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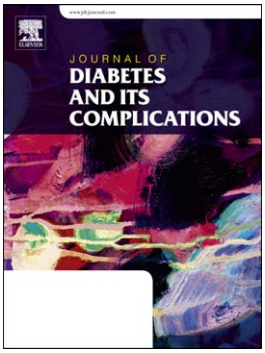

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The cardiometabolic risk profile of Chinese adults with diabetes: a nationwide cross-sectional survey

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Abstract

Aims We aimed to estimate the cardiometabolic risk profile of Chinese adults with diabetes.

Methods We conducted a nationally representative survey of 98,658 noninstitutionalized Chinese adults aged ≥18 years using a complex, multistage, probability sampling design in 2010. Diabetes was defined in 12,607 participants according to the 2010 American Diabetes Association criteria. All estimates were weighted to represent the overall Chinese adults with diabetes.

Results Among Chinese adults with diabetes, the weighted prevalence estimates were 47.5% (95% confidence interval (CI): 46.4%-48.7%) for low fruit and vegetable intake, 20.3% (19.3%-21.2%) for low physical activity, 27.2% (26.2%-28.3%) for current smoking, 10.9% (10.3%-11.7%) for obesity, 52.2% (51.0%-53.3%) for systolic blood pressure (BP) ≥140 mmHg, 46.8% (45.6%-47.9%) for low-density lipoprotein (LDL) cholesterol ≥100 mg/dL, 36.4% (35.3%-37.5%) for hemoglobin A1c (HbA1c) ≥7.0% (53 mmol/mol), and 69.5% (68.4%-70.6%) for metabolic syndrome. Proportions of Chinese patients with diabetes with 0, 1, 2, 3, and 4 cardiometabolic risk factors including current smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and HbA1c≥7.0% (53 mmol/mol) were 13.4% (12.6%-14.2%), 32.9% (31.8%-33.9%), 35.0% (33.9%-36.1%), 16.2% (15.4%-17.0%), and 2.6% (2.3%-3.0%), respectively.

Conclusions Cardiometabolic risk factors were highly prevalent among Chinese with diabetes. Effective interventions should be taken.

Keywords Cardiometabolic risk; diabetes; Chinese.

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In 2010, the prevalence of diabetes in China reached 11.6%, with an estimated 113.9 million Chinese adults with diabetes (Xu, Wang, He et al. 2013). Meanwhile, the percentage of Chinese adults with ideal cardiovascular health is as low as 0.2% (Bi, Jiang, He et al. 2015). Diabetes and cardiovascular health have become major health concerns in China.

Cardiovascular disease is the predominant cause of death in persons with diabetes (An, Zhang, Wang et al. 2015; Fox, Massaro, Hoffmann et al. 2007; Haffner, Lehto, Ronnemaa et al. 1998). Despite a marked reduction in cardiovascular disease incidence among individuals with or without diabetes in the United States (US), over the past five decades, the fact that diabetes as a cardiovascular risk factor does not appear to have changed (Fox, Coady, Sorlie et al. 2004; Fox, Massaro, Hoffmann et al. 2007; Vazquez-Benitez, Desai, Xu et al. 2015).Notably, cardiovascular mortality in China has continued to increase (Zhang XF 2012) and prevalences of cardiovascular risk factors remain high. Except from being the new 'diabetes capital' of the world, China also has the largest number of cigarette smokers (Yang, Kong, Zhao et al. 2008). In addition, hypertension is present in 26.6% (Gao, Chen, Tian et al. 2013) and dyslipidemia accounts for 18.6% of Chinese adults (Zhao, Zhang, You et al. 2005). The likelihood of developing cardiovascular disease is increased if these risk factors coexist with diabetes. This emphasizes the need for increased efforts in timely screening and aggressive control of cardiovascular risk factors among patients with diabetes. Nevertheless, recent data regarding the prevalence and distribution of cardiovascular risk factors among Chinese adults with diabetes are limited. The current study evaluated the cardiometabolic risk profile of Chinese patients with diabetes using a large nationally representative sample.

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Research design and methods

The 2010 China Noncommunicable Disease Surveillance selected a nationally representative sample of noninstitutionalized Chinese adults aged ≥18 years from the China CDC's National Disease Surveillance Point System. The System includes 162 study sites, covering major geographic areas of all 31 provinces, autonomous regions, and municipalities in mainland China (Xu, Wang, He et al. 2013; Yang, Hu, Rao et al. 2005). At each site, participants were selected using a complex, multistage, probability sampling design to be representative of civilian, non-institutionalized Chinese adults. Only persons who had been living in their current residence for at least 6 months were eligible to participate. Details of multistage sampling were described previously (Xu, Wang, He et al. 2013; Bi, Jiang, He et al. 2015). Briefly, in the first stage, four subdistricts in urban areas or townships in rural areas were selected from each site with probability proportional to size (PPS). In the second stage, three neighborhood communities or administrative villages were selected with PPS. In the third stage, households within each neighborhood community or administrative village were listed, and 50 households were randomly selected. In the final stage, one person aged ≥18 years was selected randomly from each household using a KISH selection table. Replacement with a similar household in the same or nearby neighborhood or village was implemented when the selected individual did not participate. A total of 109 023 adults were selected and 98 658 finally participated in the survey. The overall response rate was 90.5% and the

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replacement rate was 9.25%. For the current analysis, 12 607 participants with previously- or newly-diagnosed diabetes were included.

The research protocol was approved by the ethical review committee of the China CDC. Written informed consent was obtained from all study participants.

Data collection was conducted in examination centers at local health stations or community clinics in the participants' residential area by trained staff according to a standard protocol. Information on demographic characteristics, medical history, and lifestyle factors was recorded using a standard questionnaire. Family history of diabetes was considered positive if either or both parents had diabetes. A semi-quantitative food frequency questionnaire was used to assess food consumption. Low fruit and vegetable intake was defined as <4.5 cups per day according to the American Heart Association (Lloyd-Jones, Hong, Labarthe et al. 2010). Grams of fruit and vegetable intake were converted into cups using reference data from the Food Composition Databases of the US Department of Agriculture (http://ndb.nal.usda.gov/ndb/search/list). Low physical activity was defined as <150 min/wk moderate intensity or <75 min/wk vigorous intensity according to the World Health Organization Physical Activity Guidelines (Global Recommendations on Physical Activity for Health. World Health Organization. 2016.). Current smoking was defined as having smoked 100 cigarettes in one's lifetime and currently smoking cigarettes. Body-mass index (BMI) was calculated as body weight (kg) divided by heights squared (m^2). Waist circumference was measured on the midpoint between the lower edge of the costal arch and the upper edge of the iliac crest with a standing posture. Blood pressure (BP) was measured

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three times consecutively with 1-minute interval between the measurements at the non-dominant arm with the participant seated after 5 minutes of rest using an automated device (OMRON Model HEM-7071, Omron Co).

Blood samples were collected from all participants after at least a 10-hour overnight fast. Participants without a self-reported history of diabetes underwent a two-point (0 and 2 hours) 75-gram oral glucose tolerance test (OGTT). Participants with previously-diagnosed diabetes were not required to undergo OGTT and were asked to have their breakfast and anti-diabetic medications as usual after fasting blood samples were taken. Plasma glucose was measured locally within 24 hours using glucose oxidase or hexokinase methods. Capillary blood samples were collected using the hemoglobin capillary collection system and levels of hemoglobin A1c (HbA1c) were tested by high-performance liquid chromatography using the VARIANT^{TM} II Hemoglobin Testing System (Bio-Rad Laboratories, CA, USA) at the central laboratory, which was certified by the US National Glycohemoglobin Standardization Program. Capillary HbA1c levels were then converted to venous HbA1c levels using a validated formula (Xu, Wang, He et al. 2013). Serum samples were aliquoted and frozen at −80°C within 2 hours of collection and delivered to the central laboratory by air in dry ice. Serum total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides were measured using an autoanalyser (Abbott Laboratories).

