

Diabetes Mellitus and IGT in relation to Gender and Age in Najran, Saudi Arabia*

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Objective: Diabetes mellitus occurs in almost all parts of the world though at a variable prevalence. In an attempt to determine the prevalence of diabetes mellitus, we initiated a national programme to screen the different areas of Saudi Arabia. This paper presents the details of our studies in Najran in south-western Saudi Arabia.

Patients and Design: The screening was conducted according to a statistically designed household screening plan. Fasting and two hour post prandial blood samples were collected from 1347 individuals (males = 596; females = 751) and blood glucose level was estimated using glucometers. Using the World Health Organization criteria the patients with diabetes mellitus and impaired glucose tolerance (IGT) were identified, and the diabetes cases were further grouped as insulin dependent diabetes mellitus (IDDM) and non-insulin dependent diabetes mellitus (NIDDM). The prevalence of IDDM, NIDDM and IGT was calculated separately in the males and females; in the children (< 14 years) and adults and in the adults in different age groups.

Results: The overall prevalence of NIDDM in the total males and females was 3.35 % and 2.39 % respectively. When the children (< 14 years) were removed the prevalence increased to 6.78 % and 4.15 % in the males and females, respectively. When grouped according to age into 14-29 years, 30-44 years, 45-60 years and > 60 years age groups the prevalence of diabetes increased significantly ($p < 0.05$). In those over 60 years old, 24.3 % of the males and 12 % of the females were suffering from NIDDM ($p < 0.05$).

Insulin dependent diabetes mellitus was identified in 3 individuals giving an overall prevalence of approximately 2/1000. Impaired glucose tolerance (IGT) was recognised in both males and females at a prevalence of 0.67 % and 0.53 % in total population, increasing to 1.02 % and 0.697 % in those over 14 years of age and to 2 % and 1.478 % in those over 30 years of age. One case of maturity onset diabetes of the young was suspected giving a prevalence of 0.0742 %. However, family studies are required to confirm MODY in this case.

Conclusion: This study confirmed that diabetes mellitus may be regarded as a health problem in the population of Najran.

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Diabetes mellitus is one of the most frequently encountered endocrine disorder which alters the entire range of metabolic activities taking place in a normal healthy individual. It occurs in almost all populations of the world though at a variable prevalence¹⁻⁷. Interestingly, differences in the prevalence are also reported within the same country in different ethnic groups⁷. Being multifactorial in nature, the development of diabetes depends on both genetic and environmental factors and individuals with genetic susceptibility develop the disease in presence of the appropriate environmental factors. The search for possible genetic markers and the appropriate environmental factors has been actively pursued, and the primary aim of all such studies is to establish ways and means of identifying individuals prior to development of the disease state.

In Saudi Arabia, a few studies have reported the prevalence of diabetes mellitus⁸⁻¹² though detailed studies in the different regions are warranted. We initiated a national study in different cities of Saudi Arabia that have been inhabited largely by different tribes, in an attempt to determine the exact prevalence of diabetes and later to search for the possible aetiological factors in each area.

This paper reports our findings in Najran in the south-western province of Saudi Arabia.

METHODS

The screening of Najran was initiated during 1993 and continued till the end of 1994. The screening was conducted according to a well designed statistical plan devised by a statistician. The Najran area was divided into several health sectors and randomly selected sectors were chosen for the screening, where every 10th street and on it every 10th house were selected for the screening. With the cooperation of the local health centres essential data on the family was obtained and the family was contacted to firstly, explain the purpose of the study and secondly, to invite them to join in the investigation. A total of 250 families were contacted and 239 families volunteered to be included, thus giving a refusal rate of < 5%. Those who volunteered were asked to remain in a fasting state on a mutually agreed day. An early morning visit was made by a team of three members including a female nurse. Essential data about the family was filled on a specially designed form. Fasting blood was drawn by venepuncture from each family member above the age of 2 years. Blood glucose was estimated immediately in whole blood using an Answer™ Blood Glucose Meter (Coulter-Wallace International Dist. USA) and blood glucose test strips impregnated with glucose oxidase/oxidase. The glucometers were regularly standardised (each week) against an Autoanalyser American Monitor 'Parallel'. The correlation coefficient of the glucose values obtained using the glucometer and American Monitor was 0.987 with $p <$

0.0001. Each adult member was given an oral glucose load of 75g glucose in 200-300 ml water and the children (< 14 years) were given 1.75g glucose/kg body weight upto a maximum of 75g. After 2 hours, postprandial glucose level was estimated in a freshly drawn blood sample.

