PREVALENCE AND DISTRIBUTION OF ABNORMAL CARBOHYDRATE TOLERANCE IN THE FAMILY MEMBERS OF KNOWN DIABETICS

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ABSTRACT

204 healthy family members of 91 known diabetics were screened for abnormal carbohydrate tolerance (ACT). The prevalence of asymptomatic diabetes and impaired glucose tolerance were found to be 3.44% and 8.33% respectively. There was positive correlation in the prevalence of ACT and age of the family members. Male children of diabetic parents were at higher risk of inheriting the disease. The risk increased when compounded with obesity and mumps infection. Suitable preventive strategies have been highlighted.

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KEY WORDS : Abnormal carbohydrate tolerance (ACT); Diabetes mellitus (DM); Impaired glucose tolerance (IGT).

Introduction

Diabetes is a global problem. It affects at least 30 million people throughout the world and the cases are reported to be increasing rapidly with aging populations, changing life style and improvement in diagnosis and treatment [1]. Diabetes often runs in families. The risk to offsprings and siblings of patients of non insulin dependent diabetes mellitus (NIDDM) is very high. Nearly two fifths of siblings and one third of offsprings eventually develop abnormal glucose tolerance or frank diabetes [2]. In defence services, asymptomatic diabetics are frequently detected among the service personnel during the annual medical examinations. Therefore, it was thought prudent and expedient to ascertain the prevalence of abnormal carbohydrate tolerance (unknown) among the family members of known diabetics and to suggest measures for prevention of diabetes.

Material and Methods

The present study was conducted in an Air Force Station, in south India during Aug 89 to Apr 90. The names of airmen suffering

from diabetes were collected from medical documents available at Station Sick Quarters. The spouses and children taking regular treatment for diabetes mellitus were identified by screening the family treatment register for last 12 months during the initial stage of the study. Altogether 54 service personnel, 35 spouses and two children belonging to 81 families were identified as diabetic. The subjects for the study were 212 healthy members of these 81 families who were to be screened for diabetes. However only 204 persons could be included in the study and remaining 8 persons could not be included for various reasons. Children below the age of 10 years were not included in this study.

Each individual was subjected to detailed history and clinical examination including height and weight measurements. Thereafter individuals were categorised into 3 groups viz, ideal weight, within 10% in excess of ideal weight and more than 10% in excess of ideal weight according to their height and age. Individuals were asked regarding their participation in some form of physical activity and were thereafter grouped into 3

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categories viz, undertaking regular physical activity - thrice a week or more, irregular physical activity - less than thrice a week and no physical activity. Running, jogging, cycling or aerobic exercise for 30 minutes at each session was considered as minimum criterion for physical activity.

Each individual was given oral glucose load of 1.75 gm per kg of body weight to a maximum of 75 gm in 250 - 350 ml of water 2 hours before the blood sugar estimation as advocated by WHO [3]. The blood sugar was estimated using modified Folin-Wu technique [4]. Diagnosis of diabetes mellitus was based on the following WHO criteria [3].

Overt : Symptomatic subjects with postprandial venous blood sugar ≥ 180 mg%

Asymptomatic : Asymptomatic subject with postprandial venous blood sugar ≥ 180 mg%.

Impaired glucose tolerance (IGT) : Subject with postprandial venous blood sugar between 120 - 180 mg%.

In this study abnormal carbohydrate tolerance (ACT) included/subject suffering from IGT as well as overt and asymptomatic diabetes.

Results

Twenty four out of 204 (11.76%) subjects were found to have ACT; 17 (8.33%) had IGT and rest 7 (3.44%) had asymptomatic diabetes. Three offsprings in the age group of 10-19, 5 offsprings in the age group of 20-29 and 3 offsprings above the age of 30 years were found to have IGT. Out of these 11 offsprings, 3 (27.27%) presented history of mumps in the recent past. Out of 13 others detected to have ACT, 5 (38.46%) presented a positive family history for diabetes in their parents. However, excessive use of alcohol or cassava root were not prevalent in this community. None of the subjects detected to have ACT were symptomatic. The highest prevalence (40%) of ACT was found in the age group of 50 years and above (Table 1). The prevalence of ACT

was found to be significantly increasing with age. Fifteen of the 89 males (16.85%) and 9 of the 115 females (7.83%) had ACT ($p > 0.05$).

Out of 15 male affected with ACT, 11 were found to be the offsprings of diabetic parents. No female offspring was found to have ACT.