A stringent quality assurance and quality control program was implemented to ensure the validity and reliability of study data. Data collection was undertaken by certified investigators

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and trained staff using standardized protocols and instruments. All data were in double entry and discrepancies were resolved by referring to original documents.

Young adults, middle-aged adults, and elderly adults were those aged 18-44 years, 45-64 years, and ≥65 years, respectively. Overweight was defined as a BMI of 25.0 to 29.9 kg/m^2, and obesity was defined as a BMI ≥ 30.0 kg/m^2 (World Health Organization. Obesity: preventing and managing the global epidemic; 1997.). Central obesity was defined as a waist circumference ≥90 cm in men and ≥80 cm in women (The World Health Organization Western Pacific Region. The Asia-Pacific perspective: redefining obesity and its treatment. 2015.). Diabetes was defined as a self-reported previous diagnosis by health professionals, and/or a fasting plasma glucose (FPG) ≥126 mg/dL, and/or a 2-hour plasma glucose (2h PG) ≥ 200 mg/dL, and/or an HbA1c≥6.5% (Assy, Djibre, Farah et al. 2010). Hypertension was defined as a systolic BP ≥140 mmHg, and/or a diastolic BP ≥90 mmHg, and/or use of anti-hypertensive medications in the past 2 weeks. Metabolic syndrome was defined based on the US National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria, (Executive Summary of The Third Report of The National Cholesterol Education Program Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults, 2001) with modification of waist circumference cutoffs to be appropriate for Asians (Alberti, Zimmet, Shaw 2005). Targets for HbA1c, systolic BP, and LDL cholesterol control in patients with diabetes were <7%, <140 mmHg, and <100 mg/dL, respectively, according to the American Diabetes Association (Cardiovascular disease and risk management, 2015).

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Statistical analyses were performed using SAS version 9.3 (SAS Institute Inc) and SUDAAN version 10.0 (Research Triangle Institute). Study sites were categorized into underdeveloped, intermediately developed, or developed. General characteristics and behavioral risk factors were described in the overall population and in subgroups of sex, location (urban/rural areas), age, levels of economic development, categories of BMI and waist circumference, newly- or previously-diagnosed diabetes, and status of glucose control. Mean levels and prevalence rates of cardiometabolic risk factors were estimated overall and in subgroups. Prevalence of multiple risk factors was also calculated in subgroups in Chinese men and women with diabetes separately. In addition, multivariable logistic regression analysis was conducted to identify determinants associated with different numbers of cardiometabolic risk factors.

All calculations were weighted to obtain national estimates. Weight coefficients were derived from 2010 China population census data and the sampling scheme of the current survey. Standard errors were calculated by the Taylor-linearization method appropriate for the complex survey design.[21]

Results

General characteristics and behavioral risk factors

General characteristics and behavioral risk factors among Chinese adults with diabetes are shown in Table 1. Men accounted for 53.1% of Chinese patients with diabetes, and the proportion was 60.7% in young adults, 52.4% in middle-aged adults, and 43.5% in elderly

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adults. More than two thirds (69.9%) of Chinese patients with diabetes were newly diagnosed, with a higher proportion in young adults, at rural areas, and in less developed regions than in older adults, at urban areas, and in developed regions, respectively. Adults with newly-diagnosed diabetes tended to be less educated and less likely to have a family history of diabetes compared with known diabetes. Approximately 44.6% of Chinese patients with diabetes had less than high school education, and the proportion was higher among women, older adults, and residents in rural areas or less developed regions compared with their counterparts, respectively. People with low fruit/vegetable intake accounted for 47.5% of all Chinese population with diabetes, and the proportion for low physical activity was 20.3%. Current cigarette smoking was present in 27.2% of individuals with diabetes in China. Nearly half of men (48.6%) smoked cigarettes compared with 3.0% among women, and a substantially higher proportion was found in adults <65 years vs. ≥65 years.

Metabolic risk factors

Estimated mean levels of metabolic risk factors in the Chinese population with diabetes and in subgroups are displayed in Table 2. Mean levels of BMI, waist circumference, systolic BP, and diastolic BP were 25.4 (95% confidence interval (CI):25.3-25.5) kg/m^2, 85.9 (85.7-86.2) cm, 144.2 (143.6-144.7) mmHg, and 86.1 (85.9-86.4) mmHg, respectively. Mean levels of total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides among Chinese patients with diabetes were 175.9 (174.8-177.1) mg/dL, 100.2 (99.5-101.0) mg/dL, 41.0 (40.8-41.3) mg/dL, and 181.2 (176.5-185.8) mg/dL, respectively. In addition, the estimated mean levels of FPG, 2h PG, and HbA1c were 142.3 (141.1-143.6) mg/dL, 197.1

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(194.4-199.8) mg/dL, and 7.2 (7.1-7.2) %, respectively in Chinese adults with diabetes. People with newly-diagnosed diabetes had lower concentrations of fasting PG and HbA1c than those with previously-diagnosed diabetes. The mean HbA1c levels were 6.2 (6.2-6.2)% and 8.9 (8.8-8.9)% in Chinese adults with controlled and uncontrolled diabetes, respectively.

Estimated prevalences of metabolic risk factors in the Chinese population with diabetes and in subgroups are displayed in Table 3. Approximately half of Chinese patients with diabetes were overweight or obese, or had central obesity, or uncontrolled systolic BP (≥140 mmHg) and LDL levels (≥100 mg/dL). Patients with uncontrolled diabetes (HbA1c ≥7.0%) accounted for 36.4% of all diabetes in China, and the proportion was 57.2% for previously-diagnosed diabetes compared with 27.5% for newly-diagnosed diabetes. Metabolic syndrome was present in 69.5% of Chinese patients with diabetes. In addition, an estimated 2.0% of Chinese adults with diabetes had myocardial infarction (MI) or stroke during the past 12 months. Generally, prevalences of metabolic risk factors among Chinese patients with diabetes were higher in subgroups of women, older adults, residents in urban areas and developed regions, and people with higher BMI and waist circumference levels compared with their counterparts, respectively. In addition, the metabolic risk profile was substantially unfavorable in previously-diagnosed diabetes vs. newly-diagnosed diabetes, and in uncontrolled vs. controlled diabetes.

Multiple cardiometabolic risk factors

Figure 1 shows the estimated prevalence of multiple metabolic risk factors including current cigarette smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and

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HbA1c ≥7.0% in the Chinese population with diabetes and in subgroups in men and women separately. Proportions of men with 0, 1, 2, 3, 4 metabolic risk factors were 9.9% (8.9-11.0), 29.6% (28.1-31.1), 36.7% (35.1-38.3), 19.3% (18.0-20.5), and 4.5% (3.9-5.3), respectively. The corresponding proportions of women were 17.3% (16.1-18.6), 36.5% (35.0-38.1), 33.1% (31.6-34.6), 12.6% (11.7-13.7), and 0.5% (0.3-0.7), respectively. Numbers of metabolic risk factors increased in older adults, in residents of urban areas and developed regions, as well as in adults with previously-diagnosed diabetes, as compared with their counterparts in both men and women. In addition, comparisons between Chinese adults with and without diabetes in the 2010 China Noncommunicable Disease Surveillance study indicated substantially more cardiometabolic risk factors in people with diabetes than those without (Supplementary Table 1).

