

Report

## Screening for type 2 diabetes in the Iranian national programme: a preliminary report

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**SUMMARY** Diabetes mellitus is a significant threat to public health. It is estimated that more than 1.5 million people with diabetes live in the Islamic Republic of Iran. We report on the preliminary results of the national programme for the prevention and control of type 2 diabetes which began in 1996. The pilot project has so far been instituted in 17 provinces. Of 595 717 people aged 30 years and over, 247 518 were classed as at risk and 3.6% had diabetes, 4.3% of women and 2.6% of men. Diabetes prevalence varied from 1.3% in rural areas to 14.5% in large cities. Early detection and control strategies are aimed at diminishing the heavy burden of diabetes.

### Introduction

The manifestations of diabetes cause considerable human suffering and impose enormous expenditures. Worldwide data currently available indicate that diabetes mellitus has become a monumental problem and a major health concern, illustrating thereby the global burden of diabetes [1–3]. According to the epidemiological studies, there are 1.5 million people with diabetes in Iran and about 14.5%–22.5% of the population aged 30 and over have impaired glucose tolerance (IGT), one fifth of them are either at risk of macrovascular complications or are potentially diabetic. Overall, 20% of the Iranian population aged 30 years and over is at risk of diabetes [4].

Early detection and appropriate management of diabetes is essential to reduce major morbidity and mortality, however,

these strategies are not implemented in many countries of the world. In the diabetes centre in Isfahan, the rate of complications among approximately 4000 type 2 diabetes patients have been recorded as: ischaemic heart disease 34%, hypertension 50%, congestive heart failure 12%, retinopathy 44%, cataract 5%, bacteriuria 27%, nephropathy 19%, neuropathy 27%, depression 60%, diabetic foot 2.5%, hypercholesterolaemia 37%, and hypertriglyceridaemia 37% [4,6]. Among 296 cases of non-traumatic amputations, 38% were diabetes-related; 27% of stroke cases (cerebrovascular accident), 15% of patients with acute myocardial infarction and 15% of dialysis patients were also diabetics. Since coding of mortality data according to the International Classification of Disease (ICD) system is not used in the Is-

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Received: 23/04/02; accepted: 06/01/03

Islamic Republic of Iran, the actual number of diabetes-related deaths is not known. Life expectancy of diabetic patients has been estimated at 60 for type 2 diabetes and 36 for type 1 diabetes respectively (Diabetes mellitus in the Islamic Republic of Iran, F. Azizi, unpublished report, 1996). Following this report, the Iranian National Advisory Committee resumed its work in 1996, and a new, comprehensive national programme for prevention and control of diabetes was designed [6]. In this report we present preliminary results of population screening for diabetes in 17 provinces.

## Methods

In February 1999, the national intervention programme was implemented as a pilot project by endocrinologists of the National Diabetes Committee in 17 locations: Khorasan, Yazd, West Azarbayjan, Bushehr, Kermanshah, Zanjan, Mazandaran, Gilan, Golestan, Kerman, Hamedan, Isfahan, Kordestan, Shahrud, and the universities of medical education and health services of Tehran, Shaheed Beheshti and Iran, located in Tehran province.

In the national programme for the prevention and control of type 2 diabetes, 4 levels of health care have been designed. At the first level, *behvarz* (community health workers) in health houses, and health professionals in urban health posts screen the community, evaluating men and women at risk. The following patients are referred to the second level:

- those with a history of diabetes among first degree relatives
- those having 2 diabetes symptoms
- those with a body mass index  $\geq 30$  kg/m<sup>2</sup>
- those with blood pressure  $\geq 140/90$  mmHg

- women who have had  $\geq 2$  spontaneous abortions of unknown cause
- women who suffered intrauterine fetal death
- women who had a child with birth weight  $\geq 4$  kg
- women with a history of gestational diabetes
- women in their 24th–28th weeks of pregnancy or classified as high risk at the beginning of their pregnancy.

