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CLINICAL ARTICLE

Incidence of gestational diabetes mellitus in Bahrain from 2002 to 2010

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ABSTRACT

Objective: To determine the incidence and trends of gestational diabetes mellitus (GDM) in Bahrain from 2002 to 2010, and to investigate 2 possible risk factors within the affected population. *Methods:* In a retrospective survey, data on maternal body weight and age were collected from women who gave birth in government maternity units in Bahrain and who were screened for GDM during pregnancy using the 2-step approach and criteria of the US Expert Committee on the diagnosis and classification of diabetes. *Results:* Among 49 552 pregnant women, 4982 (10.1%) were diagnosed with gestational diabetes. The Cox–Stuart test for trend analysis suggested that there was an increase in the incidence of gestational diabetes from 7.2% in 2002 to 12.5% in 2010 ($P<0.01$). For the period 2006–2010, maternal age, and weight at onset of pregnancy and at time of delivery were positively associated with risk of GDM with an odds ratio (95% confidence interval) of 1.094 (1.081–1.107), 1.081 (1.001–1.104), and 1.027 (1.013–1.040), respectively. *Conclusion:* A combination of increasing maternal weight, maternal age, and incidence of GDM among women in Bahrain indicates a significant future burden on health services.

1. Introduction

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [1]. Exposure of the fetus to maternal hyperglycemia can cause fetal malformations, as well as affecting fetal growth and glycemic regulation [2,3]. GDM is also associated with considerable adverse outcomes for the mother and offspring in the short and long term. Approximately 50% of women with GDM will develop type 2 diabetes in the 5–10 years after pregnancy [4]. In the long term, offspring of women with GDM are at increased risk of developing obesity and diabetes in late adolescence and early adulthood [5].

Several studies over the past decade have suggested that there is a rising trend in the incidence of GDM. This was initially confined to high-risk ethnic groups in the United States and Australia, but later emerged among mixed populations from all over the world [6]. Worldwide, the overall incidence is currently estimated at 1%–14% depending on the population under study, and on the choice and timing of the diagnostic test [4,5,7,8].

Risk factors for GDM in White, Asian, and Chinese populations are reported to include obesity, advanced maternal age, and family history of diabetes [7,9,10]. Furthermore, the prevalence of GDM normally reflects the number of cases of type 2 diabetes in the underlying population [11]. In the Gulf Co-operation Council (GCC) states comprising Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, the prevalence of type 2 diabetes has been reported to be 14%–19% which is among the highest in the world [12,13]. When these figures are combined with the growing epidemic of obesity, sedentary lifestyle, and change in dietary habits in this region [14–16], it is anticipated that there will be a substantial rise in type 2 diabetes and perhaps GDM.

Currently, there is a lack of data regarding the incidence of GDM and associated risk factors in Bahrain. These data are important both for assessing the likely future burden on healthcare services and for developing strategies to ameliorate the inter-relationship among GDM, adolescent and adult obesity, and diabetes. The aims of the present nationwide-study were to investigate the year-on-year trend in the incidence of GDM in the population of Bahrain over the period 2002–2010 and to analyze its relationship to the risk factors of maternal age and body weight.

2. Materials and methods

The present retrospective cohort study on the incidence of GDM was conducted in Bahrain during the period January 1, 2002, to December 31, 2010. The study was approved by the Research Committee of Salmaniya Medical Complex (SMC) and the Ethics and Research Review Committee of the College of Medicine and Medical Sciences, Arabian Gulf University, Bahrain. The study was also granted a waiver of consent on the basis that it would be impractical for such a large number of patients; the study did not involve risk to the patients; the rights and welfare of the patients were not affected; and patient identifiers would be destroyed at the earliest possible stage after publication.

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Medical services in Bahrain consist of the government central hospital (SMC) and 2 other peripheral government maternity units (Jidhafs and Muharraq). Additional maternity services exist in the military hospital and 3 other private maternity units. These medical facilities provide maternity care for a national population of 1.2 million. The present study was conducted at SMC, Jidhafs, and Muharraq, which are currently responsible for approximately 80% of all births in Bahrain.

Data on the glucose tolerance test (GTT) of pregnant women were retrieved from the database of the Central Biochemistry Laboratory of SMC. This database, which was established at the end of 2000, includes data on pregnant women between 26 and 30 weeks of gestation (or earlier in some cases). These women were screened for GDM using the 2-step protocol [5]. Patients were screened for GDM with the 1-hour, 50-g oral glucose challenge test (GCT). If the blood glucose value was 7.8 mmol/L or higher (i.e. ≥140 mg/dL), then the patient underwent a full 3-hour, oral 75-g diagnostic glucose tolerance test (oGTT). For a patient to qualify for diagnosis of GDM, they were required to undergo both tests. GDM was diagnosed if 2 or more glucose values during the diagnostic oGTT met or exceeded the criteria for the positive test, as recommended by the National Diabetes Data Group in 1979 [17].