Risk factors associated with an adverse cardiometabolic risk profile

The multivariable logistic regression analyses revealed that risk factors associated with the presence of multiple risk factors included an increased age, overweight or obesity, central obesity, and previously-diagnosed diabetes in both men and women (Table 4). In particular, women with diabetes aged 45-64 and ≥65 years were 3.07- and 3.85-fold more likely to have 3-4 cardiometabolic risk factors compared to have only 0-1 risk factor than those aged 18-44 years, respectively. In addition, family history of diabetes was also independently associated with the presence of 3-4 risk factors vs. 0-1 risk factor in men.

Discussion

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The present study examined the cardiometabolic risk profile of Chinese adults with diabetes using a large nationally representative sample. We found that in addition to current cigarette smoking, which was present in 48.6% of men with diabetes, the weighted prevalence estimates were 41.1% (40.0-42.2) for overweight, 10.9% (10.3-11.7) for obesity, 54.1% (52.9-55.2) for central obesity, 52.2% (51.0-53.3) for systolic BP ≥140 mmHg, 46.8% (45.6-47.9) for LDL cholesterol ≥100 mg/dL, 36.4% (35.3-37.5) for HbA1c ≥7.0% (53 mmol/mol), and 69.5% (68.4-70.6) for metabolic syndrome in the Chinese population with diabetes. These data suggest that both behavioral and metabolic risk factors were highly prevalent in Chinese patients with diabetes, which could potentially lead to a major epidemic of diabetes-related cardiovascular disease in the near future without effective national interventions.

Recent advances in medical care and improvements in cardiovascular risk factor control have resulted in a marked reduction of cardiovascular morbidity and mortality in some developed countries (Gregg, Li, Wang et al. 2014). However, the incidence of cardiovascular disease or the prevalence of its risk factors have remained high in China, as well as in many other developing countries (Ramachandran, Mary, Yamuna et al. 2008; Reddy 2004), where rapid socioeconomic and demographic changes have had immense impacts on people's lifestyle and health behaviors. In addition, multiple cardiovascular risk factors could be present in one person. Chinese adults with ≥1, ≥2, and ≥3 cardiovascular risk factors (dyslipidemia, hypertension, diabetes, cigarette smoking, and overweight) accounted for 80.5%, 45.9%, and 17.2% of the overall Chinese adult population aged 35-74 years,

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respectively (Gu, Gupta, Muntner et al. 2005). The presence and clustering of cardiovascular risk factors are detrimental because they lead to cardiovascular disease. The dramatic increase in cardiovascular mortality during 1984-1999 in Beijing, China has largely been attributed to increases in serum cholesterol, obesity, and diabetes (Critchley, Liu, Zhao et al. 2004). The 2007-2008 China National Diabetes and Metabolic Disorders Study also reported that odds ratios of cardiovascular disease for those who had 1, 2, 3, or ≥4 cardiovascular risk factors including smoking, overweight or obese, hypertension, dyslipidemia, and hyperglycemia was 2.36, 4.24, 4.88, and 7.22, respectively, when compared with Chinese adults with no risk factors(Yang, Liu, Ge et al. 2012), but no information was provided specifically on Chinese adults with diabetes. Likewise, inadequate risk factor control such as LDL cholesterol ≥100 mg/dL, HbA1c ≥7.0%, BP ≥140/90 mmHg, or smoking could all increase risks of MI, stroke, heart failure, and all-cause mortality in diabetes with or without a cardiovascular disease history (Vazquez-Benitez, Desai, Xu et al. 2015). Because cardiovascular disease is the predominant cause of death in patients with diabetes (An, Zhang, Wang et al. 2015), the examination of cardiometabolic risk profile in the overall Chinese population with diabetes is of crucial importance for the prevention and reduction of cardiovascular morbidity and mortality in Chinese patients with diabetes.

According to our study, only 9.9% men and 17.3% women with diabetes in China had adequate control of all four cardiovascular risk factors, which include cigarette smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and HbA1c ≥7.0%. Data from the US National Health and Nutrition Examination Survey (NHANES) showed that approximately

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18.8% of US adults with self-reported diabetes had controlled levels of all three risk factors of BP, LDL cholesterol, and HbA1c during 2007-2010. The proportions of cardiovascular risk factors were 28.0% for BP ≥140/90 mmHg, 43.8% for LDL cholesterol ≥100 mg/dL, and 47.5% for HbA1c ≥7.0%, respectively in US adults with self-reported diabetes (Stark Casagrande, Fradkin, Saydah et al. 2013), compared with 56.7% for systolic BP ≥140 mmHg, 46.5% for LDL cholesterol ≥100 mg/dL, and 57.2% for HbA1c ≥7.0%, respectively in Chinese adults with self-reported diabetes as indicated in our study. Therefore, although control of LDL cholesterol and HbA1c in diabetes were far from optimal in both countries, control of BP in Chinese patients with diabetes was only half of that in US patients with diabetes. The self-reported use of antihypertensive agents by patients with diabetes was 19.9% in China vs. 58.9% in the US. An even more striking difference between two countries was the proportion of patients with diabetes on lipid-lowering drugs, which was 6.3% in China vs. 42.2% in the US (Kuznik and Mardekian 2011). In addition, individuals taking diabetes medications accounted for only 25.8% among the Chinese population with diabetes (Xu, Wang, He et al. 2013). In addition, If patients with diabetes are properly managed based on ADA guidelines after diagnosis, previously diagnosed patients would have more controlled metabolic risk profiles (Brown TM, Tanner RM, Carson AP, Yun H, et al. 2013; Lee YH, Armstrong EJ, Kim G, et al. 2015).Therefore, although there are new and improved therapeutic agents and increasing scientific evidence of cardiovascular benefits from risk factor control, use of medications to improve the cardiovascular risk profile in Chinese patients with diabetes was very limited.

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While individual risk factor control in diabetes has been demonstrated to reduce cardiovascular risk by landmark studies such as the United Kingdom Prospective Diabetes Study (UKPDS), the Hypertension Optimal Treatment (HOT) trial, and the Scandinavian Simvastatin Survival Study (4S), an intensified multifactorial treatment approach to control cardiovascular risk factors collectively has been proved to halve the risk of cardiovascular events and all-cause mortality among patients with type 2 diabetes and additional cardiovascular risk factors such as microalbuminuria (UKPDS 38. UK Prospective Diabetes Study Group 1998; Hansson, Zanchetti, Carruthers et al. 1998; Pyorala, Pedersen, Kjekshus et al. 1997; Gaede, Lund-Andersen, Parving et al. 2008; Gaede, Vedel, Larsen et al. 2003). This comprehensive treatment approach is of particular relevance for Chinese patients with diabetes because more than 90% of Chinese men and more than 80% of Chinese women with diabetes had ≥1 risk factors including current cigarette smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and HbA1c ≥7.0%. In addition, emphasis on the importance of lifestyle modification as the cornerstone of cardiovascular risk management should be reinforced at all levels. Public health campaigns to encourage smoking cessation as well as to promote heart-healthy diets and regular moderate-to-vigorous physical activity are critical steps towards cardiovascular risk management. To date, lifestyle interventions have not been implemented adequately in Chinese patients with diabetes because people with diabetes diagnosed previously had similar levels of unhealthy eating or low physical activity as those with newly-diagnosed diabetes as indicated by our study. Therefore, it is increasingly evident that multidisciplinary management of diabetes, combining behavioral risk factor reduction

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with individual metabolic risk factor control, should be the fundamental component of cardiovascular risk reduction in diabetes.

