Glycemic control in Kuwaiti people with treated diabetes

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Keywords: diabetes, glycemic control, Kuwait, Arab

Word count: 2,537

Tables and figure: 4 tables + 1 figure

ABSTRACT

Background: Diabetes is prevalent in Kuwait. We aimed to assess the level of glycemic control in Kuwaiti adults with diabetes.

Method: The World Health Organization's STEPS non-communicable disease risk factor survey was conducted in Kuwait in 2014. Participants' demographics, medical history, physical measurements and blood biochemistry were assessed. A total of 2,561 Kuwaiti men and women aged 18-69 years completed all three survey steps. Glycemic control in 278 individuals with diabetes who were on glucose-lowering medication was determined using the US National Institutes of Health guidelines of fasting plasma glucose (FPG) ≤7.2mmol/l and the American Diabetes Association guidelines of glycated hemoglobin (HbA1c) <7% (53 mmol/mol).

Results: Adequate glycemic control in people with drug-treated diabetes was 34.5% when determined by HbA1c, 37.8% when determined by FPG level, and 24.5% when both criteria were met. Mean body-mass index and fasting serum triglycerides were significantly higher, and serum high-density lipoprotein-cholesterol were significantly lower in individuals with an inadequate glycemic control than in those with adequate control. Women with diabetes were almost twice as likely to have inadequate HbA1c levels as men with diabetes (OR, 1.9, [95% CI, 1.03, 3.5]).

Conclusions: Glycemic control in Kuwaiti people with treated diabetes is low. A systemic, multi-disciplinary public health approach is needed to improve diabetes education and adherence to treatment.

INTRODUCTION

Diabetes is a growing worldwide health concern and the prevalence is particularly high in the Middle East and North Africa (MENA). According to International Diabetes Federation, diabetes prevalence is 8.8% globally and 10.8% in the MENA region [1]. In Kuwaiti adults aged 18 to 69 years, the age-adjusted prevalence of diabetes is 18.8% according to the latest survey [2]. The prevalence of diabetes-associated disorders in Kuwait such as obesity, hypertension and dyslipidemia is also high [3, 4]. Additionally, the socioeconomic burden of diabetes in Kuwait is high; the estimated cost of treating diabetes and its complications in Kuwait is $2,000 annually per person with diabetes [5].

The effective management of diabetes is essential for maintaining health and quality of life, preventing the progression to complications due to diabetes and avoiding excessive costs of treating people with diabetes. Healthy diet, physical activity and pharmaceutical interventions, in combination, are the most common approaches for diabetes management [6-8]. Effective diabetes management is primarily defined by adequate glycemic control, as measured by glycated hemoglobin (HbA1c) and/or fasting plasma glucose (FPG) levels [9, 10]. It is also important to manage dyslipidemia, hypertension, smoking and other risk factors associated with the development of complications and increased mortality [11]. Uncontrolled glycemic levels increase the risk of micro- and macrovascular complications and several other complications in various organs [12]. However, the proportion of people with diabetes achieving desired glycemic

targets is generally poor [13]. In the countries of the Arabian Gulf, adequate glycemic control ranges from 15% to 41% [14], but population-based studies in the region are rare.

A World Health Organization (WHO) STEPwise non-communicable disease health survey was conducted in Kuwait on a representative sample of Kuwaiti adults in 2014 [4]. We have previously reported on the prevalence of diabetes [2] and obesity [3] in this population. This study reports on the level of glycemic control in Kuwaiti adults under treatment for diabetes.

METHODS

Survey design

A cross-sectional population health survey entitled the Eastern Mediterranean Approaches to Non-Communicable Diseases (EMAN) was conducted in Kuwait between March and September 2014. The survey was conducted by the Ministry of Health and supported by the WHO, as has been previously described [2]. Briefly, data was collected using the STEPwise approach to Surveillance methodology (STEPS) [4, 15] which consisted of 3 consecutive steps: 1) demographics and medical history, 2) physical measurements and 3) blood biochemistry. In Step 1, participants self-reported their medical history and medication, including insulin, although no distinction was made between type 1 and type 2 diabetes.