For each patient, the laboratory database also provided name, central population registry number, age, geographic area, nationality, dates of testing, and results of the glucose challenge test. Patient body weight and parity were obtained at the booking visit and at the time of delivery from the prenatal records and labor room registers. Data for maternal age and weight were available only for the period 2006–2010. Patients were excluded from the study if they had multiple pregnancies, delivered before 22 weeks, or were known diabetics.

Descriptive statistics including mean and standard deviation (SD) were used to describe continuous variables, and frequencies were used to describe categoric variables. The Cox–Stuart test for trend analysis was used to investigate the changing incidence of GDM over the study period. The χ^2 test was used to compare the incidence of GDM among different age groups. Comparisons of the mean age, and weight at first visit and on delivery were made between pregnant women with GDM and those without GDM the Student *t* test of independent variables. Risk factors (i.e. maternal age, weight at first visit, and weight at time of delivery) associated with GDM were analyzed by multivariate analysis (logistic regression) using a 2-class categorization of glucose levels (i.e. GDM and non-GDM) to compute the odds ratio (OR) and 95% confidence interval (CI). All statistical tests were performed with SPSS version 19.0 (SPSS, Chicago, IL, USA), and statistical significance was set at a *P* value of less than 0.05.

3. Results

During the study period, 49 552 women were screened for GDM and of these 4982 (10.1%) had a positive diagnosis (Table 1). The nationality/ethnicity and percentage of women who had a positive challenge test were Bahraini, 88%; Asian, 8%; non-Bahraini Arab, 2%; Southeast Asian, 1%; and other nationality, 1%.

The incidence of GDM among this birth cohort progressively increased over the period of the study from 6.7% to 12.7% despite fluctuations in the early years of the study period (Table 1). The Cox–Stuart test for trend analysis suggested that this upward trend in the incidence of gestational diabetes was significant ($P<0.01$; Fig. 1). Women with GDM who were on dietary management constituted 52% of those tested positive for GDM. The percentage of women with GDM on insulin therapy was 33%. The remainder had impaired glucose tolerance and were reviewed in the clinic at monthly intervals (Table 1).

For the period 2006–2010, the proportion of women with GDM increased significantly from 9% in those under 25 years of age to 34% in those aged between 35 and 39 years (Table 2). The mean age of women with GDM (32.57 ± 8.65 years) was greater ($P<0.05$) than that of women without GDM (29.1 ± 5.77 years) (Table 3). For the same period, maternal weight at the beginning of pregnancy was significantly greater ($P<0.01$) for those women who developed GDM (79.81 ± 18.89 kg) than for those who did not (70.62 ± 16.61 kg). In addition, mean weight at the time of delivery was significantly greater ($P<0.05$) for women with GDM (86.69 ± 26.84 kg) than for those without GDM (76.67 ± 16.15 kg) (Table 3). For the period 2006–2010, multivariate analysis showed that maternal age and weight were positively associated with risk of GDM, although the odds were modest (Table 4).

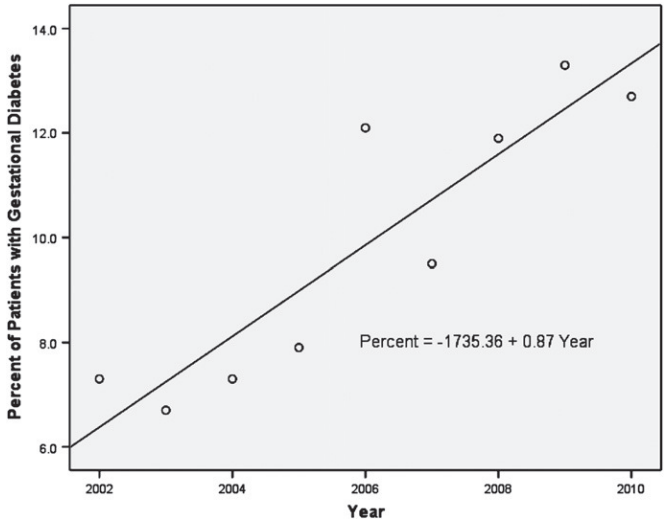

Fig. 1. Cox–Stuart analysis showed a significant upward trend in the incidence of patients with GDM in government maternity units during the period 2002–2010 ($P<0.01$).

Table 1
Screening results for gestational diabetes mellitus in government maternity units of Bahrain during the period 2002–2010 [a].

Year	Number of GCTs	Number of positive GCTs	Number of positive GTTs	Breakdown of positive GTTs		
				Impaired GTT curve	GDM: on diet only	GDM: on insulin and diet
2002	5472	1755 (32.1)	399 (7.3)	75	196	128
2003	5561	1862 (33.5)	384 (6.7)	83	187	114
2004	4793	1669 (34.8)	349 (7.3)	48	197	104
2005	4907	1557 (31.7)	390 (7.9)	61	233	96
2006	4992	1434 (28.7)	603 (12.1)	155	296	152
2007	5133	1538 (30.0)	487 (9.5)	66	263	158
2008	5690	1620 (28.5)	678 (11.9)	83	414	181
2009	6293	1743 (27.7)	839 (13.3)	91	547	201
2010	6711	2088 (33.1)	853 (12.7)	102	574	177

Abbreviations: GCT, glucose challenge test; GDM, gestational diabetes mellitus; GTT, glucose tolerance test.
[a] Values are given as number or number (percentage).