Notably, the percentage of newly-diagnosed diabetes was high in our study. A similar and high percentage was also found in another national diabetes study, which reported an approximate 60% of overall diabetes being undiagnosed in Chinese adults [Yang, Lu, Weng et al. 2010]. In addition, the diagnostic criteria for diabetes used in our study further increased the percentage of newly-diagnosed diabetes by detecting more diabetic individuals because it included an HbA1c ≥6.5% on the basis of fasting and 2h post-load glucose to diagnose diabetes.

The present study has several strengths. First, it was conducted in a large nationally representative sample to provide national estimates of cardiometabolic risk factors in the Chinese population with diabetes as well as in subgroups. Second, a comprehensive cardiometabolic risk profile including both behavioral and metabolic risk factors was examined using standard definitions. In addition, a stringent quality assurance and quality control program was implemented to ensure data validity and reliability. There are also several limitations. Aside from describing comprehensively the cardiometabolic risk profile in Chinese patients with diabetes, this cross-sectional survey was not able to record cardiovascular outcomes in patients with diabetes longitudinally. Likewise, the presence of MI or stroke was only asked for the previous 12 months of the study interview. History of cardiovascular disease beyond that period was not available. In addition, we included noninstitutionalized Chinese adults with diabetes for the current study. Patients with diabetes

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who were hospitalized during the survey were not selected, which might have resulted in an underestimation of the cardiometabolic risk prevalence of the overall Chinese population with diabetes. In addition, type 1 and type 2 diabetes were not distinguished in this study. Nevertheless, type 2 diabetes accounts for the majority of diabetes in adults. Finally, some behavioral risk factors such as low intake of fruits and vegetables have not been validated in a Chinese population.

In conclusion, inadequately controlled risk factors associated with cardiovascular disease remain highly prevalent among Chinese adults with diabetes. More efforts should be taken to effectively control the epidemic of cardiometabolic risk factors and sufficiently prioritize clinical and public health strategies to further reduce the burden of cardiovascular disease in Chinese patients with diabetes.

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Conflicts of interest

We declare that we have no conflicts of interest.

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Figure Legends

Figure 1. Prevalence of multiple cardiometabolic risk factors among Chinese adults with diabetes in men and women. Cardiometabolic risk factors (CM risk factors) included current cigarette smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and HbA1c ≥7.0% (53 mmol/mol).

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Table 1. General characteristics and behavioral risk factors among Chinese adults with diabetes

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	Number of Participants	Men, %	Age, years	Newly-diagnosed diabetes, %	Family history of diabetes, %	Less than high school education, %	Low fruit and vegetables intake, %	Low physical activity, %	Current cigarette smoking, %
Overall	12607	53.1 (52.0-54.3)	52.3 (51.9-52.7)	69.9 (68.9-70.9)	11.3 (10.6-12.0)	44.6 (43.5-45.8)	47.5 (46.4-48.7)	20.3 (19.3-21.2)	27.2 (26.2-28.3)
Sex									
Men	6094	100.0	50.5 (49.9-51.0)	70.3 (68.8-71.7)	12.3 (11.2-13.4)	32.1 (30.7-33.6)	47.4 (45.8-49.1)	21.9 (20.6-23.4)	48.6 (47.0-50.3)
Women	6513	0.0	54.4 (53.8-55.0)	69.5 (68.1-70.9)	10.1 (9.2-11.0)	58.8 (57.3-60.4)	47.6 (46.0-49.2)	18.4 (17.1-19.7)	3.0 (2.6-3.5)
P value	/	/	<0.0001	0.47	0.003	<0.0001	0.87	0.0002	<0.0001
Age, years									
18-44	2870	60.7 (58.4-63.1)	34.4 (33.9-34.8)	77.5 (75.6-79.4)	14.6 (12.9-16.3)	24.0 (22.1-26.0)	46.9 (44.5-49.4)	21.4 (19.4-23.6)	30.7 (28.5-33.0)
45-64	6779	52.4 (51.0-53.9)	54.9 (54.8-55.1)	67.5 (66.1-68.8)	11.8 (10.9-12.8)	45.6 (44.1-47.1)	45.3 (43.8-46.7)	16.1 (15.1-17.2)	28.7 (27.3-30.1)
≥65	2958	43.5 (41.2-45.7)	72.9 (72.6-73.2)	64.2 (62.0-66.3)	5.2 (4.4-6.3)	72.7 (70.8-74.6)	53.3 (51.0-55.6)	27.5 (25.5-29.7)	19.0 (17.4-20.8)
P value	/	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Location									
Urban	6086	54.4 (52.9-56.0)	53.6 (53.0-54.1)	61.3 (59.7-62.8)	17.6 (16.3-18.9)	31.0 (29.6-32.4)	42.6 (41.1-44.1)	18.8 (17.7-20.1)	28.1 (26.7-29.6)
Rural	6521	52.3 (50.7-53.9)	51.5 (51.0-52.1)	75.4 (74.1-76.7)	7.3 (6.5-8.1)	53.3 (51.7-54.9)	50.6 (49.1-52.2)	21.2 (19.8-22.6)	26.7 (25.3-28.1)
P value	/	0.06	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.16	
Economic development									
Underdeveloped	3083	53.1 (50.8-55.4)	51.5 (50.6-52.3)	79.3 (77.4-81.0)	5.6 (4.6-6.7)	55.1 (52.7-57.4)	49.6 (47.3-51.9)	17.8 (16.0-19.7)	27.9 (25.8-30.0)
Intermediately developed	3966	53.3 (51.2-55.3)	52.4 (51.6-53.1)	69.5 (67.6-71.2)	10.1 (8.9-11.5)	48.0 (46.0-50.1)	43.7 (41.7-45.8)	22.8 (21.0-24.7)	26.1 (24.4-27.9)
Developed	5558	53.0 (51.4-54.7)	52.9 (52.3-53.5)	63.6 (62.1-65.2)	16.2 (15.0-17.4)	34.7 (33.2-36.3)	48.9 (47.2-50.6)	20.1 (18.8-21.5)	27.6 (26.1-29.2)
P value	/	0.98	0.005	<0.0001	<0.0001	<0.0001	0.0001	0.0007	0.33
Education									
High school education or above	6,631	65.1 (63.6-66.6)	46.7 (46.2-47.2)	68.4 (67.0-69.8)	15.9 (14.7-17.1)	0.0	43.3 (41.8-44.9)	20.2 (18.9-21.6)	32.0 (30.5-33.5)
Less than high school education	5,976	38.2 (36.7-39.8)	59.3 (58.8-59.8)	71.8 (70.4-73.2)	5.5 (4.9-6.3)	100.0	52.7 (51.1-54.3)	20.3 (19.0-21.6)	21.4 (20.1-22.7)
P value	/	<0.0001	<0.0001	0.0009	<0.0001	/	<0.0001	0.95	<0.0001
Body mass index, kg/m^2									
<25.0	5,767	54.3 (52.6-56.0)	52.7 (52.0-53.4)	71.0 (69.5-72.4)	9.8 (8.8-10.8)	48.0 (46.3-49.7)	48.9 (47.2-50.6)	20.1 (18.7-21.6)	28.6 (27.1-30.2)
25.0-29.9	5,358	53.1	52.3	67.6	12.2	41.5	46.8	20.3	26.4

