to the community care level. This is the only way of ensuring the usefulness of large-scale detection programs.

- Promote the teaching of diabetes in schools of medicine, nursing, nutrition, and related fields, in programs commensurate with the magnitude of the problem. At the postgraduate level, promote the preparation of specialists, courses for non-specialist physicians on the care of diabetic patients, and training of ancillary medical personnel in the field of diabetes mellitus and chronic diseases in general.

- Identify and strengthen approved centers in the Region with a view to research, teaching, and specialized care in regard to the disease.

- Promote educational activities for diabetic patients and the general public, with active participation of the community and interested organizations.

- Within each country, adapt the present methods of treatment to the local socioeconomic and cultural situation. This is particularly important for dietetic treatment and the correct prescription of insulin and oral hypoglycemic drugs.

- Promote basic, clinical, and epidemiologic research within the Region that is designed to cope with local problems and to help inculcate a better knowledge of the nature of the disease and its complications. Stress is placed on the importance of: studies on the poor showing of dietetic treatment, the factors affecting the develop-

ment of vascular complications, operations research on systems of care, and the association of obesity as a target factor in diabetes.

- In view of the increasing importance of diabetes mellitus in the Region, PAHO is urged to provide continuing attention to the problem, and to take an active role in the implementation of the recommendations of the Study Group. In this regard the Group also recommended:

- a) Establishment of a permanent monitoring mechanism, to ensure that these recommendations are translated into collaborative actions with the countries of the Region in their control programs.

- b) Coordination of multinational activities, with the collaboration of agencies such as the American Diabetes Association and local associations. Among these activities, priority should go to epidemiologic research, the registration program, and educational programs.

- c) The registry program should be started, with a common model, only in specific areas of some countries where diabetes is a serious problem.

- The World Health Organization is urged to incorporate a system of multiple cause coding in the 1978 Death Certificate, to facilitate meaningful analysis of diabetes-related conditions and to increase the usefulness of death certification data with respect to all chronic multisystem diseases.

SUMMARY

PAHO recently convened a meeting of experts on diabetes mellitus for purposes of underlining the importance of the disease as a health problem and developing recommendations to assist the countries of the Region in establishing control programs.

Existing data on the prevalence of diabetes mellitus in different countries are not comparable, since population samples are not always repre-

sentative and diagnostic criteria vary. Ten different countries set the prevalence figure at anywhere from 1.2 to 6.9 per cent.

Mortality from diabetes reveals only part of the problem, largely because of registration difficulties. The figures that are available, however, show that the situation is very serious in several Caribbean countries; that is, Barbados, Trinidad and Tobago, and Jamaica rank first, second, and

third, respectively, among 22 countries in the Americas.

The data now available on morbidity and mortality, expected population growth, and probable increases in the relative size of older population groups lead to the assumption that diabetes mellitus, together with its complications, will become an increasingly serious problem in the Region over the next 10 to 15 years.

Programs for the control of diabetes mellitus should include educational campaigns for patients, the public, and health professionals; early detection of the disease in high-risk groups; registration and followup of cases and the organization of systems for providing comprehensive care. Promotion of basic, clinical, and epidemiologic research directed at local problems and seeking

to acquire a better understanding of the nature of the disease and its complications is also highly recommended. Naturally, each country should adapt current methods of treatment to local socioeconomic and cultural circumstances, especially with regard to dietary therapy, prescribed insulin dosage, and use of the controversial oral hypoglycemic drugs.

Despite the important contribution that research can make to a better understanding of diabetes mellitus, it is the health authorities, the patients, and the public who still have the major task of coping with this increasingly prevalent disease, which more and more is revealing the consequences of its chronic nature and complications in our Region.

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