

DIABETES MELLITUS IN SAMOA: An Epidemiological and Quality of Care Review

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Abstract

Aim - To review the epidemiology of diabetes, risk factors, complications and quality of diabetes care in Samoa.

Method - Search of MEDLINE using the term diabetes, Samoa and other relevant keywords to identify all studies. All types of diabetes, impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) were included.

Results - We found four relevant articles. Analysis of the data reveals that a higher prevalence of type 2 diabetes was found in 1991 (compared to 1978) in each age group (except 25-34 year group) in both males and females. Prevalence of type 2 diabetes was higher in females. The age-standardised prevalence of type 2 diabetes in urban areas (13.4 percent females; vs 9.5 percent males) was higher than in rural areas (5.6 percent females vs 5.3 percent males) in 1991. Prevalence of obesity also increased from 26.8 percent to 46.6 percent in males and 47.2 percent to 65.3 percent in females during 1978-1991, with a higher prevalence in the urban population. Diabetes prevalence remained higher in urban (than rural) subjects after adjusting for differences in obesity and age. Proliferative diabetic retinopathy was found in 4.5 percent of known diabetes subjects in 1991. The same survey found elevated urinary albumin concentration in 15.0 percent with IGT, 26.0 percent in newly diagnosed diabetes and 23.4 percent in known diabetes subjects. A 2002 survey found diabetes prevalence to have increased to 23.1 percent (22.9 percent males; 23.3 percent females) and obesity 57.0 percent which showed an increasing prevalence in both males and females with higher rates in females and urban areas.

Conclusions - Prevalence of diabetes had increased during 1978-1991 and more than doubled by 2002. Data on the prevalence of undiagnosed diabetes, pre-diabetes or gestational diabetes are limited and/or outdated but for every diagnosed case of diabetes at least four undiagnosed cases can be estimated for the region¹. Diabetes prevalence was higher in females and urban populations consistently. The effect of obesity on glucose intolerance was not con-

sistently observed in Samoans. Prevalence of obesity had also shown a rapidly increasing trend during 1978-1991 and 1990-1995. Increase in diabetes prevalence could not be explained by the increase in obesity alone. Diabetes complications such as diabetic retinopathy and albuminuria were common in those with pre-diabetes and newly diagnosed diabetes.

Introduction

Diabetes Mellitus is a global health problem that causes a significant burden in many countries and has become an important cause of morbidity and mortality in developing countries, reaching epidemic proportions. Acute and long term complications of diabetes pose a significant economic burden on developing economies.

Type 2 diabetes (T2D) (previously known as Non Insulin Dependent Diabetes Mellitus) is the type found commonly in adults and results from an interaction between genetic predisposition and environmental factors resulting in a defect in insulin secretion and action. Pacific Island populations are known to have a high prevalence of this disease. According to the World Health Organization (WHO) 85-90 percent of diabetes in the Western Pacific Region (WPR) is type 2.

Diabetes is diagnosed using specific criteria and hyperglycaemia not high enough to diagnose diabetes is classified as "pre-diabetes." Pre-diabetes can be Impaired Fasting Glucose (IFG) when fasting plasma glucose is between 5.6-6.9 mmol/l or Impaired Glucose Tolerance (IGT) when two-hour plasma glucose is between 7.8-11.0 mmol/l. Pre-diabetes is a risk factor for the development of diabetes and cardiovascular disease. Lifestyle factors like obesity, inadequate physical exercise and a high fat low fibre diet are thought to promote the onset of T2D. Such lifestyle factors are associated with westernization and economic development in developing countries and therefore T2D presents as a major and growing public health problem in the Pacific¹.

This review discusses trends in prevalence of diabetes, risk factors, complications and quality of diabetes care in Samoa.