		(51.4-54.8)	(51.8-52.9)	(66.0-69.1)	(11.2-13.4)	(39.8-43.2)	(45.1-48.6)	(18.9-21.8)	(24.9-28.0)
≥30.0	1,470	48.2 (44.9-51.6)	50.5 (49.4-51.6)	74.1 (71.2-76.7)	14.2 (12.0-16.8)	41.7 (38.5-44.9)	43.9 (40.7-47.2)	20.5 (18.0-23.2)	24.3 (21.5-27.4)
P value	/	0.006	0.007	0.0001	0.0002	<0.0001	0.02	0.97	0.02
Waist circumference, cm									
<90 in men, <80 in women	5,348	67.1 (65.4-68.7)	51.1 (50.5-51.8)	71.8 (70.3-73.3)	10.0 (8.9-11.1)	43.0 (41.3-44.7)	47.1 (45.6-48.6)	20.4 (19.1-21.7)	21.8 (20.6-23.1)
≥90 in men, ≥80 in women	7,251	41.3 (39.8-42.8)	53.3 (52.8-53.9)	68.3 (67.0-69.6)	12.4 (11.4-13.4)	46.0 (44.5-47.5)	48.0 (46.3-49.8)	20.1 (18.7-21.6)	33.6 (32.0-35.3)
P value	/	<0.0001	<0.0001	0.0006	0.001	0.01	0.41	0.78	<0.0001
Diabetes status									
Newly diagnosed	8,413	53.4 (52.0-54.8)	51.0 (50.5-51.5)	100.0	6.9 (6.2-7.6)	45.8 (44.4-47.2)	47.5 (46.1-48.9)	20.1 (18.9-21.3)	28.6 (27.4-29.9)
Previously diagnosed	4,194	52.5 (50.6-54.4)	55.4 (54.8-56.0)	0.0	21.4 (19.8-23.1)	41.9 (40.0-43.8)	47.5 (45.6-49.4)	20.6 (19.1-22.3)	24.0 (22.3-25.7)
P value	/	0.47	<0.0001	/	<0.0001	0.0009	0.96	0.59	<0.0001
HbA1c, % (mmol/mol)									
<7.0 (53)	7,738	53.0 (51.5-54.4)	51.9 (51.4-52.4)	79.9 (78.8-81.0)	9.1 (8.3-10.0)	46.1 (44.6-47.5)	48.3 (46.8-49.8)	20.0 (18.8-21.2)	27.5 (26.2-28.8)
≥7.0 (53)	4,754	53.5 (51.6-55.3)	53.0 (52.3-53.7)	53.1 (51.3-54.9)	14.7 (13.4-16.1)	42.5 (40.8-44.3)	46.0 (44.2-47.9)	20.8 (19.3-22.3)	26.7 (25.0-28.4)
P value	/	0.68	0.01	<0.0001	<0.0001	0.003	0.06	0.44	0.43

Data are weighted percentages (95% confidence intervals). There are 12 missing values for body-mass index, 8 missing values for waist circumference. HbA1c: hemoglobin A1c.

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Table 2. Mean levels of metabolic risk factors among Chinese adults with diabetes

	Body-mass index, kg/m^2	Waist circumference, cm	Blood pressure, mm Hg		Serum cholesterol, mg/dL			Triglyceride, mg/dL	Plasma glucose, mg/dL		HbA1c, %	HbA1c, mmol/mol
			Systolic	Diastolic	Total	LDL	HDL		Fasting	2h Post-load		
Overall	25.4 (25.3-25.5)	85.9 (85.7-86.2)	144.2 (143.6-144.7)	86.1 (85.9-86.4)	175.9 (174.8-177.1)	100.2 (99.5-101.0)	41.0 (40.8-41.3)	181.2 (176.5-185.8)	142.3 (141.1-143.6)	197.1 (194.4-199.8)	7.2 (7.1-7.2)	55 (54-55)
Sex												
Men	25.2 (25.1-25.4)	87.2 (86.9-87.6)	142.5 (141.8-143.2)	86.4 (86.0-86.8)	173.6 (172.0-175.2)	98.3 (97.2-99.4)	39.9 (39.5-40.3)	194.5 (186.9-202.1)	144.6 (142.8-146.4)	197.4 (193.6-201.1)	7.1 (7.1-7.2)	55 (54-55)
Women	25.6 (25.4-25.7)	84.4 (84.1-84.7)	146.0 (145.2-146.9)	85.8 (85.4-86.2)	178.6 (177.0-180.1)	102.4 (101.3-103.5)	42.3 (41.9-42.7)	166.0 (161.2-170.9)	139.8 (138.2-141.4)	196.8 (193.0-200.6)	7.2 (7.1-7.2)	55 (54-55)
P value	0.0004	<0.0001	<0.0001	0.05	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.83	0.77	0.77
Age, years												
18-44	25.5 (25.3-25.7)	85.5 (85.0-86.1)	134.5 (133.5-135.5)	84.5 (83.9-85.1)	171.0 (168.6-173.4)	96.3 (94.7-97.9)	39.4 (38.8-40.0)	199.8 (188.5-211.1)	142.8 (140.2-145.3)	186.4 (181.1-191.6)	7.1 (7.0-7.2)	54 (53-55)
45-64	25.6 (25.5-25.7)	86.5 (86.1-86.8)	145.6 (144.9-146.3)	87.7 (87.4-88.1)	179.4 (177.9-180.9)	102.2 (101.2-103.1)	41.7 (41.3-42.1)	183.6 (177.8-189.4)	144.3 (142.7-146.0)	201.2 (197.5-204.8)	7.2 (7.2-7.3)	55 (55-56)
≥65	24.8 (24.6-25.0)	85.3 (84.8-85.7)	155.1 (154.0-156.2)	85.1 (84.5-85.7)	175.5 (173.4-177.6)	101.8 (100.2-103.4)	42.1 (41.5-42.6)	148.6 (143.0-154.1)	137.4 (135.0-139.7)	206.4 (201.0-211.7)	7.1 (7.0-7.2)	54 (53-55)
P value	<0.0001	0.85	<0.0001	0.007	0.0007	<0.0001	<0.0001	<0.0001	0.01	<0.0001	0.20	0.20
Location												
Urban	25.8 (25.7-26.0)	87.7 (87.4-88.1)	143.6 (142.9-144.3)	86.1 (85.7-86.4)	177.1 (175.5-178.7)	102.7 (101.6-103.8)	40.5 (40.1-40.9)	178.2 (172.5-184.0)	145.0 (143.4-146.7)	203.9 (199.9-207.9)	7.2 (7.2-7.3)	56 (55-56)
Rural	25.1 (25.0-25.2)	84.8 (84.4-85.1)	144.5 (143.7-145.3)	86.2 (85.8-86.6)	175.2 (173.7-176.7)	98.6 (97.6-99.7)	41.4 (41.0-41.8)	183.0 (176.3-189.6)	140.6 (139.0-142.3)	193.5 (190.0-197.0)	7.1 (7.0-7.2)	54 (53-55)
P value	<0.0001	<0.0001	0.08	0.61	0.10	<0.0001	0.002	0.29	0.0002	0.0001	0.0009	0.0009
Economic development												
Underdeveloped	24.7 (24.6-24.9)	83.8 (83.2-84.3)	142.8 (141.7-143.9)	85.1 (84.5-85.7)	176.1 (173.9-178.3)	98.9 (97.4-100.4)	41.5 (40.9-42.2)	181.9 (172.1-191.6)	139.7 (137.1-142.4)	193.6 (188.2-198.9)	7.1 (7.1-7.2)	55 (54-56)
Intermediately developed	25.2 (25.1-25.4)	85.5 (85.1-86.0)	144.6 (143.6-145.6)	86.3 (85.8-86.8)	174.0 (171.8-176.2)	99.2 (97.7-100.6)	41.0 (40.5-41.5)	186.3 (177.5-195.0)	141.7 (139.5-143.9)	198.2 (193.5-203.0)	7.2 (7.1-7.2)	55 (54-56)
Developed	26.0 (25.8-26.1)	87.7 (87.3-88.1)	144.8 (144.1-145.6)	86.8 (86.4-87.2)	177.2 (175.7-178.8)	102.0 (100.9-103.1)	40.7 (40.3-41.1)	176.8 (170.5-183.1)	144.7 (143.1-146.3)	199.3 (195.4-203.1)	7.1 (7.1-7.2)	55 (54-55)
P value	<0.0001	<0.0001	0.004	<0.0001	0.30	0.0005	0.02	0.32	0.001	0.10	0.98	0.98
Education												
High school education or above	25.7 (25.5-25.8)	86.9 (86.5-87.3)	140.6 (139.9-141.3)	86.1 (85.7-86.5)	175.6 (174.0-177.2)	100.3 (99.2-101.3)	39.9 (39.5-40.3)	193.9 (186.8-201.0)	143.8 (142.1-145.5)	194.3 (190.5-198.1)	7.2 (7.1-7.2)	55 (54-55)
Less than high school education	25.1 (24.9-25.2)	84.7 (84.4-85.1)	148.6 (147.8-149.4)	86.1 (85.7-86.6)	176.3 (174.7-177.9)	100.2 (99.1-101.3)	42.4 (42.0-42.8)	165.4 (160.0-170.9)	140.6 (138.8-142.3)	200.4 (196.6-204.1)	7.1 (7.1-7.2)	55 (54-55)
P value	<0.0001	<0.0001	<0.0001	0.95	0.54	0.89	<0.0001	<0.0001	0.01	0.03	0.75	0.75
Body-mass index, kg/m^2												
<25.0	22.2	78.9	140.3	82.8	171.2	96.5	43.6	147.3	142.1	191.5	7.1	54

