Diabetes Mellitus, Noninsulin-Dependent

Alternative Names
NIDDM
Diabetes Mellitus, Type II
Noninsulin-Dependent Diabetes Mellitus
Maturity-Onset Diabetes
Insulin Resistance, Susceptibility to

Record Category
Disease phenotype

WHO-ICD
Endocrine, nutritional and metabolic diseases > Diabetes mellitus

Incidence per 100,000 Live Births
101- ~

OMIM Number
125853

Mode of Inheritance
Autosomal dominant

Gene Map Locus
20q12-q13.1, 20q12-q13.1, 19q13.1-q13.2, 19p13.2, 17q25, 17cen-q21.3, 13q34, 13q12.1, 12q24.2, 11p12-p11.2, 10q25.3, 7p15-p13, 6q22-q23, 6p12, 5q34-q35.2, 2q32, 2q24.1

Description
The first actual description of diabetes dates from 1500 years before Christianity when a Pharaoh's doctor noticed the accumulation of ants around the urine of some people instead of others. Hess Raa described it as a curable disease. It was then spoken of by Gallinious in Roman books. But, the most accurate description of the disease and its complications appeared in a book, The Law in Medicine, by President Ibn Sina (Avicenna) in the 10th century.

Diabetes mellitus is one of the most common endocrine disorders affecting almost 6% of the world's population. The number of diabetic patients will reach 300 million in 2025. More than 97% of these patients will have type II diabetes. The projected increase in the number of diabetic patients will strain the capabilities of healthcare providers the world over. Thus it is of paramount importance to revisit the causes and epidemiology of diabetes mellitus.

Noninsulin dependent diabetes mellitus (NIDDM) is a chronic condition that results when body tissues become resistant to insulin leading to increased blood glucose and decreased intracellular glucose. This will activate the pancreas to produce more insulin. However, insulin production will be reduced over time. Also, the liver releases more glucose into blood because the tissues are starved of glucose causing fasting hyperglycemia. Usually, there are no symptoms associated with NIDDM, but patients may have excessive thirst, frequent urination, and weight loss in the long term. NIDDM is detected when the plasma glucose fasting test show a value above 120 mg/dl. Using some medications that make the target site for insulin more sensitive or decrease the production of glucose from liver, regulating diet, and exercising are the main methods to manage the complications of NIDDM.

Although, NIDDM affects people older than 40 years, some overweight children with family history may also be affected. Being overweight, and having high blood pressure or high cholesterol increase the risk of getting NIDDM. This form of diabetes is common worldwide, but people of African-Caribbean, Asian, and Hispanic origin are highly affected. Statistics indicated that at least, 171 million people worldwide have diabetes with a prediction to be doubled by the year 2030. However, about 90% of the cases are of the NIDDM type. The prevalence of NIDDM ranges from 0.3 to 17.9% in Africa, 1.2 to 14.6% in Asia, 0.7

to 11.6% in Europe, 4.6 to 40% in the Middle East, 6.69 to 28.2% in North America, and 2.01 to 17.4% in South America.

Profound changes in the way of life of the Arabian Peninsula during the last 30 years have been associated with the emergence of diabetes. A genetic susceptibility in these populations may explain why diabetes has become an "epidemic." In comparison to Caucasian and European populations with similar degrees of obesity and glucose tolerance, Arabs are more insulin-resistant than Europeans.

Molecular Genetics

Although researches are widely performed to identify the genes involved in diabetes, very little information has been known about its genetic etiology. This problem may be attributed to environmental influences, genetic backgrounds, and modifier genes that together cause different presentation of the disease in each person and each family, even if an exact same mutation is present in all patients.

Genetic susceptibility plays a crucial role in the etiology and manifestation of type II diabetes, with concordance in monozygotic twins approaching 100%. Genetic factors may have to be modified by environmental factors for diabetes mellitus to become overt. An individual with a susceptible gene may become diabetic if environmental factors modify the expression of these genes. Since there is an increase in the trend at which diabetes prevail, it is evident that environmental factors are playing a more increasing role in the cause of diabetes mellitus.

It is well known that multiple genes and multiple gene-environment interactions are involved in diabetes. For example, mutations in the calpain 10 (CAPN10) gene have been identified in many cases with NIDDM. It is thought that this gene is involved in the secretion and action of insulin. Also, mutations in the neurogenic differentiation 1 (NEUROD1) gene are found to be associated with NIDDM. Naturally, the NEUROD1 gene is responsible for the development of brain and pancreas. Furthermore, diabetes-related genes, such as obesity-related genes, have been detected in many cases.