15.7% of the population were overweight. The prevalence of ACT was significantly higher among the over weight population as compared to the normal (Table 2).

It is gratifying to note that nearly 69% of the population regularly undertook some kind of physical activity. Prevalence of ACT among the subjects undertaking regular physical activity was found to be 12.86% as compared to 7.69% in the no physical activity group ($p > 0.05$, Table 3).

TABLE 1
Carbohydrate tolerance according to the age

Age group	Total	Abnormal carbohydrate tolerance
10-19	40	03 (7.50)
20-29	61	05 (8.20)
30-39	49	05 (10.20)
40-49	39	05 (12.82)
50+	15	06 (40.00)
Total	204	24 (11.76)

$X^2 = 5.99$ df : 2, $p < 0.01$; (Figures in the parenthesis indicate percentages)

TABLE 2
Carbohydrate tolerance according to body weight

Body weight as per height and age	Total	Abnormal carbohydrate tolerance
Within ideal range	172	14 (8.14)
Within 10% in excess of ideal range	21	07 (33.33)
More than 10% in excess of ideal range	11	03 (27.27)
Total	204	24 (11.76)

$X^2 = 11.74$ df : 1, $p < 0.001$ (Last two rows are pooled) (Figures in the parenthesis indicate percentages)

TABLE 3
Carbohydrate tolerance according to physical activity

Physical activity	Total	Abnormal carbohydrate tolerance
Regular	140	18 (12.86)
Irregular	38	04 (10.53)
No physical activity	26	02 (07.69)
Total	204	24 (11.76)

$\chi^2 = 0.23$; df : 1; $p > 0.05$ (Last two rows are pooled)
OR = 1.43; 95% confidence limits : (0.49, 4.26). (Figures in the parenthesis indicate percentages)

Discussion

The overall prevalence of ACT in the population under study was 11.76% which includes 8.33% IGT and 3.44% asymptomatic diabetes. Thirumoorti (5) in Madras reported an ACT prevalence of 25.7% of which 10.3% and 15.4% were IGT and diabetes respectively. Viswanathan [6] also noted a higher prevalence of diabetes mellitus and IGT among the members of known diabetic families. The prevalence of ACT in the present study is lower because all known cases of diabetes mellitus were excluded, the age composition of the study population is younger as compared to other studies and the families were all nuclear in composition so that siblings of the known diabetics could not be included. The prevalence of ACT in the present population was found to be significantly rising with age. The highest prevalence (40%) of ACT was found in the age group of 50 years and above. Certain Indian studies have documented the highest prevalence of ACT in the age group of 40-49 years [5,7]. Studies from abroad have reported the highest prevalence of ACT in the age group of 50-59 years [8,9]. The male members of the families had higher prevalence of ACT as compared to females. In UK the overall male, female ratio among the diabetics is 1:1, whereas in south-east Asia an excess of male diabetics has been reported [10]. Out of 131 offsprings screened 11 (8.40%) had IGT of which 3 (27.27%) presented history of mumps in the recent past. Prevalence of IGT

was more among the offsprings whose father was diabetic. Series of studies from abroad [11,12] documented a high prevalence of ACT (42%, 45% respectively) among the offsprings of diabetic parents. The difference observed may be due to the ethnic influence in the genetic factors operating in diabetes.

The study showed 15.7% of the subjects were overweight and the prevalence of ACT is significantly higher among the overweight population as compared to normal. A pattern of increasing mean weight of population and increase in prevalence of diabetes has been noted [13]. Similarly within a population, there is a strong correlation between degree of obesity and risk of diabetes [14]. The incidence of diabetes is increased 4 fold in persons with moderate obesity and 30 fold in those with severe obesity [10].

Nearly 69% of the subjects were undertaking some kind of physical activity regularly which is a welcome finding. However, no statistically significant association was observed between the prevalence of ACT and the degree of physical activity. The increased participation of the study subjects in physical activity appeared to be due to conscious awareness of their belonging to diabetic heredity. Diabetics are advised to exercise but it has not yet been possible to decide whether regular exercise prolongs life and reduces morbidity in diabetics [15].

The present study has shown that male offsprings of diabetic parents are at potential risk to develop ACT. The outcome is further aggravated when compounded with obesity and mumps infection. Further family studies are needed to substantiate these observations and to assess the extent of problem among the family members of known diabetics. This will create an awareness regarding early detection of diabetes; even 'at risk' individuals may be prospectively identified so that preventive intervention programme can be initiated to reduce morbidity.

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