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	(22.1-22.3)	(78.6-79.2)	(139.4-141.1)	(82.4-83.2)	(169.6-172.8)	(95.4-97.6)	(43.1-44.0)	(141.9-152.7)	(140.2-144.0)	(187.3-195.6)	(7.0-7.2)	(53-55)
25.0-29.9	27.1 (27.1-27.2)	90.1 (89.9-90.4)	146.9 (146.1-147.6)	88.4 (88.0-88.8)	179.8 (178.0-181.6)	103.2 (102.0-104.4)	38.9 (38.5-39.2)	209.1 (201.0-217.1)	143.0 (141.3-144.7)	202.7 (198.7-206.7)	7.2 (7.1-7.2)	55 (54-56)
≥30.0	32.8 (32.6-33.0)	100.8 (100.1-101.5)	151.0 (149.5-152.6)	92.2 (91.4-93.0)	182.2 (178.9-185.5)	105.3 (103.3-107.3)	38.2 (37.5-38.9)	225.1 (208.5-241.6)	141.1 (137.7-144.5)	201.4 (195.1-207.7)	7.2 (7.1-7.3)	55 (54-56)
P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.99	0.0002	0.03	0.03
Waist circumference, cm												
<90 in men, <80 in women	22.9 (22.8-23.0)	77.5 (77.2-77.8)	139.4 (138.6-140.3)	83.1 (82.7-83.5)	170.0 (168.3-171.7)	95.9 (94.8-97.1)	43.2 (42.7-43.6)	151.2 (144.9-157.5)	141.1 (139.2-143.1)	187.8 (183.6-192.0)	7.0 (6.9-7.1)	53 (52-54)
≥90 in men, ≥80 in women	27.5 (27.4-27.6)	93.0 (92.8-93.3)	148.2 (147.5-148.8)	88.7 (88.4-89.1)	181.0 (179.5-182.5)	103.9 (102.9-104.9)	39.3 (38.9-39.6)	206.8 (200.2-213.4)	143.4 (141.9-144.9)	205.5 (202.2-208.8)	7.3 (7.2-7.3)	56 (55-57)
P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.07	<0.0001	<0.0001	<0.0001
Diabetes status												
Newly diagnosed	25.3 (25.2-25.5)	85.6 (85.3-86.0)	143.4 (142.7-144.0)	86.0 (85.6-86.4)	176.6 (175.2-178.0)	100.4 (99.5-101.4)	41.5 (41.1-41.8)	181.7 (175.8-187.5)	136.1 (134.7-137.4)	198.3 (195.5-201.0)	6.9 (6.8-6.9)	52 (51-52)
Previously diagnosed	25.5 (25.4-25.7)	86.5 (86.1-87.0)	146.0 (145.1-146.9)	86.5 (86.0-86.9)	174.4 (172.5-176.2)	99.8 (98.5-101.0)	40.0 (39.6-40.5)	180.0 (172.8-187.2)	157.0 (154.5-159.4)	/	7.8 (7.7-7.8)	61 (60-62)
P value	0.06	0.001	<0.0001	0.12	0.06	0.40	<0.0001	0.72	<0.0001	/	<0.0001	<0.0001
HbA1c, % (mmol/mol)												
<7.0 (53)	25.1 (25.0-25.2)	84.8 (84.5-85.1)	143.3 (142.6-144.0)	85.7 (85.3-86.0)	172.3 (170.9-173.7)	97.8 (96.8-98.8)	41.8 (41.5-42.2)	164.0 (158.7-169.2)	123.1 (122.3-124.0)	169.9 (167.9-172.0)	6.2 (6.2-6.2)	44 (44-44)
≥7.0 (53)	25.9 (25.8-26.1)	87.9 (87.4-88.3)	145.7 (144.8-146.5)	87.1 (86.6-87.5)	182.3 (180.4-184.1)	104.5 (103.2-105.7)	39.7 (39.3-40.1)	211.1 (202.4-219.7)	175.8 (173.3-178.3)	273.9 (267.1-280.8)	8.9 (8.8-8.9)	73 (73-74)
P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Data are weighted means (95% confidence intervals). To convert total cholesterol, LDL-cholesterol and HDL-cholesterol to mmol/l, multiply values by 0.0259. To convert triglycerides to mmol/l, multiply values by 0.0113. To convert plasma glucose to mmol/l, multiply values by 0.0555. LDL: low-density lipoprotein; HDL: high-density lipoprotein; HbA1c: hemoglobin A1c.