The Public Authority for Civil Information prepared a random national sample of Kuwaiti citizens aged 18 to 69 years from eight age- and sex-stratified groups (18-29, 30-44, 45-59 and 60-69 years). The survey target sample was 4,391 participants (inflated for expected non-participation) and 3,915 participants completed the first two steps. The number of participants who completed all three steps, including anthropometric measures and obtaining a valid FPG and

HbA1c measurements, was 2,561. The age-standardized prevalence of diabetes in this population was 18.8%, as has been previously reported [2]. The number of individuals with diabetes who self-reported receiving glucose-lowering drug treatment for diabetes was 278. There were 15 people who self-reported having diabetes but were not receiving drug treatment for diabetes. They were not included in this analysis that evaluated the efficacy of treatment.

Data collection

Height and weight were measured using the electronic Growth Management Scale. Body mass index (BMI) was calculated by dividing a person's weight in kilograms by the square of height in meters. Waist and hip circumference were determined using a Miotape. Central adiposity was determined using waist-to-hip ratio (WHR). Of the 278 individuals with diabetes in this study, 264 had a recorded BMI and 253 had a recorded waist-hip ratio. A mercury sphygmomanometer with a universal cuff was used on the right arm in a sitting position to determine blood pressure (BP). Participants' BP was measured three times and they rested for 3 minutes between each measurement. The mean of the second and third measurements was taken for analysis. Venous blood samples were collected after a 12 hour fast in sodium fluoride vacutainer and serum separator tubes for lipid profile and FPG measurements. Whole blood was sampled in EDTA tubes for HbA1c measurements. Blood samples were immediately centrifuged after sample collection and examined by an Auto-analyzer Architect within 6 hours. Blood biochemistry analysis was conducted by the laboratory of the Kuwait Cancer Control Center Clinical Laboratory using standard clinical laboratory techniques and quality control procedures.

Standards

Diabetes was defined as FPG >7.0 mmol/l or HbA1c ≥6.5% (48 mmol/mol) or use of glucose lowering drugs [16]. Treated diabetes was determined by self-reported current treatment with physician-prescribed glucose lowering drugs. The criteria used for adequate control of diabetes were the National Institute of Health (NIH) guidelines for FPG ≤7.2 mmol/l (≤130 mg/dl) [10] and the American Diabetes Association (ADA) guidelines for HbA1c <7% (53 mmol/mol) [9]. Obesity was defined as BMI ≥30 kg/m^2 and overweight was defined as BMI 25-29.9 kg/m^2 [17]. Elevated WHR was defined as ≥0.9 for men and ≥0.85 for women.

Statistical analysis

Statistical analysis was performed using GraphPad Prism 8 and IBM SPSS Statistics version 25. Two-tailed t-tests, the Chi-square test and the Chi-square test for trend were used as appropriate. Binary logistic regression models were used to assess associations between sociodemographic, lifestyle and medical factors and glycemic control. Statistical significance was determined by $p<0.05$.

Ethical Considerations

This study was approved by the Ministry of Health Standing Ethics Committee for the Coordination of Medical and Health Research. Written informed consent was obtained from each participant. The study adhered to the Declaration of Helsinki ethical standards.

RESULTS

Treatment was received by 94.9% (278/293) of individuals with known diabetes. Of the 278 individuals with diabetes under treatment, 60% were women and 40% were men (Table 1). Mean age was 51.1 years, mean BMI was 33.1 kg/m^2 and mean systolic and diastolic blood pressure was 129 mmHg and 82 mmHg, respectively. Insulin was prescribed to 45.7% of the diabetic patients (127/278); 52.2% were also receiving anti-hypertensive medication (145/278) and 47.1% were receiving lipid-lowering medication (131/278). Over two thirds (180/264) were obese and 11.2% (31/278) were smokers. Over 70% had an elevated waist-hip ratio (178/253). Men had significantly higher mean diastolic blood pressure (p=0.02) and smoking prevalence (p<0.0001) than women. Women were more obese (p=0.01), had significantly higher BMI (p=0.002) and fasting serum HDL levels (p=0.02) than men.