The diagnosis of diabetes mellitus and impaired glucose tolerance was made using the criteria of WHO^{13,14} and the diabetic patients were further grouped into non insulin dependent diabetes (NIDDM) and insulin dependent diabetes (IDDM) based on the age of disease onset and the type of treatment soon after disease onset. All individuals with age of onset < 25 years and control of hyperglycaemic state using dietary control or oral hypoglycaemics were classified as Maturity Onset Diabetes of the Young (MODY).

The prevalence of diabetes and impaired glucose tolerance was calculated in the overall population, in the total males and females and in the children, adult males and females. Further grouping of the adults was done according to age into 15-29, 30-44, 45-60 and > 60 years age groups and the prevalence of diabetes and IGT were calculated in each group.

The significance of the difference in the results of any two groups was determined by chi square analysis using 2 x 2 contingency Table. $P < 0.05$ was considered statistically significant.

RESULTS

The screening of Najran included 1347 individuals [males = 596 (44.25%); females = 751 (55.75%)] with age ranging from 2-70 years. In this population 3 cases of IDDM were recognised which gave an approximate prevalence of 2/1000. The overall prevalence of NIDDM in the total population was 2.82%, though when the male and female results were separately analysed, a prevalence of 3.35% and 2.39% was obtained in the total males and females, respectively (Table 1).

When the children (< 14 years) were removed, the prevalence of NIDDM in the adults males and females increased. Further grouping was done according to age into 14-29 years, 30-44 years, 45-60 years and > 60 years old and the prevalence of NIDDM was recalculated in each group. The results in the male and female are presented in Figure 1. A significant increase in the prevalence of NIDDM with age was encountered in the male and female population ($p < 0.05$).

Table 1. Prevalence of NIDDM in Najran population

Age Group	Males			Females			Total		
	No.	NIDDM No.	%	No.	NIDDM No.	%	No.	NIDDM No.	%
2-70 yrs	596	20	3.35	751	18	2.39	1347	38	2.82
>14 yrs	295	20	6.78	433	18	4.157	728	38	5.22
>30 yrs	150	20	13.30	203	17	8.37	353	37	10.48