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Table 3. Prevalence of cardiometabolic risk factors among Chinese adults with diabetes

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	Overweight	Obesity	Central obesity	Systolic BP ≥140 mmHg	LDL cholesterol ≥100 mg/dL	HbA1c ≥7.0% (53 mmol/mol)	Metabolic syndrome	MI or stroke in past 12 months
Overall	41.1 (40.0-42.2)	10.9 (10.3-11.7)	54.1 (52.9-55.2)	52.2 (51.0-53.3)	46.8 (45.6-47.9)	36.4 (35.3-37.5)	69.5 (68.4-70.6)	2.0 (1.7-2.3)
Sex								
Men	41.1 (39.5-42.7)	9.9 (9.0-10.9)	42.0 (40.4-43.6)	49.6 (48.0-51.3)	44.6 (43.0-46.3)	36.6 (35.0-38.2)	62.6 (61.0-64.1)	1.8 (1.4-2.2)
Women	41.1 (39.6-42.7)	12.1 (11.2-13.1)	67.8 (66.2-69.3)	55.0 (53.4-56.6)	49.2 (47.6-50.8)	36.1 (34.6-37.7)	77.4 (76.0-78.8)	2.2 (1.8-2.7)
P value	0.96	0.002	<0.0001	<0.0001	0.0001	0.68	<0.0001	0.17
Age, years								
18-44	40.7 (38.4-43.1)	12.2 (10.8-13.8)	49.0 (46.6-51.5)	32.4 (30.2-34.7)	42.6 (40.2-45.1)	33.0 (30.8-35.3)	64.1 (61.7-66.4)	0.3 (0.2-0.6)
45-64	43.1 (41.7-44.6)	11.3 (10.4-12.2)	56.9 (55.4-58.4)	56.1 (54.6-57.5)	48.5 (47.0-50.0)	38.8 (37.4-40.2)	72.3 (71.0-73.7)	2.0 (1.7-2.5)
≥65	37.2 (35.1-39.4)	8.4 (7.3-9.7)	55.4 (53.1-57.7)	72.5 (70.5-74.5)	49.0 (46.7-51.3)	36.1 (33.9-38.3)	71.4 (69.2-73.4)	4.1 (3.3-5.1)
P value	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001
Location								
Urban	44.6 (43.1-46.2)	12.3 (11.3-13.3)	59.3 (57.8-60.9)	52.3 (50.7-53.8)	49.8 (48.2-51.4)	40.4 (38.9-42.0)	74.3 (72.9-75.7)	2.5 (2.1-3.0)
Rural	38.8 (37.3-40.4)	10.1 (9.3-11.1)	50.8 (49.2-52.3)	52.1 (50.5-53.7)	44.8 (43.3-46.4)	33.8 (32.4-35.3)	66.5 (65.0-68.0)	1.6 (1.3-2.0)
P value	<0.0001	0.002	<0.0001	0.90	<0.0001	<0.0001	<0.0001	0.003
Economic development								
Underdeveloped	36.7 (34.5-39.0)	8.1 (6.9-9.5)	47.7 (45.4-50.0)	48.8 (46.5-51.1)	45.2 (42.9-47.6)	33.8 (31.6-36.0)	63.9 (61.6-66.1)	1.6 (1.1-2.3)
Intermediately developed	40.4 (38.4-42.4)	10.7 (9.6-12.0)	51.7 (49.6-53.8)	52.5 (50.4-54.5)	45.0 (42.9-47.0)	36.4 (34.5-38.4)	67.7 (65.7-69.7)	1.9 (1.5-2.5)
Developed	44.7 (43.0-46.4)	13.2 (12.1-14.3)	60.4 (58.7-62.0)	54.3 (52.6-56.0)	49.2 (47.5-50.9)	38.2 (36.6-39.8)	74.8 (73.3-76.3)	2.3 (1.9-2.7)
P value	<0.0001	<0.0001	<0.0001	0.0009	0.002	0.007	<0.0001	0.18
Education								
High school education or above	43.4 (41.8-45.0)	11.5 (10.6-12.5)	52.7 (51.1-54.4)	45.9 (44.3-47.5)	47.0 (45.4-48.6)	37.9 (36.3-39.4)	69.5 (68.0-71.0)	1.6 (1.3-2.0)
Less than high school education	38.2 (36.6-39.7)	10.2 (9.3-11.2)	55.8 (54.1-57.4)	59.9 (58.3-61.5)	46.4 (44.8-48.1)	34.6 (33.1-36.1)	69.5 (68.0-71.0)	2.3 (1.9-2.9)
P value	<0.0001	0.06	0.01	<0.0001	0.62	0.003	0.98	0.02
Body-mass index, kg/m^2								
<25.0	/	/	24.3 (22.9-25.8)	44.1 (42.4-45.8)	42.9 (41.3-44.7)	32.6 (31.0-34.2)	48.8 (47.1-50.5)	1.5 (1.1-1.9)
25.0-29.9	/	/	77.3 (75.8-78.8)	57.8 (56.0-59.5)	49.2 (47.4-50.9)	39.2 (37.6-40.9)	86.9 (85.6-88.1)	2.4 (1.9-2.9)
≥30.0	/	/	97.3	66.5	54.5	42.5	94.8	2.4

			(96.1-98.1)	(63.3-69.6)	(51.1-57.7)	(39.2-45.8)	(92.9-96.2)	(1.7-3.4)
P value	/	/	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.008
Waist circumference, cm								
<90 in men, <80 in women	20.3 (18.9-21.7)	0.6 (0.4-0.9)	/	42.7 (41.0-44.4)	41.5 (39.7-43.2)	30.7 (29.2-32.3)	40.7 (39.0-42.4)	1.4 (1.1-1.8)
≥90 in men, ≥80 in women	58.7 (57.2-60.2)	19.7 (18.5-20.9)	/	60.2 (58.7-61.6)	51.3 (49.8-52.8)	41.2 (39.7-42.7)	93.9 (93.1-94.6)	2.4 (2.0-2.9)
P value	<0.0001	<0.0001	/	<0.0001	<0.0001	<0.0001	<0.0001	0.0004
Diabetes status								
Newly diagnosed	39.7 (38.3-41.1)	11.6 (10.8-12.5)	52.8 (51.4-54.2)	50.2 (48.8-51.6)	46.9 (45.4-48.3)	27.5 (26.3-28.8)	65.5 (64.1-66.9)	1.3 (1.0-1.6)
Previously diagnosed	44.3 (42.4-46.2)	9.4 (8.4-10.6)	57.0 (55.1-58.9)	56.7 (54.8-58.6)	46.5 (44.6-48.4)	57.2 (55.3-59.1)	78.8 (77.2-80.4)	3.5 (2.9-4.3)
P value	0.0001	0.002	0.0006	<0.0001	0.78	<0.0001	<0.0001	<0.0001
HbA1c, % (mmol/mol)								
<7.0 (53)	39.3 (37.9-40.7)	9.9 (9.1-10.8)	50.0 (48.5-51.4)	50.5 (49.1-52.0)	43.7 (42.3-45.2)	0.0	63.8 (62.3-65.2)	1.7 (1.4-2.1)
≥7.0 (53)	44.4 (42.6-46.2)	12.8 (11.6-14.1)	61.2 (59.4-63.0)	55.2 (53.4-57.1)	51.9 (50.1-53.7)	100.0	79.2 (77.7-80.8)	2.3 (1.9-2.8)
P value	<0.0001	0.0002	<0.0001	0.0001	<0.0001	/	<0.0001	0.07

Data are weighted percentages (95% confidence intervals). Overweight: body-mass index ≥25 and <30 kg/m^2; Obesity: body-mass index ≥30 kg/m^2; Central obesity: waist circumference ≥90 cm in men and ≥80 cm in women; Metabolic syndrome: 3 or more metabolic risk factors (waist circumference ≥90 cm in men and ≥80 cm in women, triglyceride ≥150 mg/dL, HDL-cholesterol <40 mg/dL in men and <50 mg/dL in women, blood pressure ≥130/85 mm Hg or use of antihypertensive medications, and fasting glucose ≥110 mg/dL or self-reported history of diabetes).