Epidemiology in the Arab World

Bahrain

Musaiger and Abdulaziz (1986) studied the demographic characteristics of diabetic patients in Bahrain. The study included all patients with diabetes as the first diagnosis between the years 1980 and 1982. About 88% of the diabetics were found to be native Bahrainis. The highest number of diabetics were found in the over 50-years age group. In a worrying trend, however, the number of diabetics under 10 years of age was seen to increase dramatically from 0.8% in 1980 to 11.1% in 1982. Musaiger and Abdulaziz reckoned that this could be due to the pancreatic infection by viruses such as mumps or influenza that are common in Bahrain. Female diabetics were found to be much higher than the males among all age groups, except in the under 10-years group. The authors attributed the high incidence of diabetes in Bahraini women to obesity, inactivity, and diet. Similarly, the prevalence of diabetes was found to be very high in urban as compared to rural areas. Muharraq city and Manama reported the highest number of diabetes cases, whereas the Western Region, Sitra, and the Central Area had very few cases. This again was attributed to the lifestyle in cities with inactivity, obesity, and consumption of high energy foods. Musaiger and Abdulaziz (1986) recommended that health workers should be trained on diet management for diabetics.

Zurba and Al-Garf (1996) undertook an epidemiological study to estimate the prevalence of diabetes mellitus among Bahraini nationals above 20-years of age. A total of 572 individuals attending four health centers in Bahrain for any problem were randomly selected as the study group. Data pertaining to the subjects' age, sex, personal and family history of diabetes, hypertension, weight, and height, were collected. In addition, the blood glucose levels were estimated 2-hours post-75 g oral glucose. Subjects known to have been diagnosed with diabetes were exempted from the blood test. The mean age of the study group was 43.9 years, and the male to female ratio was 1:1.9. Interestingly, 27.6% of the total subjects studied had a positive family history of diabetes, whereas 41.7% of the subjects diagnosed with diabetes had a positive family history. Total prevalence of diabetes among this study group was found to be 25.5% (males-26.4%, females-25%). Prevalence of known diabetes (17.3%) was higher than that of newly diagnosed (8.2%) cases. Zurba and Al-Garf (1996) surmised that this could be indicative of the increased awareness among the population, as well as the easy accessibility of free health care services. About 14.7% of the subjects were found to have impaired glucose tolerance (IGT). In addition, 58.3% of the subjects diagnosed with diabetes and 53.4% of the subjects with IGT showed increased blood pressure according to the WHO expert group criteria for hypertension (1994). Almost

75% of subjects with diabetes and a similar percentage of subjects with IGT were found to be obese (BMI > 25%). Gross obesity (BMI > 30%) was observed in 31.5% of subjects with diabetes and 34.2% in cases with IGT.

Al-Mahroos and McKeigue (1998) performed the first cross sectional survey in Bahrain to detect the prevalence of diabetes mellitus among Bahraini natives. A total of 2128 Bahrainis, aged between 40 and 69-years were employed for the study. Parameters studied included the subjects' waist, hip and height measurements, family history of diabetes, physical activity, and blood glucose measurements after fasting as well as 2-hours post oral glucose administration. Based on the study, diabetes and IGT was estimated to be prevalent in 18% and 30% of the population, respectively. The highest numbers of diabetics were seen in the 55-59 years age group (31.9% males, 36.1% females). These prevalence rates were higher than those in most other populations compared, including other Arab populations from Kuwait, Saudi Arabia, and the UAE. There was a significant difference in the waist to hip ratio between diabetic (0.98 cm) and non-diabetic men (0.95 cm), whereas such a significant difference could not be seen among the women. The waist to height ratio however was significantly increased in both diabetic men and women as compared to their non-diabetic counterparts. The authors were able to show that only 6% of women and 20% of men between 50-59 years of age exercised by walking at least 1 Km each day. In the same age group, only 9% of men cycled, whereas only 7 women on the whole reported to be cycling. The results showed that about 35% of Bahraini diabetics between the ages of 40 and 69 years were undiagnosed.

Bhatt and Samahiji (1999) performed a retrospective study of vitreous surgery to demonstrate the efficacy of the technique in the management of complications of diabetic retinopathy. Of all the surgeries, approximately 30% (22 eyes) were for complications of diabetic retinopathy. Of these 22 eyes, 16 belonged to females, and the remaining six to males. The diabetic patients ranged from age 32 years to 73 years. The surgeries were for vitreous hemorrhage alone (6), tractional retinal detachment with or without vitreous hemorrhage (13), or combined tractional and rhegomatogenous retinal detachment (3). Out of these, 20 (91%) of the eyes showed improved in visual acuity. Vision in two eyes did not improve, possibly due to optic atrophy and retinal ischemia. Three eyes required additional surgery, one underwent silicon oil removal, and one needed removal of recurrent vitreous hemorrhage.

Fikree et al. (2006) performed a retrospective study to determine the frequency of use of HbA1c level as an indicator for type 2 diabetes control and to identify the glycemic control among type 2 diabetic patients. A total of 383 (162 males and 221 females) type 2 diabetic patients were identified. The patients' ages ranged between 30 and 88 years. Oral treatment was taken by 327 patients, oral and insulin treatment by 24 cases, and insulin therapy by six cases. Six cases were on diet alone. One hundred seventy eight cases (46.5%) had HbA1c done for them and the mean HbA1c level was 9.6%. Among those, only 20 cases (11.2%) were controlled with an average HbA1c test result of 7% or less, while the rest (88.8%) were uncontrolled. There was no statistically significant relation between the HbA1c level and neither gender nor the type of treatment.

