Prevalence of diabetes and impaired fasting glucose in Uygur children of Xinjiang, China

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ABSTRACT. This study was designed to estimate the prevalence of diabetes and impaired fasting glucose (IFG) in Xinjiang children in western China. Data were obtained from the Chun-Miao Project, a community-based, cross-sectional study designed to investigate the prevalence and risk factors of diabetes in children of the Chinese Uygur population in Xinjiang from February 2010 to May 2012. A total of 3644 children completed the survey and measurements of fasting glucose. Diabetes and IFG were defined using American Diabetes Association 2009 criteria. Overall, 0.7% of the 3644 Uygur children had IFG and 0.1% had diabetes. In the newborn to 8-year-old group, the prevalence of diabetes and IFG was 0.6 and 1.1%, respectively. In the 9-13-year-old group, the prevalence of diabetes and IFG was 0.1 and 0.7%, respectively. There was no evidence of IFG or diabetes in the 14-17-year-old group. Logistic regression analysis suggested that overweight and obesity were independent risk factors of diabetes in Uygur children of Xinjiang. The prevalence of diabetes and IFG in Uygur children was lower than that reported previously in children of other ethnicities in China.

Key words: Children; Prevalence of diabetes; Impaired fasting glucose; Diabetes

INTRODUCTION

Diabetes and impaired fasting glucose (IFG) are recognized as risk factors for cardio-vascular disease (Ricks et al., 2012). The World Health Organization (WHO) forecasted that the global population will increase by 37% between 2000 and 2030, and that the number of diabetes patients will increase by 114% by 2030 (Wild et al., 2004). The International Diabetes Federation (2006) estimated that the number of diabetes patients will likely increase to up to 380 million by 2025. Furthermore, the number of children with type 2 diabetes has increased two to three times in the last 30 years (Berhan et al., 2011). In China, the prevalence of diabetes and pre-diabetes is as high as 9.7% in adults ≥20 years of age (Yang et al., 2010). In a previous study, we reported that the prevalence of adult diabetes in the Xinjiang Uygur population of western China was 6.23% (Yang et al., 2012). Tao et al. (2008) reported that the prevalence of diabetes was 8.16% in the Uygur population and was 1.47% in the Kazak population in 2008, whereas Awuti et al. (2012) reported a diabetes prevalence of 9.0% in the Uygur population in 2010. Fu et al. (2007) found that the prevalence of diabetes in Chinese children and adolescents was 0.19%, and Cao et al. (2007) found total age-adjusted prevalence rates of diabetes and IFG of 0.57 and 1.35% in Beijing children. Children with IFG or diabetes are at increased risk of developing cardiovascular disease in later life (Berenson et al., 1998; Freedman et al., 2001). However, the prevalence of diabetes and IFG in Uygur children has not yet been reported to date.

In the preset study, we aimed to investigate the prevalence of diabetes and IFG in Uygur children of Xinjiang, in western China.

MATERIAL AND METHODS

Ethics statement

The present study was conducted in accordance with the Declaration of Helsinki guidelines, and informed consent was obtained from each individual and guardian according to a protocol approved by the Ethics Committee of the First Affiliated Hospital of Xinjiang Medical University.

Subjects

From February 2010 to May 2012, we used a random sampling method to select a representative sample of the general population of Chinese Uygur children aged <18 years in Xinjiang, China. Three cities (Hetian, Aletai and Kashi) were chosen, and based on the government record of registered residence, one child was randomly selected from each household. In this way, 3644 participants were randomly selected from 31 villages of these three cities and were invited to participate.

Data collection was conducted in examination centers at local hospitals in the participants' residential areas. During clinic or home visits, trained research staff administered a standard questionnaire. Information on demographic characteristics, including age, gender, education, address, and ethnicity, was collected. Height and body weight were measured as described previously (Xie et al., 2010b). Body mass index was calculated by dividing weight (kg) by height (m^2). Obese and overweight were defined according to criteria suggested by Wu et al. (2010).

We measured the serum concentration of total cholesterol, triglycerides, blood urea nitrogen, creatinine, low-density lipoprotein, high-density lipoprotein, and fasting glucose by using a chemical analysis equipment (Dimension AR/AVL Clinical Chemistry System, Newark, NJ, USA) at the Clinical Laboratory Department of the First Affiliated Hospital of Xinjiang Medical University as described previously (Xie et al., 2010a, 2011). We defined diabetes using the American Diabetes Association (2009) criteria of fasting plasma glucose (FPG) $\geq$126 mg/dL, or based on self-reported current diabetes treatments in the survey. IFG was defined as $100 \leq FPG \leq 125$ mg/dL.

Data management and statistical analysis

All questionnaire data were double-entered and cross-validated using EpiData version 3.1 (EpiData Association, Odense, Denmark). Statistical analyses were performed in SPSS version 17.0 (SPSS Institute, Chicago, IL, USA). Continuous variables were summarized with mean and median, and percentages were calculated for categorical variables. The χ^2 test was used to explore associations of categorical data. The Student t-test was used to compare means of numerical data. Logistic regression analysis was used to calculate the odds ratio and its 95% confidence interval. Two-tailed tests were performed with the significance level set to 0.05.

RESULTS

Characteristics of study participants

The study cohort consisted of 3644 subjects (1754 males, 1890 females). The age distribution of the study population is shown in Table 1, and the characteristics of participants are shown in Table 2.