Prevalence of Diabetes and Obesity

The first study on prevalence of T2D in Samoa was conducted in 1978 and showed a high prevalence of diabetes and obesity. Obesity is a known risk factor for development of T2D. A follow up survey in 1991 using similar methods confirmed an increase in the age standardized prevalence of T2D and obesity during the 13 year period from 1978-1991. The age-standardised prevalence of T2D in urban areas (Apia) had increased from 8.1 to 9.5 percent in males and from 8.2 to 13.4 percent in females. In rural areas

(Tuasivi) the increase was from 2.3 to 7.0 percent in males and from 4.4 to 7.5 percent in females. In the other rural area included in this survey (Poutasi) the increase was dramatic (from 0.1 to 5.3 percent) in males, but minimal in females (5.4 to 5.6 percent). Age-standardised prevalence of T2D was consistently higher in females in urban and rural areas than in males². Another study into rural vs urban prevalence using similar methods found diabetes in the urban population to be more than two times that in the rural (7.0.1 percent vs 2.7 percent)³. A cardiovascular disease (CVD) risk factor prevalence survey during 1990-1995 found a diabetes prevalence of 3.3 percent in males, 5.4 percent in females, with the highest prevalence in females aged 55+ years⁴.

In surveys on ten Pacific Island (PI) populations, Mauritius and Rodrigues confirmed the high prevalence of obesity. Some populations had some of the highest prevalence of obesity in the world when data were presented as an aggregate and contributed to the risk of T2D. Investigators postulated a genetic susceptibility to obesity combined with high energy intakes and reduced physical activity as possible factors in the PI populations⁵. The CVD risk factor survey which included an urban - rural mix (Savaii, Upolu, Apia) found the prevalence of obesity to be 32.9 percent in males and 62.0 percent females⁴. Other investigators who consider PI as a group of diverse people have analysed data separately. They have also found Polynesians and some Micronesians to have a very high prevalence of obesity and diabetes but the cause for this was not clear. Some factors involved were thought to be related to urbanisation and migration⁶. Other investigators have found diabetes to be rare among indigenous Pacific populations maintaining a traditional lifestyle but high in urbanised Pacific populations⁷. The WHO STEPS survey (in 2002) found diabetes prevalence in Samoa to have increased to 23.1 percent (22.9 percent males; 23.3 percent females) and obesity to 57.0 percent which showed an increasing prevalence in both males and females with higher rates in females and urban areas⁸. Age standardised prevalence rates of diabetes are shown in Table 1.

The effect of obesity on glucose intolerance was not consistently observed in Samoans. An increasing age-standardised prevalence of IGT and diabetes was observed with increasing Body Mass Index (BMI) in males but not in females. Investigators noted that the urban-rural differentials in prevalence of abnormal glucose tolerance were altered little by adjusting for differences in BMI.

Therefore environmental factors such as diet, physical activity and stress, acting independently of BMI, must have contributed significantly to the observed rural/urban differentials of abnormal glucose tolerance⁹. However the 'SEARCH for Diabetes in Youth Study' on Asian, Pacific Islander and Asian-Pacific Islanders in the U.S. found most with T2D to be obese (Asian 71.0 percent ; PI 100.0 percent). PI consisted of Native Hawaiians and Samoans. All Asian, PI and

Asian-Pacific Islanders with T2D were obese confirming the association of obesity and T2D. However Asian and Asian-Pacific Islanders with diabetes (Type 1 and 2) had lower mean BMIs than Pacific Islanders. The majority of youth in all three subgroups had Type 1 diabetes (T1D) with older (10-19 years) youth having an incidence of T2D almost double that of T1D. In this study, diabetes type was reported by health care professionals or abstracted from medical records and confirmed that Micronesians are frequently affected by T2D but T1D was not common¹⁰.

Diabetes Complications

Data on microvascular complications (retinopathy, nephropathy, neuropathy) and macrovascular complications (cardiovascular disease, cerebrovascular disease, peripheral vascular disease) in Samoa is scarce. Diabetes is known to have a long time-lag between onset and diagnosis and many patients present with long term complications at the time of diagnosis. One of the earliest studies on prevalence of diabetic retinopathy and nephropathy in patients with T2D or IGT from Samoa was conducted in 1991 and found proliferative diabetic retinopathy in 4.5 percent of diabetes patients. Elevated urinary albumin concentration was found in 15.0 percent with IGT, 26.0 percent in newly diagnosed diabetes and 23.4 percent in known diabetes subjects confirming that diabetic complications are common¹¹.

Risk factors

Genetic factors cannot explain changes in prevalence, which are due to rapid changes in lifestyle and associated factors such as obesity, unhealthy diets, and physical inactivity¹². No reliable data are available on physical activity in Samoa. Risk factors associated with diabetes are now reasonably well understood but the prevention and control in the Pacific may not be straightforward¹³.