Approximately a third (34.5%, 95% CI 31.6, 37.5) of Kuwaitis with diabetes under glucose-lowering treatment had adequate glycemic control as measured by HbA1c (<7%) (Figure 1A). An almost similar percentage (37.8%, 95% CI 34.8, 40.8) had adequate FPG levels (≤7.2mmol/l). Less than a quarter (24.5%, 95% CI 21.9, 27.3) of the patients under treatment had both adequately controlled HbA1c and FPG levels; 10% (28/278) had controlled HbA1c only and 13% (37/278) had controlled FPG only (Figure 1B). Mean BMI (p=0.0005) and fasting serum triglycerides (p=0.02) were significantly lower and fasting high-density lipoprotein (HDL, p=0.03) was significantly higher in Kuwaitis with an adequate HbA1c compared with those with an uncontrolled HbA1c

(Table 2). Mean BMI (p=0.03) and fasting triglycerides (p=0.0003) were also significantly lower in individuals with adequate FPG levels.

The proportion of men with diabetes with HbA1c <7% was 43.2%, significantly higher than the 28.7% found in women with diabetes (p=0.013, Table 3). Patients treated with insulin also had lower proportion of adequate glycemic control (25.2%) than patients treated with oral glucose-lowering drugs only (42.5%, p=0.003). Except for individuals with a normal BMI and men with normal WHR, every population subgroup had a majority of people with diabetes with poor glycemic control. Kuwaiti women with diabetes were almost twice as likely to have poor HbA1c levels as men (Odds Ratio, OR = 1.9, p=0.04) (Table 4). Patients on insulin were also twice as likely to have both poor HbA1c (OR = 2.7, p=0.001) and FPG levels (OR = 1.9, p=0.02) as those treated with oral drugs. Patients who were obese or had an elevated waist-to-hip ratio tended to have higher inadequate HbA1c levels, although this increase did not reach statistical significance.

DISCUSSION

In this cross-sectional survey from 2014, we found that although the proportion of drug treatment for diabetes was high (95%) among people with known diabetes, most Kuwaiti adults with diabetes under glucose-lowering drug treatment had poor glycemic control. Only 35% had adequate HbA1c levels and 38% had adequate FPG levels. Almost half of diabetic patients were prescribed insulin, indicating that treatment with oral antidiabetic drugs had not been successful for reasons unknown in this survey. Mean BMI and fasting serum triglycerides were significantly higher and fasting serum HDL was significantly lower in individuals with poor glycemic control. Adequate glycemic control was significantly higher in men with diabetes compared with women.

Although glycemic control in Kuwait overall was found to be low in this study, when comparing our results to previous studies, it appears to have been improving with time. Approximately 30% of patients attending a specialist diabetes medical and research center in Kuwait between 2011 and 2014 had an HbA1c <7% [18]. A study analyzing data from the Kuwait Diabetes Register reported that only 26% of Kuwaiti diabetic patients had an HbA1c <7% in 2012 [19], while in Kuwait in 2010 glycemic control was reportedly between 19% [20, 21] and 21% [22]. This apparent improvement in glycemic control is in keeping with other findings from the Arabian Gulf countries. In Saudi Arabia, adequate glycemic control improved from 21% in 2004 [23] to 32% in 2013 [24], in Oman from 23% in 2007 [25] to 35% in 2013 [26], in Bahrain from 15% in 2004 [27] to 32% in 2010 [28], and in the UAE from 31% in 2006 [29] to 38% in 2016 [30]. In Qatar, glycemic control was 31% in 2015 [31].

Despite the improvement, levels of glycemic control in the Arabian Gulf countries falls behind Europe and North America [21]. In the US, almost 60% of adults with diabetes achieved HbA1c <7% in 2010 [32]. Glycemic control differed by ethnicity; non-Hispanic whites achieved higher levels of glycemic control than non-Hispanic blacks and Mexican Americans [32]. In Europe, a cross-country analysis reported glycemic control to be over 50%, although there was considerable inter-country variation [33]. In Asia, glycemic control was reported to be 45% in Japan [34], 39% in South Korea [35], 32% in China [36], 31% in India [37], 23% in Bangladesh [38], 22% in Malaysia [39] and 15% in the Philippines [40]. In a population survey in Mauritius, glycemic control in people with diabetes based on HbA1c was 19% in 2009, and had improved to 22% in 2015, but still remained poor [41]. A recent analysis of data from diabetes clinics across nine countries outside North America and Europe did not find improvement in glycemic control from

2006 to 2015 on average [42]. However, there was heterogeneity among the countries: the proportion of patients who reached the target of HbA1c <7% increased in Argentina, India, Japan, Russia and South Africa, but not in Australia, Hong Kong, Saudi Arabia and Uganda. Among all the clinical services, South Africa had the lowest glycemic control with only 10% and 17% in 2006 and 2015, respectively. This study also showed that the introduction of newer classes of glucose-lowering drugs did not improve glycemic control.