At the second level, general physicians and laboratory facilities are available in rural and urban health centres as a diabetes team. General physicians will screen referred person by testing either fasting blood sugar or 2-hour postprandial glucose and manage all patients according to treatment and control protocols defined by the National Diabetes Committee. All patients would then be referred for early detection of complications to the third level, which is located in a district hospital, where an internist (or endocrinologist if available), a full-time educational nurse, and a part-time nutritionist staff the diabetes unit. Patients needing more specific facilities for diagnosis and treatment would then be referred to the fourth level, the diabetes centre, which is situated in a university (provincial) hospital and has an internist (or an endocrinologist if available) and a full-time educational nurse and a part-time nutritionist who constitute the diabetes team in the centre.

From October 1999 to October 2001, pilot areas in 17 provinces entered the screening project for type 2 diabetes. The health authorities in each province selected 1 division to take part in the study. All physicians and *behvarz* in the division were engaged in the programme. Approximately 200 *behvarz* in 984 health houses, 300 physicians and 700 health workers in 161 rural and 171 urban health centres participated.

All those in the selected division aged 30 years and over were screened (cut-off age selected by the National Diabetes Committee). Diagnostic criteria were based on fasting blood sugar  $\geq 126$  mg/dL or 2-hour postprandial blood glucose  $\geq 200$  mg/dL.

## Results

During the 2 years of this study, 3.5 million people were screened, of whom 998 237 individuals were aged 30 years or over. During this time a total of 595 717 people within this age range were initially screened by *behvarz* in the screening programme. Those found to have risk factors were referred for confirmation and blood testing. More women were screened than men: 347 501 (57.5%) versus 248 217 (42.5%), mainly because during the mornings, when most of the screenings were done, men attended to agricultural work and other business.

The age distribution of the study population is shown in Table 1. In total, 21 637 diabetics, 15 091 women and 6547 men, were detected. Table 2 shows the prevalence of known and newly discovered diabetic patients in the screened population. Overall, 3.6% of the subjects were diabetic, of whom 58.3% were known and 41.7% were newly discovered. The prevalence of risk factors for diabetes in people

screened is given in Table 3. Obesity, hypertension, family history of diabetes, and in females history of  $\geq 2$  abortions and having a baby  $\geq 4$  kg birth weight were more prevalent than other risk factors.

Table 4 shows the prevalence of diabetes in 11 provinces, the lowest being 1.3% in the rural areas of Kordestan and Khorasan, and the highest 10.7% and 14.5% in two urban areas in Tehran.

## Discussion

This study shows the results of screening procedures for the detection of type 2 diabetes in more than half a million at-risk adults in 17 provinces of the Islamic Republic of Iran.

Epidemiological studies on the prevalence of diabetes have been carried out in some parts of the country in the last decade—there are now an estimated 1.5 million people with diabetes. Since 1976, some studies have been done among children, government employees, and factory workers [7,8], but because of their invalid methodology, the results are not reliable. A systematic approach to epidemiological studies was initiated in 1993. The Endocrine Research Centre and the Institute of Nutrition of Shaheed Beheshti University of Medical Sciences conducted the first systematic population study in Iran and reported a prevalence of diabetes of 7.6 % for females, 7.1% for males, while 14.9% of females and 8.9% of males had IGT of 2033 individuals aged 30 years and above, selected by random sampling in Islamshahr (population 244 000) [9]. They also found that, of people aged 30 years and over living in rural areas of Tehran province, 7.3% had diabetes and 7.2% had IGT [10]. A report covering 2800 inhabitants aged 30 years and over in Tehran city with a mean

Table 1 Study population displayed proportionally by age group and sex

Sex	No. screened	Age group (years)			
		30–39	40–49	50–59	$\geq 60$
Female	347 501	39	27	16	18
Male	248 216	34	23	16	27
Total	595 717	37	25	16	22