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Table 4. Risk factors associated with different numbers of cardiometabolic risk factors among Chinese adults with diabetes

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	Men		Women	
	3-4 vs 0-1 risk factors	**2 vs 0-1 risk factors**	**3-4 vs 0-1 risk factors**	**2 vs 0-1 risk factors**
Age, years				
18-44	1.00	1.00	1.00	1.00
45-64	1.81 (1.47-2.22)	1.51 (1.27-1.81)	3.07 (2.23-4.23)	2.07 (1.70-2.52)
≥65	1.95 (1.50-2.53)	1.41 (1.13-1.76)	3.85 (2.71-5.46)	2.89 (2.29-3.65)
Urban	1.16 (0.95-1.41)	1.14 (0.96-1.35)	1.02 (0.82-1.27)	1.00 (0.84-1.18)
Economic Development				
Underdeveloped	1.00	1.00	1.00	1.00
Intermediately developed	0.91 (0.72-1.15)	1.11 (0.90-1.36)	1.04 (0.80-1.36)	1.06 (0.87-1.29)
Developed	1.04 (0.82-1.31)	1.12 (0.91-1.38)	1.04 (0.79-1.35)	1.13 (0.92-1.38)
Family history of diabetes	1.58 (1.21-2.06)	1.22 (0.93-1.59)	0.93 (0.68-1.28)	0.83 (0.66-1.05)
Less than high school education	1.12 (0.92-1.36)	1.13 (0.96-1.34)	1.11 (0.90-1.36)	1.17 (1.00-1.37)
Low fruit and vegetable intake	1.04 (0.88-1.24)	0.99 (0.85-1.15)	1.04 (0.86-1.26)	1.04 (0.90-1.20)
Low physical activity	0.91 (0.74-1.12)	0.83 (0.69-1.01)	1.00 (0.78-1.29)	0.98 (0.80-1.18)
Overweight or obesity	1.50 (1.21-1.86)	1.09 (0.89-1.33)	1.43 (1.15-1.78)	1.35 (1.14-1.60)
Central obesity	1.79 (1.44-2.22)	1.66 (1.35-2.04)	1.95 (1.49-2.54)	1.51 (1.26-1.83)
Previously-diagnosed diabetes	1.67 (1.39-2.01)	1.07 (0.91-1.27)	2.59 (2.12-3.17)	1.64 (1.41-1.91)

Risk factors included current cigarette smoking, systolic BP ≥140 mmHg, LDL cholesterol ≥100 mg/dL, and HbA1c ≥7.0% (53 mmol/mol).

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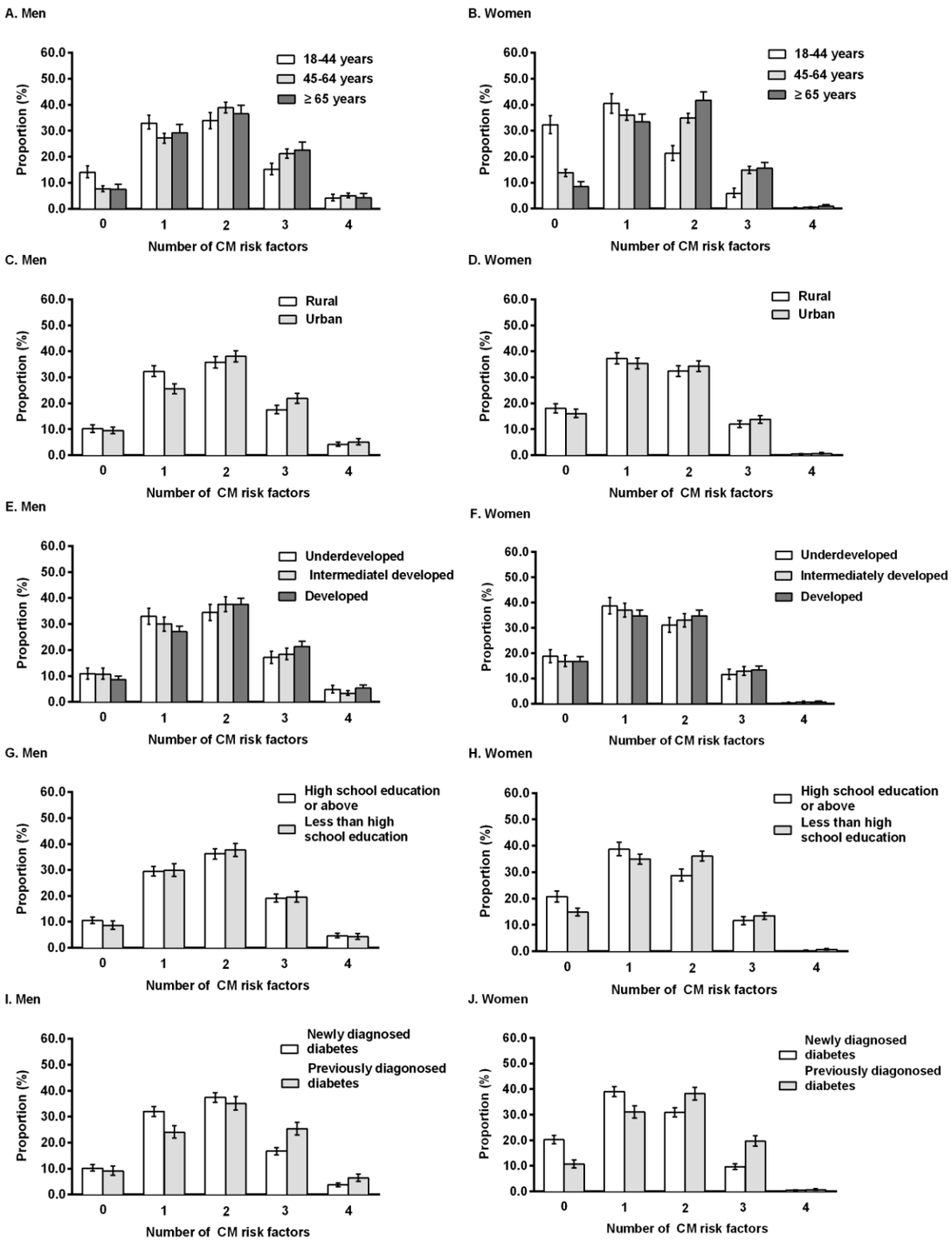
A. Men
B. Women
C. Men
D. Women
E. Men
F. Women
G. Men
H. Women
I. Men
J. Women
Proportion (%)
Number of CM risk factors
Number of CM risk factors
18-44 years
45-64 years
≥ 65 years
Rural
Urban
Underdeveloped
Intermediatel developed
Intermediately developed
Developed
High school education or above
Less than high school education
Newly diagnosed diabetes
Previously diagonosed diabetes

Figure 1

Highlights

Both behavioral and metabolic risk factors were highly prevalent in Chinese diabetes.

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The clustering of risk factors in individuals with diabetes in China is worrisome.

Actions are needed to curb the epidemic of cardiometabolic risk factors among diabetes.

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