Being overweight or obese is associated with poor glycemic control in people with diabetes [43]. In this study, over two thirds of individuals treated for diabetes were obese. The only subgroup with over 50% of adequate glycemic control comprised individuals with normal weight (BMI <25kg/m^2) and in men with normal WHR. The prevalence of overweight and obesity is high in Kuwait [3] and the surrounding region [44]. High calorie diets, sugar-sweetened beverages, low physical activity, sedentary lifestyle, genetic factors and some cultural barriers are among contributing factors to the obesity epidemic in the Middle East [45].

We found glycemic control to be less in women than men, findings consistent with recent studies on type 2 diabetes in South Korea [35] and type 1 diabetes in Italy [46]. Although the prevalence of diabetes is higher in Kuwaiti men than women [2], the prevalence of obesity and mean BMI are higher in Kuwaiti women, and Kuwaiti women are also less physically active than men [3]. In this study, obesity levels and mean BMI were significantly higher in Kuwaiti women being treated for diabetes than in men, which suggest that a targeted high-risk obesity prevention approach may benefit women with concurrent obesity and poor glycemic control.

206 Hypertension is also highly prevalent in Kuwait in general [4] and in Kuwaiti people with
207 diabetes [47]. Over half of individuals receiving glucose lowering drug treatment in this study
208 were also receiving antihypertensive drug treatment. Hypertension is associated with worsening
209 complications of diabetes, and improvement in blood pressure leads to a reduction in both
210 macrovascular and microvascular complications in patients with diabetes [48]. Almost half of
211 people with diabetes in this study were also receiving treatment for dyslipidemia, and elevated
212 fasting triglycerides and low HDL levels were significantly more common in those with poor
213 glycemic control. Poor lipid profiles have been previously reported to be associated with poor
214 glycemic control in other studies [34, 49, 50].

215 Other factors that contribute to poor glycemic control are poor diabetes education and
216 poor adherence to treatment. There is a general lack of diabetes education in the Middle East
217 [51]. In Kuwait, most diabetic patients do not adhere to diet or exercise advice [52], and over a
218 quarter of patients do not fully adhere to their prescribed glucose lowering medication [53].
219 Many patients do not consider diabetes to be a chronic condition with serious health implications
220 [54]. Treating and controlling co-morbidities, as well as improving education and adherence to
221 treatment, are essential to improving glycemic control. Recent studies have also highlighted the
222 benefit of benchmarking and target setting in improving diabetes care [55, 56].

223 The WHO STEPS study strengths included the representative, population-based sample
224 and its standardized measurement techniques. However, in this study only Kuwaiti nationals
225 were surveyed, whereas Kuwaiti has a large, multi-ethnic, expatriate majority [57]. Previous
226 studies on glycemic control in Kuwait have only included Kuwaiti nationals as well [19, 20, 22].

Diabetes prevalence among expatriates in Kuwait is reportedly to be even higher than amongst Kuwaiti nationals [47]. The WHO STEPS survey did not distinguish between type 1 and type 2 diabetes, but it can be assumed that the proportion of people with type 1 diabetes is likely less than 10% of all individuals with diabetes in this study. Other limitations include the lack of longitudinal measurements or measures of adherence to medication and lifestyle treatments. We did not have information about the names of drugs and their doses, and therefore we could not assess the quality of specific prescribed treatments. Nonetheless, this study showed that the introduction of newer classes of glucose-lowering drugs did not improve glycemic control (Table x).