Table 2
Number of pregnant women with gestational diabetes mellitus in different age groups during the period 2006–2010.

	No. (%)
Total	4982 (100.0)
Age group, y [a]	
<25	450 (9)
25–29	1052 (21)
30–34	1750 (35)
35–39	1674 (34)
40–50	56 (1)

[a] The proportion of women with gestational diabetes mellitus differed significantly among the age group categories (χ^2 test; $P<0.05$).

Table 3
Age and weight of women screened for GDM in government maternity units in Bahrain during the period 2006–2010.

	Patient group	Number of women	Mean ± SD	*P* value
Age, y	Non-GDM	2192	29.1 ± 5.8	<0.05
	GDM	2266	32.6 ± 8.7	
Body weight at onset of pregnancy, kg	Non-GDM	1966	70.6 ± 16.6	0.01
	GDM	2072	79.8 ± 18.9	
Body weight at time of delivery, kg	Non-GDM	2012	76.7 ± 16.2	0.05
	GDM	1970	86.7 ± 26.8	

Abbreviation: GDM, gestational diabetes mellitus.

4. Discussion

In the present large retrospective study of 49 552 pregnant women in Bahrain, the average incidence of GDM was found to rise from 7.2% in 2002 to 12.5% in 2010, based on the diagnostic criteria of the National Diabetes Data Group (1979) [17]. These rates are considerably higher than the last published value of 5.4% for the incidence of GDM in Bahrain in 1989 [18], and show that the incidence rose gradually during the 9-year period of the present study. This trend puts the incidence for Bahrain at the upper end of the range reported globally (i.e. 14%) [4,5,7,8]. This increase in cases of GDM is alarming and provides an indicator of the future burden on health services in Bahrain [2–5,19].

In the present cohort, the women with GDM were older and also heavier than those without GDM. These differences are consistent with previous findings that age and weight are positively correlated with risk of GDM [7,20,21], although in the present study the odds were modest. The prevalence of GDM has been reported to rise from 2.5% to 4.1% as age advances from 25–29 years to 30–34 years, respectively [20]. Being overweight, obese, or severely obese (i.e. a body mass index of 25–29, 30–39, or >40, respectively) [22] increases the risk of developing GDM by a factor of 2.1, 3.6, or 8.6, respectively [20]. The incidence of being overweight or obese in Bahrain and the GCC region is increasing and indicates an alarming trend in women [14–16]. Lack of exercise, high calorie intake, and multiple pregnancies are some of the possible risk factors for the high prevalence of obesity among Bahraini females [14]. These factors are important for health service research in Bahrain.

The increase in incidence of GDM parallels the rise in diabetes and its associated metabolic complications such as “Gulf metabolic syndrome” in Bahrain and the GCC region [23]. This trend is not exclusive to the Gulf States but has been reported worldwide [24]. In addition, it has prompted the UN General Assembly to describe it as the “world diabetes epidemic” in a recent resolution [25]. In this resolution, member states were encouraged to develop national policies for the prevention, care, and treatment of diabetes. The health ministers of the GCC states have responded to the UN challenge and have pledged to make diabetes-related obesity a top priority on their health agenda.

The present study had some limitations. First, 49% of the birth cohort in the Government Maternity Units were not tested for GDM because either they failed to attend for testing or they received care through the private sector, overseas, or in domiciliary practice. Despite this limitation, we consider that the present data are representative of the birth cohort in government hospitals during the study period. Second, patient weight was used in the analysis instead of body mass index because of a lack of data on patient height. Third, many potential confounding factors were excluded in the selection criteria: in particular, women with a previous history of diabetes, women with multiple pregnancies, and women who delivered before 22 weeks. However, other risk factors that might explain the increasing incidence of GDM, for example a family history of diabetes [16], could not be controlled for in the analysis owing to lack of data.

In summary, the present large retrospective nationwide study of pregnant women Bahrain has shown that the incidence of GDM rose gradually over a 9-year period. The incidence was found to be at the upper end of the range reported globally. The increase in maternal weight, maternal age, and incidence of GDM indicates a significant future burden on health services. Preventive and interventional policies pertaining to future strategies by health planners need to evolve to combat these challenges.

Table 4
Age and weight as risk factors for gestational diabetes mellitus among pregnant women in Bahrain during the period 2006–2010.

Variable	OR (95% CI)	*P* value
Age	1.094 (1.081–1.107)	<0.0001
Weight at first visit	1.081 (1.001–1.104)	<0.05
Weight at time of delivery	1.027 (1.013–1.040)	<0.0001

Abbreviations: OR, odds ratio; CI, confidence interval.

Conflict of interest

The authors have no conflicts of interest.

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