INCIDENCE OF TYPE 1 DIABETES IN CHILDREN (0-14 YEARS) IN BENGHAZI LIBYA (1991-2000)

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SUMMARY - Background: Incidence of Type 1 diabetes in 0-14 year olds in Benghazi (Libya) during the period 1981-1990 was 7.0/105. The aim of this study is to report the incidence of Type 1 diabetes in 0-14 year olds in Benghazi Libya during the period 1991-2000.

Methods: Incidence data are based on prospective registration of Type 1 diabetes new cases for the period 1991-2000 in Type 1 register.

Results: A total of 276 (males 117, females 159) Type 1 diabetes new cases 0-14 years of age were identified during the period 1.01.1991-31.12.2000. Completeness of ascertainment was 100%. The average annual incidence per year was 7.8/100,000 population (95% CI 6.91-8.78). The standardized incidence rate (World standard) was 8.3/100,000 (95% CI 7.36-9.35). There was excess risk for females (9.1 95% CI 7.77-10.65) versus males (6.6 95% CI 5.45-7.89) (p < 0.001). No significant temporal trend was observed, yet there was an increase in incidence rate over that reported for the period 1981-1990 (7.8 vs 7.0). Seasonal variation in incidence was significant.

Conclusion: It was concluded that the incidence of Type 1 diabetes in Benghazi is in the middle of the worldwide range close to the incidence in Mediterranean countries.

Key-words: type 1 diabetes, incidence, Libya, children.

RE´ SUME´ - Incidence du diabète de type 1 chez les enfants (0-14 ans) à Benghazi en Libye (1991-2000).

Contexte : L’incidence du diabète de type 1 chez les enfants de 0-14 ans à Benghazi (Libye) pendant la période 1981-1990 était de 7,0/105. Le but de cette étude est d’analyser l’incidence du diabète de type 1 chez les enfants de 0-14 ans à Benghazi Libye pendant la période 1991-2000.


Résultats : Un total de 276 (117 garçons, 159 filles) nouveaux cas de diabète de type 1 chez des enfants âgés de 0-14 ans a été identifié dans la période 1.01.1991-31.12.2000. Le taux d’exhaustivité était de 100 %. L’incidence annuelle par an était de 7,8/100 000 au niveau de la population (95 % CI 6,91-8,78). Le taux d’incidence standardisé (standard mondial) était de 8,3/100 000 (95 % CI 7,36-9,35). Il y avait un excès de risque pour les filles (9,1 95 % CI 7,77-10,65) par rapport aux garçons (6,6 95 % CI 5,45-7,89) (p < 0.001). Aucune tendance temporelle significative n’a été observée, cependant il y avait une augmentation du taux d’incidence par rapport à la période 1981-1990 (7,8 vs 7,0). Une variation saisonnière d’incidence était significative.

Conclusion : L’incidence du diabète de type 1 à Benghazi se situe au milieu de la gamme d’incidence mondiale, voisine de l’incidence des autres pays méditerranéens.

Mots-clés : diabète de type 1, incidence, Libye, enfants.
There is marked global variations in the incidence of Type 1 diabetes. The incidence is highest in Europe and north America and is much lower in south America, Africa and Asia [1].

The establishment of standardized diabetes registers in Arab countries as part of WHO Diamond Project [2] has led to a stream of papers in peer-reviewed journals on the epidemiology of Type 1 diabetes in Arab heritage populations.

The incidence of diabetes in Benghazi in 0-14 years age group during the period 1981 to 1990 with > 95% ascertainment rate was 7.0/100,000 (95% C.I. 6.0-8.2) for Type 1 diabetes and 0.5/100,000 (95% C.I. 0.3-0.9) for Type 2 diabetes [3].

The aim of this paper is to report the incidence of Type 1 diabetes during the period 1991 to 2000 in Benghazi and to determine whether the incidence has increased.

