Published in final edited form as:

Diabet Med. 2008 October ; 25(10): 1251–1252. doi:10.1111/j.1464-5491.2008.02548.x.

Prevalence and Determinants of Glycosuria: the Shanghai Men's Health Study

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The prevalence of Type 2 diabetes mellitus (DM) is increasing rapidly in developing countries that are adopting a Western lifestyle (1). While associations between environmental risk factors and Type 2 DM are well-documented in Western populations, limited data are available from developing countries.

We estimated the prevalence and risk factors of glycosuria, an indicator of pre-diabetes and/or undetected Type 2 DM in urban, middle-aged Chinese men, using cross-sectional data from the Shanghai Men's Health Study (SMHS), a population-based cohort study based in Shanghai, China (response rate 74.1%).

From the initial number of 61 582 participants, a total of 35 458 had no prior history of Type 2 DM, hypertension or cardiovascular disease and had donated a urine sample. A cutoff point greater than trace for urine glucose was used to define glycosuria. An in-person interview was conducted to collect information on demographic characteristics, disease history and current and past smoking and drinking habits (including usual amount of consumption of rice wine, grape wine, beer or liquor separately). Participants that had given up drinking were excluded from the analysis. Dietary intake and physical activity were assessed using validated questionnaires (2;3). Participants were measured for weight and waist and hip circumferences according to a standard protocol. The Chinese Food Composition Tables (4) were used to estimate energy intake (kcal/day). Physical activity energy expenditure was estimated using standard metabolic equivalent values (MET) (5) and total non-occupational physical activity was calculated by combining all types of physical activities. Unconditional logistic regression models were used to estimate associations between physical activity, smoking, alcohol intake and glycosuria. All analyses were performed using SAS (version 9.1), and all tests of statistical significance were based on two-sided probability. Analyses were adjusted for age, kcal/day, education, income, occupation and family history of diabetes.

We identified 817 (2.30%) participants with glucose in their urine. Glycosuria prevalence was associated with higher WHR (ORs across quintiles were 1.00, 1.41, 1.98, 2.53 and 4.01; Ptrend <0.001), while the association between BMI quintiles and glycosuria was not statistically significant (Ptrend 0.23). Exercise participation and total non-occupational physical activity were associated with a lower risk of glycosuria. The ORs for quintiles of total non-occupational

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Published version available at: <http://www3.interscience.wiley.com/journal/119818374/group/home/home.html>

Competing interests: None to declare.

METs were 1.00, 0.85, 0.81, 0.73 and 0.67 (Ptrend <0.001) showing a dose-response relationship. The ORs for never smokers, ex-smokers, and smokers of <10, 10-20, >20-39 and >39 cigarettes/day were 1.00, 1.12, 1.12, 1.12, 1.49 and 1.64, respectively, in analyses adjusted for age, kcal/day, physical activity, alcohol intake, income, occupation, education and family history of diabetes. After adjustment for BMI and WHR, smoking more than 40 cigarettes per day was related to prevalence of glycosuria (OR=1.48; 95% CI: 1.01-2.16). Drinking one drink per day or more was associated with a higher risk of glycosuria, Table 1. Beer and wine but not liquor were associated with higher glycosuria prevalence (data not shown in table). Occasional/light drinking was not associated with glycosuria prevalence.

Although the specificity of the glycosuria test is good, its sensitivity is not ideal (6), and it is possible that we did not detect all undiagnosed cases of Type 2 DM.

In summary, central obesity and components of an adverse lifestyle were associated with a higher prevalence of glycosuria among middle-aged Chinese men. Diabetes has become a major public health problem in China, as a consequence of a rapid decline in physical activity levels that has occurred in parallel with an increase in the prevalence of overweight and obesity (7). Smoking, a common exposure in this population (65.27%), may play a causal role in the development of Type 2 DM, and thus, the promotion of an active lifestyle and smoking cessation should receive the highest public health priority.

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Table 1
Logistic regression analysis* with glycosuria as the dependent variable and physical activity as the independent variable

	Cases	OR1	(95% CI)	OR2	(95% CI)
Exercise+					
None	615	1.00		1.00	
Low	68	0.73	0.57-0.95	0.74	0.57-0.96
Medium	67	0.63	0.48-0.83	0.67	0.51-0.87
High	67	0.74	0.56-0.97	0.77	0.59-1.02
		<i>P Trend <0.001</i>		<i>P Trend <0.01</i>	
Total METs					
Quintile 1	205	1.00		1.00	
Quintile 2	164	0.80	0.64-0.98	0.85	0.69-1.05
Quintile 3	162	0.76	0.61-0.94	0.81	0.65-1.01
Quintile 4	147	0.66	0.53-0.82	0.73	0.58-0.91
Quintile 5	139	0.60	0.47-0.75	0.67	0.53-0.84
		<i>P Trend <0.001</i>		<i>P Trend <0.001</i>	
Smoking status*					
Never smoker	180	1.00		1.00	
Ex smoker	73	1.12	0.84-1.48	1.02	0.76-1.36
>0-10 cigarettes/day	181	1.12	0.90-1.39	1.14	0.91-1.42
>10-20	291	1.12	0.91-1.37	1.11	0.90-1.36
>20-39	53	1.49	1.07-2.06	1.36	0.98-1.89
≥40	39	1.64	1.13-2.39	1.48	1.01-2.16
Alcohol categories*					
Non drinker	484	1.00		1.00	
Occasional/light	38	0.87	0.62-1.21	0.89	0.63-1.24
Moderate	168	1.39	1.16-1.67	1.35	1.12-1.62
Heavy	104	1.71	1.36-2.15	1.54	1.22-1.94
		<i>P Trend <0.001</i>		<i>P Trend 0.01</i>	

OR1 Adjusted for age, kcal/day, alcohol consumption, smoking, education level, income level, occupation and family history of diabetes. In addition, associations between physical activity and glycosuria were adjusted for smoking and alcohol intake, while those between glycosuria and smoking were adjusted for physical activity and alcohol intake and those between alcohol intake and glycosuria were adjusted for physical activity and smoking

OR2 Adjusted for all of the above plus BMI and WHR.