Many factors contribute to the poor glycemic control levels found in this study in Kuwait. Of note, the very high prevalence of treatment among known diabetes in this study (95%) suggests that the diabetes population has a very high degree of access to diabetes services in Kuwait, although glycemic control should be improved. The Ministry of Health can use these data to tailor interventions focused on prescribing physicians and people with diabetes, to improve glycemic control from both directions. Also, in view of the extraordinarily high prevalence of diabetes in Kuwait, a holistic public health approach is needed to decrease the prevalence of diabetes and associated co-morbidities and to better educate people with diabetes on the importance of maintaining a healthy diet, physical activity and adherence to prescribed medication. The next STEPS survey in Kuwait is planned for 2020, and it will be possible to assess if improvements in glycemic control continues among people with diabetes.

DISCLOSURES

The authors declare no conflicts of interest.

ACKNOWLEDGEMENTS

Dr. Ameera Abdullah and Dr. Abdullah Alkandari performed the data analysis and drafted the manuscript. Dr. Joseph Longenecker prepared the STEPS dataset for analysis, including data cleaning and recoding variables. Dr. Qais Al-Duwairi was the Chairperson of the Kuwait STEPS National Coordinating Committee, and Dr. Rihab Al-Wotayan was the Principal Investigator of the STEPS study. Dr Ahmad Alkhatib critically revised the manuscript and contributed to the initial study concept. All authors were involved in the critical evaluation, scientific input, and approval of the final manuscript. The STEPS survey was funded by the Kuwaiti Ministry of Health and supported by the World Health Organization. We thank the members of the national and regional committees and the field work teams involved in the survey. Biochemical measurements were conducted in the clinical laboratories of the Kuwait Cancer Control Center Clinical Laboratory.

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Table 1: Demographic and selected clinical information of 278 Kuwaiti patients with treated diabetes[ǂ]

Participant Characteristics	**Total**	**Men**	**Women**	
Patients, n (row %)	278	111 (40)	167 (60)	**p**
Age (years)	51.1 ± 11.7	50.1 ± 12	51.8 ± 11.4	0.23
BMI (kg/m^2)	33.1 ± 6.65	31.6 ± 5.6	34.2 ± 7.08	0.002
Systolic blood pressure (mmHg)	129 ± 15.1	131 ± 15.2	128 ± 14.9	0.17
Diastolic blood pressure (mmHg)	82 ± 9.7	83 ± 10.9	80 ± 8.6	0.02
Fasting plasma glucose (mmol/L)	9.42 ± 4.26	9.25 ± 4.16	9.54 ± 4.33	0.59
HbA1c (%)	8.17 ± 2.24	7.85 ± 2.21	8.38 ± 2.24	0.06
Fasting serum HDL (mmol/L)	1.18 ± 0.28	1.1 ± 0.26	1.24 ± 0.28	<0.0001
Fasting serum LDL	2.96 ± 0.97	2.87 ± 0.85	3.01 ± 1.04	0.24
Fasting serum triglycerides (mmol/L)	1.84 ± 1.23	2.01 ± 1.57	1.73 ± 0.93	0.06
Fasting serum total Cholesterol (mmol/L)	5.0 ± 1.12	4.9 ± 1.02	5.0 ± 1.19	0.24
Waist-hip ratio (WHR)	0.91 ± 0.09	0.94 ± 0.1	0.89 ± 0.07	<0.0001
Obesity (%)	68.2%	59.4%	74.1%	0.01
Elevated WHR (%)	70.4%	70%	70.6%	0.92
Smoking (%)	11.2%	27%	0.6%	<0.0001
Use of insulin (%)	45.7%	44.1%	46.7%	0.67
Use of anti-hypertensive medication (%)	52.2%	45.9%	56.3%	0.09
Use of lipid lowering medication (%)	47.1%	45%	48.5%	0.57

[ǂ]Values represent mean ± standard deviation, or frequencies. Obesity defined as a ≥BMI 30kg/m^2. Elevated waist-hip ratio defined as ≥0.9 for men and ≥0.85 for women. P values assessed by two-tailed t-tests or the Chi-square test as appropriate. Of the 278 diabetes patients in this study, 264 had a recorded BMI and 253 had a recorded waist-hip ratio.