Jordan

Awadallah and Hamad (2003) conducted a study to investigate the association between haptoglobin (Hp) polymorphism and the occurrence of chronic renal failure (CRF) in Jordanians. The study group consisted of 159 patients with CRF resulting from various predisposing conditions and from 200 healthy unrelated controls. Hp phenotyping indicated that the Hp 2-2 phenotype was over-represented in CRF patients in general (0.547), patients with hypertension (0.622) and patients with diabetes mellitus (0.633). The Hp 2-1 phenotype was over-represented in patients with chronic glomerulonephritis (0.549) and patients with reflux nephropathy (0.445).

Lebanon

Barbari et al. (2003) surveyed all the dialysis centers in Lebanon to study the effect of consanguineous marriages and their impact on the repartition of kidney diseases and on the risk for familial nephritis. Diabetes, polycystic kidney disease (PKD), chronic pyelonephritis and nephrosclerosis (NS) were the most commonly documented diagnoses in 925 patients reviewed.

United Arab Emirates

Omer et al. (1985) conducted a retrospective analysis on patients with diabetes observed in Al-Ain, the second largest city in the Abu Dhabi Emirate, between 1980 and 1984. Omer et al. (1985) indicated that diabetes accounted for 6% of all general medical admissions to hospitals in the city.

Raupp et al. (2002) reported the first case of a neonate with lipoprotein lipase deficiency (LPLD) who presented poor feeding and lethargy from the third day. At his fourth week, he developed hyperglycemia and glucosuria and insulin therapy was started. He had a lactescent serum and hypertriglyceridemia. Lethargy, hepatomegaly, and hyperglycemia increased with time. Increasing hyperglycemia in spite of having insulin therapy indicated the existence of insulin-resistant diabetes type. The liver biopsy at one month showed massive steatosis. Poor feeding, lethargy, hyperglycemia, and hyperlipidemia were resolved with the normalization of triglyceride level.

In 1995, El Mugamer et al. conducted a study coronary heart disease risk factors of non-insulin dependent diabetes mellitus (NIDDM), obesity and hypertension using community based survey among a bedouin-derived Emirati population sample of 322 subjects (> or = 20 years). Diagnosis of diabetes was based on a random capillary blood glucose level > or = 11.1 mmol l-1. Overall diabetes prevalence was 6% (11% in male and 7% in female subjects aged 30-64 years). Urban residence was associated with higher blood glucose levels (P = 0.000), and with higher Body Mass Index (BMI) values (P = 0.002): 27% of all urban residents were obese (BMI > or = 30). The Shamsi were positively associated with higher blood glucose levels compared with other tribal groups (P = 0.000). Female gender was associated with higher BMI values (P = 0.000). Between 19 and 25% of all subjects (male or female; urban or rural residents) have systolic hypertension (> 140 mm Hg). Male gender was associated with raised diastolic BP (P = 0.023). Diabetes was associated with higher mean systolic (P = 0.0274) and diastolic (P = 0.0132) BP levels.

Punnose et al. (2002) studied the diabetes mellitus (DM) pattern among 40 patients from the UAE population under the age of 18 years. Patients who were maintained on diabetic diet or oral hypoglycemic agents without the development of ketosis for a period more than six months and had high fasting serum C peptide (> 0.2 nmol/l) with negative serum pancreatic cytoplasmic islet cell antibodies (PICA) were regarded to have type II DM. Of those 40 patients, five were considered to be of type II DM. Superobesity was noticed in four patients with type II DM and family history was obtained in some patients. Punnose et al. (2002) concluded that type II DM existed in the pediatric and adolescent population of the UAE which was mainly due to increasing obesity among that population. Few years later, Punnose et al. (2005) studied the prevalence of type II DM among children and adolescents in Al Ain, UAE. The study included 96 patients with DM. Of those, 11 patients were considered to have type II DM with clinical characteristics of pubertal onset, female predominance, obesity, family history of type II DM, high plasma glucose at presentation, adequate beta cell reserve, and serum pancreatic islet cell antibody negativity. The study of Punnose et al. (2005) emphasized the observation that type II DM occurs frequently among children of the region.

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Related CTGA Records

Diabetes Mellitus, Insulin-Dependent
Guanine Nucleotide-Binding Protein, Beta-3
Hyperlipoproteinemia, Type I
Lipodystrophy, Congenital Generalized, Type 1
Polycystic Kidney Disease Autosomal Recessive
Polycystic Kidneys
Polycystic Ovary Syndrome 1
Werner Syndrome

External Links

http://darwin.nmsu.edu/~molbio/diabetes/disease.html
http://hcd2.bupa.co.uk/fact_sheets/html/diabetes2.html
http://www.emedicine.com/emerg/topic134.htm
http://www.who.int/dietphysicalactivity/publications/facts/diabetes/en/
http://www-good.pasteur-lille.fr/idf-gd/posters/topic5/poster_68.htm

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