■ PATIENTS AND METHODS

Libya is a Mediterranean Arab country. The total population according to 1995 census is estimated to be 5,040,166 in the year 2000. Tripoli is the capital. Benghazi is the second largest town (665,615 inhabitants). The proportion of population below 15 years of age in Benghazi was 49.95% in 1991 and 51.29% in 2000.

Vaccination of infants and children against viral infections is compulsory. BCG vaccination of neonates is compulsory since June 1971. A National diabetes program is existing since 1984. It consists of diabetic centres in Tripoli and Benghazi and diabetic clinics in smaller cities. Insulin (human U-100) and insulin syringes are not available in public pharmacies. They are available in diabetic centres, diabetic clinics and in hospitals for inpatients only. Incidence data are based on prospective registration of cases in Type 1 register as part of Diamond Project [2]. Eligibility criteria for registration were: diagnosis of Type 1 diabetes by a physician, Benghazi resident, insulin treated at diagnosis and age at diagnosis less than 15 years.

All registered patients are Libyans Benghazi residents. Date of diagnosis was the date of first insulin injection. Numerators consisted of all newly diagnosed Type 1 cases 0-14 years of age between 1 January 1991 and 31 December 2000.

Age and sex-specific incidence rates were calculated by dividing the numbers of new cases by the estimated numbers of person-years at risk in the 5-year age groups.

The mean annual incidence rates were calculated as the total number of new cases in each age group in 10 years divided by the total number of population at risk.

Denominators for the population at risk in each age group for each sex were obtained from the National Census Bureau in Tripoli. The 0-14 years age adjusted rate was standardized against the World population (direct method). Seasonality of Type 1 cases was defined by month of diagnosis.

Case ascertainment

Benghazi diabetes center was established by one of us (OAK) in 1969. It is one of the oldest and largest diabetes registries in the World. It is the only diabetic outpatient clinic in Benghazi municipality serving Benghazi area and supervising diabetic clinics in the eastern part of Libya. All registered patients have files. Children are registered in the main clinic and in Al Fateh Children Hospital clinic in the southern part of Benghazi. Insulin is not available for private practice. All diagnosed Type 1 cases must register in the main clinic or in Al-Fateh children clinic the only two outpatient clinics in Benghazi area where insulin is available.

The primary source of ascertainment was Type 1 registries in the main clinic and Al-Fateh children clinic (Type 1 register). Secondary source of ascertainment was the discharge registers of the five hospitals and ten polyclinics in Benghazi area. All cases identified through the secondary source of ascertainment were found to be registered in the primary source and we assume our ascertainment to be 100%.

Statistical analysis

Number of incident cases and corresponding population size were tabulated by sex and in 5-year age classes (0-4, 5-9, 10-14) for each calendar year. For seasonal analysis cases were further tabulated by month of diagnosis.

The data were modelled using a Poisson age-cohort model for the rates. The 95% confidence intervals (95% CI) were calculated using Wald statistics. Likelihood-ratio statistics were used for tests.

Seasonal variation was estimated by a Poisson model with seasonal splines with knots in December, April and August. The level of significance used was 0.05.

■ RESULTS

A total of 276 Type 1 cases (males 117, females 159) aged 0-14 years were diagnosed during the period 1 January 1991 to 31 December 2000. Five defaulted cases (3 males, 2 females) and two deceased cases (from hypoglycemia and diabetic ketoacidosis) were included in this study. Temporary registered expatriate children were not included in this study. Completeness of ascertainment was 100%. The average
The standardized incidence rate (World standard) was 8.3 (95% C.I. 7.36-9.35). The rate was significantly higher in females (9.1 95% C.I. 7.77-10.65) than in males (6.6 95% C.I. 5.45-7.89) (p < 0.001). The incidence increased with age in both sexes to 13.2 (95% C.I. 10.12-17.01) in males and 21.0 (95% C.I. 16.98-26.04) in females in 10-14 year olds. The age specific incidence rates were significantly higher in girls than in boys in 0-4 (P < 0.001) and 10-14 year olds (p < 0.001).