Table 1. Gender and age distribution of the participants.

Age-group (years)	Male (N, %)	Female (N, %)
0-8	179 (10.2%)	238 (12.6%)
9-13	1518 (86.5%)	1623 (85.9%)
14-17	57 (3.3%)	29 (1.5%)
Total	1754	1890

Table 2. Characteristics of participants.

Characteristics	Means ± SD
Age (years)	10.64 ± 1.73
Waist circumference (cm)	60.99 ± 7.48
Abdominal circumference (cm)	63.96 ± 8.30
Hip circumference (cm)	71.42 ± 7.74
BMI (kg/m²)	16.58 ± 2.17
SBP (mmHg)	98.28 ± 13.26
DBP (mmHg)	60.36 ± 12.72
TC (mM)	2.84 ± 0.68
TG (mM)	0.81 ± 0.40
HDL-C (mM)	1.04 ± 0.39
LDL-C (mM)	1.50 ± 0.51

Prevalence of diabetes and IFG

Overall, 0.7% of the 3644 Uygur children had IFG and 0.1% had diabetes. In the newborn to 8-year-old group, the prevalence of diabetes and IFG was 0.6 and 1.1%, respectively. In the 9-13-year-old group, the prevalence of diabetes and IFG was 0.1 and 0.7%, respectively. There was no evidence of IFG or diabetes in the 14-17-year-old group (Table 3).

Table 3. Prevalence of the diabetes and impaired fasting glucose in Uygur children.

Age-group (years)	Female (N, %)			Male (N, %)			Total		
	N	Diabetes	IFG (%)	N	DM (%)	IFG (%)	N	DM (%)	IFG (%)
0-8	238	0 (0%)	4 (1.7%)	179	1 (6%)	2 (1.1%)	417	1 (0.2%)	6 (1.4%)
9-13	1623	1 (0.1%)	8 (0.5%)	1518	1 (0.1%)	10 (0.7%)	3141	2 (0.1%)	18 (0.6%)
14-17	29	0 (0%)	0 (0%)	57	0 (0%)	0 (0%)	86	0 (0%)	0 (0%)
Total	1890	1 (0.1%)	12 (0.6%)	1754	2 (0.1%)	12 (0.7%)	3644	3 (0.1%)	24 (0.7%)

Risk factors of diabetes in the Uygur population

Logistic regression analysis revealed two independent risk factors for diabetes in Uygur children (Table 4).

Table 4. Logistic regression analysis.

Variables	β	SE	Wald	P	OR	95%CI
Gender	0.084	0.369	0.052	0.82	1.088	0.528-2.242
SBP	0.009	0.02	0.183	0.669	1.009	0.969-1.050
BMI			6.955	0.031		
Overweight	1.045	0.523	4	0.045	2.844	1.021-7.919
Obesity	1.377	0.667	4.263	0.039	3.963	1.072-4.647
TG	0.045	0.413	0.012	0.913	1.046	0.466-2.315
TC	0.488	0.269	3.274	0.07	1.628	0.960-2.761

DISCUSSION

In the present study, we found that the prevalence of IFG and diabetes was 0.7 and 0.1%, respectively, in Uygur children of Xinjiang, in the west of China. To the best of our knowledge, this is the first study to investigate the prevalence of diabetes in Uygur children.

As described previously, the prevalence of diabetes in Xinjiang adults is very high, and the rate of awareness, treatment, and control is very low, particularly in the Uygur and Kazak populations (Yang et al., 2012). The Xinjiang Province of China is part of the ancient Silk Road and borders eight countries including Russia, Kazakhstan, Kirghizastan, Tajikistan, Pakistan, Mongolia, India, and Afghanistan. There are more than 13 different ethnic groups living in this area. Among them, the Uygur people account for 46%, the Han account for 40%, and Kazaks account for 7%. Xinjiang is a multi-ethnic region, and Uygur adults are a potentially high-risk diabetic population (Yang et al., 2012). Therefore, much attention must be paid to the children of this population to take preventive measures.

In the present study, we provide the first report of the prevalence of diabetes and IFG in Xinjiang Uygur children. We found prevalence of 0.7% diabetes and 1.1% IFG, which are

lower than rates previously reported for Chinese Han children (Fu et al., 2007; Cao et al., 2007). Logistic regression analysis revealed that overweight and obese status were independent risk factor for diabetes in Xinjiang Uygur children. In addition, we did not find any cases of diabetes or IFG in children in the 14-17-year-old group; however, this result may be due to the very small sample size of this group.

Interestingly, although the prevalence of diabetes in Uygur adults is generally higher than that of other ethnic populations, we found that the prevalence of diabetes and IFG in Uygur children was significantly lower than that of other ethnic populations. This fact suggested that acquired lifestyle and dietary habits are likely the most important predisposing factors of diabetes in the Uygur population. In our analysis, overweight and obesity were independent risk factors of diabetes, suggesting that obesity-related education and popularization of obesity prevention programs should be actively carried out, especially for children.

Our study has several limitations. On the one hand, the present study analyzed only cross-sectional data, which did not permit further study of risk factors for incident diabetes. On the other hand, there were very few participants younger than 8 years old and older than 13 years, which might have resulted in underestimation of the prevalence of diabetes in these two age groups.

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Conflicts of interest

The authors declare not conflict of interest.

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