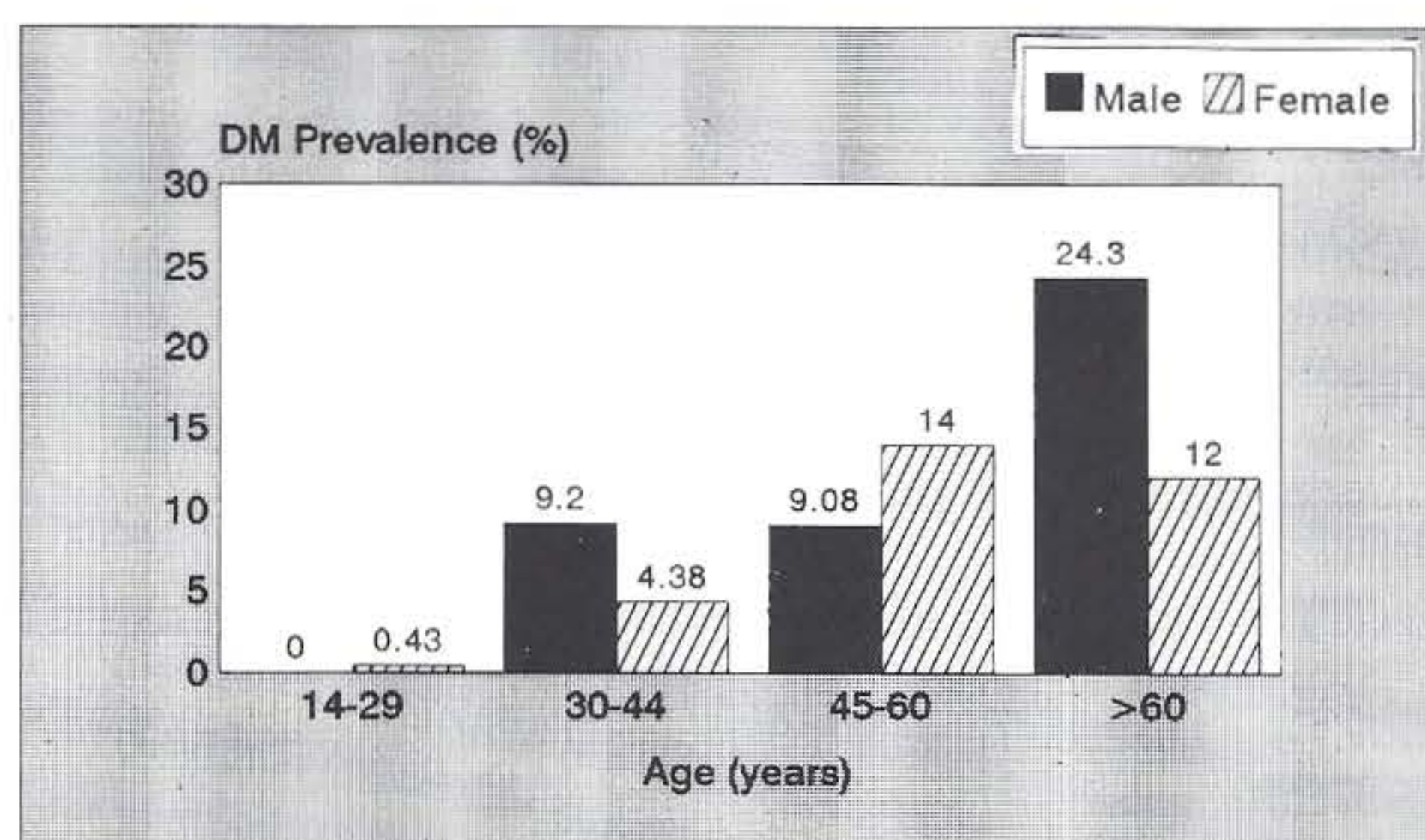


Fig 1. The prevalence of NIDDM in different age groups in Najran population

Impaired glucose tolerance was encountered both in the male and female at a frequency of 0.67 % and 0.53 %, respectively, in the total population (Table 2). In those over 14 years of age the IGT prevalence was 1.02 % and 0.693 %, increasing to 2 % and 1.478 % in those over 30 years of age in the males and females, respectively (Table 2).

Table 2. Prevalence of Impaired Glucose Tolerance in Najran population

Age Group	Males			Females			Total		
	No.	IGT No.	%	No.	IGT No.	%	No.	IGT No.	%
2-70 yrs	596	4	0.67	751	4	0.53	1347	8	0.594
>14 yrs	295	3	1.02	433	3	0.693	728	6	0.824
>30 yrs	150	3	2.00	203	3	1.478	353	6	1.70

One of the females identified as NIDDM was suspected to have maturity onset diabetes of the young, as she was less than 30 years old at the time of diagnosis and the diabetic state was controlled by hypoglycaemics and diet. The overall prevalence of MODY was calculated as 0.0742 %. However, since detailed family studies could not be carried out due to unavailability of all the family members, MODY could not be confirmed.

DISCUSSION

Najran, in the south-western province of Saudi Arabia is an urban area, which is fast developing, following a pattern similar to that in the other major cities of Saudi Arabia including Riyadh, Jeddah and Dammam. Due to its location above sea level, Najran enjoys a slightly milder climate in winter compared to its neighbour Jaizan, though in the summer the temperatures are high. There are several oasis in Najran separated by sand deserts. Populations include the Beduins, in addition to the settled elements in Najran.