Number of newly diagnosed Type 1 cases in individual calendar years are shown in Figure 1. The age-cohort model showed only a non-significant decrease in rates of 1.1% per year (95% C.I. 0.01-2.3%) (Table I).

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More Type 1 cases were diagnosed during the cooler months October through March (162 cases) as compared to 114 cases during April through September. Seasonal analysis revealed significantly lower onset rates during the warm months (p = 0.051), July: RR = 0.69, 95% C.I. (0.51-0.93).

**DISCUSSION**

This study together with previous studies on the incidence of Type 1 diabetes for the periods 1981-1990 and 1991-1995 in Benghazi [4, 5] represent one of the longest incidence studies of Type 1 diabetes in children. High level of awareness of diabetes and the presence of medical school together with free of charge diagnostic and treatment services make it very unlikely for diabetic patients to die undiagnosed in Benghazi area.

The average incidence rate in Benghazi for the period 1991-2000 is 7.8/100,000 (95% C.I. 6.91-8.78). This rate is in the middle of the World wide range, close to the rates in southern Europe and in between...
the high rates in high risk countries and the low rates in Asia and the Caribbean [6].

The incidence rate of Type 1 diabetes varies widely in Arab countries. The incidence rate in the present study is approximately similar to the rates in African Arab populations; Egypt 8.3 [7, 8], Tunisia 6.9 [9] Algeria 8.1 [10], and Sudan 10.1 [11], and in between the higher rates in Kuwait 15.36 [12] and Saudi Arabia 12.3 [13] and the lower rates in Oman 2.6 [14], Jordan 3.6 [15] and Israeli Arabs 2.6 [16]. Little is known about the risk of Type 1 diabetes in sub-Saharan Africa. Reported incidence rates of Type 1 diabetes in children less than 15 years among African-Americans varied from 3.3/100,000 to 11.8/100,000 [17, 18]. The incidence rate of Type 1 diabetes in Tanzania was 0.9/100,000 [19]. About ten percent of the population of Benghazi are from sub-Saharan African origin, but in this study only two cases were of sub-Saharan origin. These data may indicate that sub-Saharan African populations are genetically a low risk ethnic group for Type 1 diabetes. Rapid socio-economic development and the presence of many ethnic and racial groups in Arab countries such as Chechmans, Armenians, Kurds, Turks and Berbers provide an opportunity to study the genetic and environmental factors that produce Type 1 diabetes [20].

The incidence of Type 1 diabetes is increasing in both high risk and low risk countries [21, 22]. There was no consistent trend in the overall incidence during the 10 years period in Benghazi, yet there was an increase in incidence rates in the present study over those reported for the period 1981-1990 (Table I).

Increase in incidence of Type 1 diabetes has been observed in several Arab populations [10-15]. Preeminence of females in this study is similar to that of most low risk countries. Seasonal variations according to month of diagnosis in Arab and Mediterranean countries are variable. Seasonal variations in incidence of Type 1 diabetes were observed in several areas with similar climates [22, 23]. In contrast to the previous study for the period 1981-1990 seasonal variation is significant in the present study. Seasonal variations are based on date of diagnosis of Type 1 diabetes. However date of diagnosis is not the date of onset of the disease. Seeking medical advice for diabetic children may be delayed particularly in developing countries. Eighty one percent of Sudanese diabetic children presented with diabetic ketoacidosis due to delay in seeking medical advice [24].

It is evident from this study that Type 1 diabetes is a common and is probably the commonest chronic disease of childhood in Libya. A National diabetes program is existing in Libya since 1984, but at the present time diabetic centres and diabetic clinics are just drug distributors. Deficiencies in the national diabetes program must be rectified to achieve near western standards [25]. There is also an urgent need in Libya for an integrated program that addresses lifestyle related diseases such as diabetes mellitus, cardiovascular diseases, hypertension, obesity and cancer.

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REFERENCES


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