**Table 2 Prevalence of diabetes in 595 717 individuals aged 30 years and over**

Sex	No. screened	No. of diabetics (%)		
		Known	Newly discovered	All
Women	347 501	8250 (2.4)	6841 (2.0)	15091 (4.3)
Men	248 216	3774 (1.5)	2772 (1.1)	6546 (2.6)
Total	595 717	12024 (2.0)	9613 (1.6)	21637 (3.6)

age of  $47 \pm 6$  years showed a prevalence of 7.2% for diabetes and 8.2% for IGT [11]. In the city of Isfahan, 1.4% of people aged 10 years and over were found to be diabetic during a screening programme conducted on 5000 individuals [5]. The prevalence of glucose intolerance was in the range 14.5%–22.5% for those aged 30 years and over according to the above-mentioned studies. Another survey conducted in the remote villages of Zanzan province showed a much lower prevalence of type 2 diabetes and IGT among people aged 30 years and over, 4.3% and 2.3% respectively [12]. A survey carried out on 1039 men and wom-

en between the ages of 30 and 64 in Bushehr port in 1996–1997 [13] showed a prevalence of 13.6% for diabetes and 9.7% for IGT.

The prevalence of diabetes in our study is lower than that reported previously. This difference may partly be because in most provinces (except Tehran) we screened rural populations or mixed rural and urban populations. It might also be due to a lack of attendance of all “at risk” individuals for blood testing. However the prevalence of diabetes in urban Tehran was found to be slightly higher than that reported previously

**Table 3 Prevalence of risk factors for diabetes in the screening programme**

Risk factor	% positive
<i>Both sexes</i>	
Body mass index $\geq 30$ kg/m <sup>2</sup>	19.4
Blood pressure $\geq 140/90$ mmHg	14.3
Family history of diabetes	10.6
Polydipsia and polyphagia	5.6
Polydipsia and polyuria	8.6
Polyphagia and polyuria	5.2
<i>Females with history of:</i>	
$\geq 2$ spontaneous abortions	8.2
Fetal death	5.4
Neonate $\geq 4$ kg weight	9.5
Gestational diabetes	0.9

**Table 4 Prevalence of diabetes in people aged 30 years and over in various locations**

Province	Prevalence of diabetes (%)
Kordestan	1.3
Khorasan	1.3
Zanzan	2.0
Kermanshah	2.2
Hamedan	2.6
Shahrud	3.5
Bushehr	5.5
Yazd	7.3
Gilan	7.7
Tehran city: area 1	8.7
Tehran city: area 2	14.5

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[4,11]. Surveys conducted among 2128 pregnant women in some maternity units in Tehran detected 28 (1.3%) cases of known diabetes and 95 (4.5%) cases of gestational diabetes [14].

A study performed in Islamshahr on 183 randomly selected people aged 30–74 years concluded that the duration and severity of glucose intolerance affected macrovascular but not microvascular complications and that IGT was accompanied by elevated blood pressure and abnormal exercise tests [15]. The prevalence of risk factors for coronary heart disease in type 2 diabetes has been investigated in a few studies. In the port city of Bushehr [13], the prevalence of hypertension was 48.9% for diabetes versus 20.2% in non-diabetic individuals and hypercholesterolaemia was found in 68.1% of diabetics as opposed to 44.4% of non-diabetics. In the rural areas of Tehran province [10], the prevalence of systolic and diastolic hypertension, high

waist–hip ratio, triglyceride and cholesterol levels and low-density lipoprotein to high-density lipoprotein ratios were increased in diabetic patients compared to non-diabetics. The most recent cross-sectional study in district 13 of Tehran, the Tehran Lipid and Glucose Study [16] has shown a prevalence of 10.6% and 12.4% for diabetes and IGT respectively in persons aged 20 years and over [17].

In the present study, the prevalence of type 2 diabetes was found to be higher in urban areas, in particular large cities such as Tehran, but is still low in remote areas and rural regions.

In conclusion, a diabetic screening programme may be effectively implemented in countries where an appropriate health network exists. Screening for diabetes coupled with a suitable management programme decreases the mortality and morbidity for this devastating disease and increases the standard of health.

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