The result of this study show that diabetes mellitus exists in Najran at a prevalence similar to that encountered in some areas of Saudi Arabia^{11,12}. With increase in age a significant increase in the prevalence of NIDDM is also observed in the Najran population and in those over the age of 60 years 24.3 % males and 12.0 % females are suffering from NIDDM. Similar high prevalence of NIDDM in older age groups have been reported in other parts of Saudi Arabia⁸⁻¹¹.

In Najran, differences in the prevalence of NIDDM between the males and females were significant with a higher prevalence in the male compared to the females in each age group except the 45-60 years old ($p < 0.05$). This pattern is frequent in developing countries¹⁶ and is also the pattern observed in majority of the areas investigated so far by us¹⁷ and others^{8-11,15,18}. However, exceptions are observed in certain areas of Saudi Arabia and in some areas the prevalence of NIDDM in the females is significantly higher compared to the males (El Hazmi, et al submitted). These differences between the prevalence in the males and females are possibly caused by differences in the activities, dietary habits and the life styles. However, the differences between the different regions of Saudi Arabia need more closer evaluation.

An interesting finding during this investigation was the significant difference between the prevalence of NIDDM and IGT in Najran. In general, most of the populations investigated have similar prevalence of NIDDM and IGT⁶. However, there are a few exceptions. In the Pima Indians with diabetes mellitus prevalence as high as 50 %, IGT occurs in only 15 % of the population and in the Micronesians from Nauru, diabetes mellitus occurs at a prevalence of 40 %, while IGT occurs in only 20 % of the population. Similarly, the Brazilians have about 10 % diabetes mellitus and 3-4 % IGT⁶. It has been suggested that the ratio of IGT to diabetes mellitus may have some predictive value in determining the stage of an epidemic of glucose intolerance within a population¹⁹. A high ratio indicates an early stage of diabetes epidemic and as the prevalence decreases it is associated with an increase in prevalence ratio of diabetes⁶. In Saudi Arabia, the diabetes mellitus has established at a high prevalence despite a low prevalence for IGT.

Maturity onset diabetes of the young has been reported in Saudi Arabia. One of the earliest reports was by Kassimi and coworkers, who identified 3 cases of MODY in the western region of Saudi Arabia²⁰. We also identified cases of MODY in Riyadh though the prevalence was less than 0.1%¹⁸. Maturity onset diabetes of the young is different from the other types of diabetes in that it has an autosomal dominant mode of inheritance, and ideally should not skip any generation. However, the diagnosis is often mistaken as NIDDM since the control of the hyperglycaemic state is achieved satisfactorily by oral hypoglycaemic and/or diet. We suspected MODY in one female and family study should have confirmed the diagnosis. However, since only a few family members were available for investigation the MODY could not be confirmed.

The overall incidence of IDDM in Najran was 2/1000. Same incidence has been encountered in other areas of Saudi Arabia screened by us¹⁷. However, to get the most accurate incidence of IDDM, it is essential to establish a National Registry of IDDM patients and to conduct detailed investigations to identify the possible genetic and environmental factors predisposing to IDDM in the Saudi population.

Every study on diabetes prevalence in Saudi population highlights the fact that diabetes is a major health in the adult population of Saudi Arabia. The need for awareness programmes and steps towards control is felt more as the study in each area of Saudi Arabia is completed. The significance of diet, exercise and life style must be stressed and the causes of diabetes, importance of control of hyperglycaemic state and complications must be clearly explained to the general public in an attempt to control the development of diabetes and its complications by avoiding the precipitating factors.

CONCLUSION

We therefore suggest a well designed, extensive awareness programme implementation, in different regions of Saudi Arabia. This can be done through public lectures, radio and TV programmes, article in newspapers, publication of booklets in simple Arabic and inclusion of diabetes mellitus in the school and college curricula. These steps must be adopted by the Ministry of Health as early as possible to implement control and prevention programmes for diabetes control in Saudi Arabia.

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