Extrapolation of data

Investigators have modelled the influence of the ratio of diagnosed: undiagnosed cases of diabetes, population demographic changes, age at onset of diabetes, mortality and incidence of diabetes on the prevalence of diabetes in Samoa over a five-year period. The expected increase in prevalence was from 11.7-17.9 percent over five years which is an increase by 53.0 percent¹⁴.

Treatment

The only data available on treatment showed that in 2002, 56.8 percent males and 68.5 percent females with diabetes were taking tablets and 4.0 percent males and 5.3 percent females were taking insulin as treatment¹⁵.

Conclusions

Data on the prevalence of diabetes complications are

Table 1: Age standardised prevalence (percent) of diabetes mellitus

Reference	Year of study		Diabetes prev. in Apia	Diabetes prev. in Tuasivi	Diabetes prev. in Poutasi	Diabetes prev. in Upolu	Diabetes prev. in Savaii	Diabetes prev. in Samoa
Collins VR, Dowse GK, Toe-lupe PM, et al	1978	Males	8.1	2.3	0.1			No data
		Females	8.2	4.4	5.3			No data
Collins VR, Dowse GK, Toe-lupe PM et al	1991	Males	9.5	7.0	5.4			No data
		Females	13.4	7.5	5.6			No data
McGarvey ST	1990 - 1995	Males	No data			No data	No data	5.4%
		Females	No data			No data	No data	3.3%
<i>McMurray C</i>	2002	Males	No data			No data	No data	22.9%
		Females	No data			No data	No data	23.3%
		Males & females	27.0%			19.7%	20.3%	23.1%

aged and not available to assess the extent of undiagnosed diabetes, pre-diabetes or gestational diabetes. Prevalence of diabetes and obesity was high and had shown an alarming increase from 1978. Diabetes prevalence was higher in urban population and in females. Increase in diabetes prevalence could not be explained by genetic factors or obesity alone. Diabetic retinopathy and albuminuria were common in known diabetes, pre-diabetes and newly diagnosed diabetes.

The WHO had identified Samoa among the 10 "fattest" countries in the world and it called upon the governments in the Asia-Pacific region through the Western-Pacific Declaration to undertake specific action for improving diabetes awareness and management in the region. Health planners and policy makers of the Samoa Ministry of Health have also identified T2D as a priority.

Optimal diabetes care requires an organised systematic approach by a team of health care professionals. In Samoa, diabetes care is provided by hospitals and community based physicians. Standards for diabetes

care have been specified by the American Diabetes Association (ADA) and International Diabetes Federation (IDF) for screening, diagnosis and treatment. These standards provide clinicians and health planners with process and outcome criteria (treatment goals). ADA standards are comprehensive while IDF global guidelines classify three levels of care, standard, minimal and comprehensive. IDF/WPR (Western Pacific Region) guidelines also contain clinical monitoring protocols. When constrained by resources and trained manpower the most pragmatic level of care can be targeted. The IDF/WPR guidelines have identified the need to improve diabetes care in most countries of the WPR. One strategy to meet this end is early diagnosis of diabetes and complications and effective management by allocation of adequate sustainable resources. Strengthening the capacity of national health systems to deliver and monitor equitable, affordable and effective diabetes services is important. Quality improvement beginning with the assessment of existing quality and audits carried out using structure, process and outcome criteria is a key strategy identified by the WHO for WPR¹⁶.

Primary prevention involves screening of high risk groups and promotion of healthy lifestyles. Lifestyle intervention studies have consistently shown that modest changes can reduce the progression from IGT to diabetes by 50.0-60.0 percent. Among many studies that confirmed the benefit of lifestyle changes is the Diabetes Prevention Program (DPP) randomised trial that showed that a combined program of weight loss, healthy diet and increase of physical exercise lowers the risk of development of T2D. These simple lifestyle changes can be very effective and cheap to implement over relatively short periods of time but sustainability depends on regular reinforcement and follow up. This should be feasible in a church-based family-oriented Samoan cultural setting based on the success of the pilot, urban, church-based lifestyle intervention programme conducted on Samoans living in New Zealand¹⁷. The population approach to prevention and control of T2D needs inter-sectoral coordination and community participation. This is an arduous but achievable challenge facing Samoa in the 21st century.

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