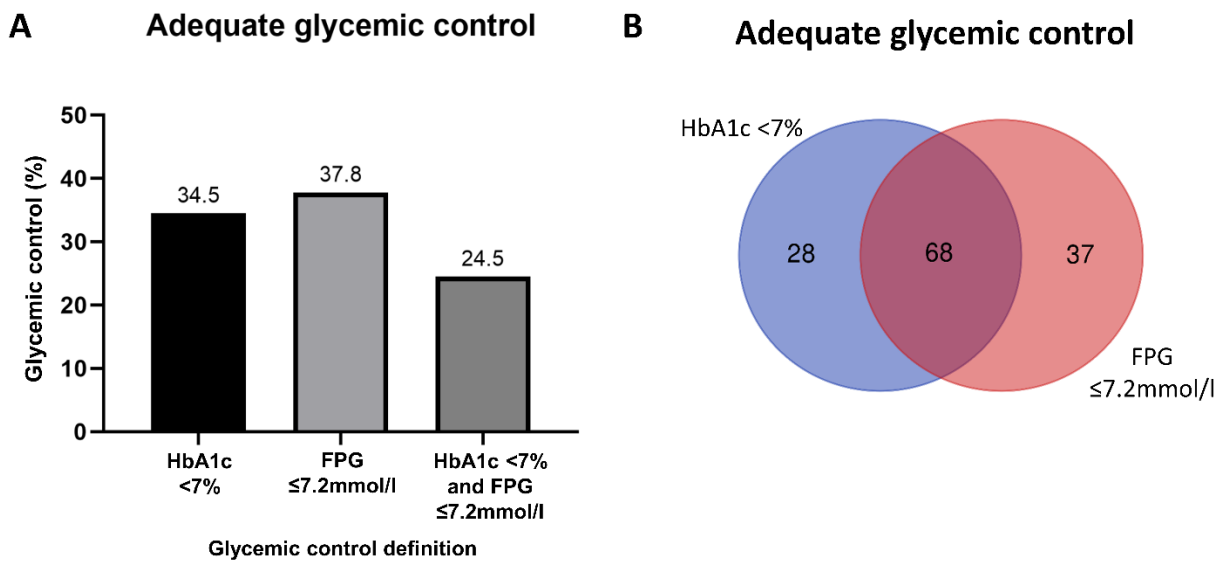

Figure 1: (A) The proportion of people with treated diabetes achieving adequate glycemic control as measured by HbA1c, FPG and both. n=278. (B) A Venn diagram of the number of people with diabetes achieving glycemic control as measured by HbA1c and FPG. n=133

Table 2: Demographic and selected clinical parameters of individuals with treated diabetes with and without adequate control[ǂ]

Participant Characteristics						
	HbA1c <7%	**HbA1c ≥7%**	**p**	**FPG ≤7.2 mmol/l**	**FPG >7.2 mmol/l**	**p**
Patients, n	(n=96)	(n=182)	-	(n=105)	(n=173)	-
Age (years)	50.1 ± 12.7	51.6 ± 11.1	0.29	49.8 ± 12.5	51.8 ± 11.1	0.17
BMI (kg/m^2)	31.2 ± 6.11	34.2 ± 6.71	0.0005	32 ± 6	33.8 ± 6.96	0.03
Systolic blood pressure (mmHg)	128 ± 16	130 ± 14.5	0.36	128 ± 14.9	130 ± 15.2	0.25
Diastolic blood pressure (mmHg)	82 ± 9.74	81 ± 9.74	0.42	82 ± 9.71	82 ± 9.79	0.99
Fasting plasma glucose (mmol/L)	6.5 ± 1.96	11.0 ± 4.33	<0.0001	5.7 ± 0.93	11.7 ± 3.86	<0.0001
HbA1c (%)	6.0 ± 0.59	9.3 ± 1.87	<0.0001	6.6 ± 1.35	9.1 ± 2.14	<0.0001
Fasting serum HDL (mmol/L)	1.23 ± 0.31	1.16 ± 0.26	0.03	1.21 ± 0.26	1.17 ± 0.29	0.28
Fasting serum LDL	2.87 ± 0.71	3.00 ± 1.08	0.29	2.98 ± 1.19	2.94 ± 0.82	0.71
Fasting serum triglycerides (mmol/L)	1.61 ± 0.87	1.97 ± 1.37	0.02	1.5 ± 0.77	2.05 ± 1.41	0.0003
Total Cholesterol (mmol/L)	4.9 ± 0.87	5.0 ± 1.23	0.21	4.9 ± 1.32	5.0 ± 0.98	0.27
Waist-hip ratio - Men	0.93 ± 0.14	0.95 ± 0.06	0.25	0.94 ± 0.14	0.94 ± 0.06	0.93
Waist-hip ratio - Women	0.87 ± 0.07	0.89 ± 0.07	0.2	0.88 ± 0.07	0.89 ± 0.08	0.21

[ǂ]Values represent mean ± standard deviation or frequencies. P values assessed by two-tailed t-tests.

Table 3: Frequency of glycemic control by demographic and clinical information[ǂ]

Characteristic	Prevalence of Glycemic Control (%)			
	HbA1c <7%	p	FPG ≤7.2 mmol/l	p
All	34.5%		37.8%	
Sex		0.01		0.44
Men	43.2%		40.5%	
Women	28.7%		35.9%	
Age		0.56		0.22
18-29	44.4%		50.0%	
30-44	37.3%		43.1%	
45-59	31.4%		35%	
60-69	36.2%		36.2%	
Use of insulin		0.003		0.14
Yes	25.2%		33.1%	
No	42.5%		41.7%	
Anti-hypertensive medication		0.63		0.95
Yes	35.9%		37.9%	
No	33.1%		37.6%	
Lipid-lowering medication		0.57		0.90
Yes	32.8%		38.2%	
No	36.1%		37.4%	
Smoking		0.19		0.15
Smokers	45.2%		25.8%	
Non-smokers	33.2%		39.3%	
Obesity		0.07		0.60
Normal weight	54.5%		40.9%	
Overweight	35.5%		41.9%	
Obese	32.2%		37.8%	
Waist-Hip Ratio		0.06		0.62
Normal	44.0%		42.7%	
Elevated	31.5%		39.3%	
Waist-Hip Ratio – Men		0.004		0.22
Normal	66.7%		53.3%	
Elevated	35.7%		40.0%	
Waist-Hip Ratio – Women		0.98		0.70
Normal	28.9%		35.6%	
Elevated	28.7%		38.9%	

[ǂ]P values assessed Chi-square test of Chi-square test for trend as appropriate. Normal weight defined as BMI ≥25 kg/m^2, overweight defined as BMI 25-29.99kg/m^2 and obesity defined as a BMI >30kg/m^2. Elevated waist-hip ratio defined as ≥0.9 for men and ≥0.85 for women.

Table 4: Logistic regression models with glycemic control as the dependent variable[ǂ]

		Odds Ratio of HbA1c ≥7%				Odds Ratio of FPG >7.2 mmol/l			
Characteristic	**Comparison**	**beta**	**OR**	**CI (95%)**	**P**	**Beta**	**OR**	**CI (95%)**	**p**
Women	Men	0.64	1.9	[1.0, 3.5]	0.04	0.41	1.5	[0.8, 2.7]	0.16
Age ≥50 years	Age<50 years	-0.25	0.8	[0.3, 2.0]	0.61	0.88	2.4	[0.9, 6.4]	0.08
Obesity (BMI ≥30kg/m^2)	Non-Obese	0.44	1.6	[0.8, 2.9]	0.16	0.13	1.1	[0.6, 2.0]	0.67
Elevated waist-hip ratio	Normal WHR	0.43	1.5	[0.9, 2.8]	0.15	0.01	1.0	[0.6, 1.8]	0.97
Current Smoking	Non-Smoking	0.32	1.5	[0.8, 2.5]	0.30	0.39	1.5	[0.8, 2.6]	0.17
Use of insulin	Non-use	0.98	2.7	[1.5, 4.7]	0.001	0.62	1.9	[1.1, 3.2]	0.02
Use of antihypertensive drugs	Non-use	-0.47	0.6	[0.3, 1.2]	0.14	-0.041	1.0	[0.5, 1.7]	0.89
Use of lipid lower drugs	Non-use	0.24	1.3	[0.7, 2.6]	0.42	-0.032	1.0	[0.6, 1.7]	0.91

[ǂ]OR=odds ratio, CI=confidence interval. Full model, n = 251.