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Associations between type 2 diabetes mellitus and risk of falls among community-dwelling elderly people in Guangzhou, China: a prospective cohort study

Wei-Quan Lin[1,2†], Ying-Xin Liao[3†], Jing-Ya Wang[4], Li-Ying Luo[1], Le-Xin Yuan[5], Si-Yu Sun[6], Yue Xu[1], Min-Ying Sun[1], Chang Wang[1], Qin Zhou[1], Xiang-Yi Liu[1] and Hui Liu[1*]

Abstract

Background Several studies have demonstrated that older adults with type 2 diabetes mellitus (T2DM) have a higher risk of falls compared to those without T2DM, which may lead to disability and a lower quality of life. While, limited prospective studies have quantified the associations in southern China. We conducted a longitudinal cohort study to quantify the associations between T2DM and falls and investigate the risk factors of falls among community-dwelling elderly people in Guangzhou, China.

Methods The population-based study included 8800 residents aged 65 and over in 11 counties of Guangzhou at baseline in 2020 and then prospectively followed up through 2022. Of 6169 participants had complete follow-up and were included in the present study. A fall event was identified by self-reported. The Cox regression was applied to quantify the associations between T2DM and falls, and hazard ratios (HRs) were calculated to the factors associated with falls among participants.

Results The median follow-up time for participants was 2.42 years. During the follow-up period, the incidence of falls among all participants was 21.96%. After adjusting for covariates in Cox regression models, T2DM remained a significant risk factor for falls, with HR of 1.781 (95% CI: 1.600-1.983) in the unadjusted covariates model and 1.757 (1.577–1.957) in the adjusted covariates model. Female (1.286, 1.136–1.457), older age (≥ 80: 1.448, 1.214–1.729), single marital status (1.239, 1.039–1.477), lower education level (primary school and below: 1.619, 1.004–1.361), hypertension (1.149, 1.026–1.286) and stroke (1.619, 1.176–2.228) were associated with a higher risk of falls, whereas everyday physical exercise (0.793, 0.686–0.918) was associated with a lower risk of falls.

Conclusion Falls are common, with risks between T2DM and falls quantified and several factors investigated in the longitudinal cohort study among community-dwelling elderly people in Guangzhou, China. Targeted action on the risk factors may reduce the burden of falls in elderly people with T2DM in the future.

†Wei-Quan Lin and Ying-Xin Liao contributed equally to this work.

*Correspondence:
Hui Liu
gzcdc_liuhui@163.com

Full list of author information is available at the end of the article

Keywords Type 2 diabetes mellitus, Falls, Risk factors, Elderly people

Background

As a result of increasing longevity, unprecedented numbers of individuals are reaching older ages [1]. According to the Seventh National Populations Census, of the national population, 1.9 billion individuals, accounting for 13.50%, are aged 65 and over. Of Guangzhou's population, 1.4 million persons, accounting for 7.82%, are aged 65 and over [2]. Consequently, a great challenge for the aging population arises, and chronic diseases, which place a heavy burden on society, are expected to increase simultaneously. Diabetes, of which about 90% are type 2 diabetes mellitus (T2DM), is one of the substantial public health issues worldwide [2, 3]. As the country with the largest number of people with diabetes, China is expected to reach approximately 174 million diabetic patients by 2045 [4], of which at least 20% are older adults, seriously threatening the quality of life and life expectancy of elderly patients [5–7].

Falls are another threat to the elderly, as approximately 30% of people over 65 have at least one fall annually around the world [8, 9]. Data from a Chinese longitudinal healthy longevity survey in 2018, the incidence of falls among community-dwelling elderly people is 22.49% in China [10], and the incidence of falls varied between 10.7% and 22.49% [8, 10–14]. Falls do have negative effects on the quality of life in old age, leading to a drastic increase in mortality and disability-adjusted life years among elderly people over the past few decades [15, 16]. According to the Global Burden of Disease Study 2019 and 2021, falls have been a leading cause of disability, possibly due to fractured bones, which is one of the most costly injuries in China [6, 17].

Many studies have found that the risk of falls is higher among people with diabetes comparing those without diabetes, and insulin treatment, retinopathy, neuropathy, hypoglycemia, and cognitive impairment caused by diabetes may contribute to fall events [14, 17–19]. Previous studies have revealed that reduced cognitive function is a mediator of the relationship between diabetes and falls [20, 21]. However, some studies have different viewpoints [22, 23]. A 5-year follow-up study from Australia has revealed that the incidence of falls is similar in men with and without T2DM after adjusting for significant risk factors [22]. A cohort study from the China Health and Retirement Longitudinal Study has figured that diseases of the metabolic system, such as diabetes and dyslipidemia, are not associated with falls among middle-aged and older [23]. Therefore, more longitudinal studies are needed to explore and quantify the risk between T2DM and falls.

Meanwhile, several risk factors for falls have been investigated in previous studies, indicating that age, gender, meteorological factors, visual impairment, and functional ability are the primary risk factors for falls [14, 15, 23, 24]. However, there is limited strong evidence from cohort studies to understudy those risk factors in China, particularly in Guangzhou, a city with a substantial elderly population.

Therefore, we conducted a prospective cohort study and aimed to: (1) assess the incidence of falls, (2) quantify associations between T2DM and falls, and (3) investigate the risk factors of falls among community-dwelling elderly people in Guangzhou, China.

Methods

Study design and participants

The Guangzhou Falls and Health Status Tracking Cohort is a longitudinal, population-based study in which participants were recruited from community health centers in 11 counties of Guangzhou, China. In brief, the Guangzhou Falls and Health Status Tracking Cohort study is designed to explore the associations between lifestyle factors, chronic diseases on falls and health outcomes. The present study is a part of the Guangzhou Falls and Health Status Tracking Cohort. Ethical approval for this study was obtained (GZCDC-ECHR-2023P0061).

8800 participants aged 65 and over from 11 counties of Guangzhou were enrolled in the cohort in 2020. Participants who refused to participate, had missing responses, and had incomplete data during the follow-up period were excluded. 6169 community-dwelling elderly people with complete data were included in the final analysis from January 2020 to December 2022 (Fig. 1). Among them, there were 1970 participants with T2DM and 4199 participants without T2DM at baseline, and 588 cases and 767 cases, respectively, were reported as fall events during the follow-up period. Additionally, participants in the non-exposure group were also terminated if they were newly diagnosed with T2DM during the follow-up period (Fig. 1).

Baseline data collection and definitions

Self-designed baseline questionnaire (Supplementary material 1) was used to collect information on demographic characteristics, lifestyle behaviors, and chronic diseases by well trained clinic staff following standard procedures.

Variables

At baseline, demographic variables were assessed by questionnaire, including age, gender, ethnic groups,

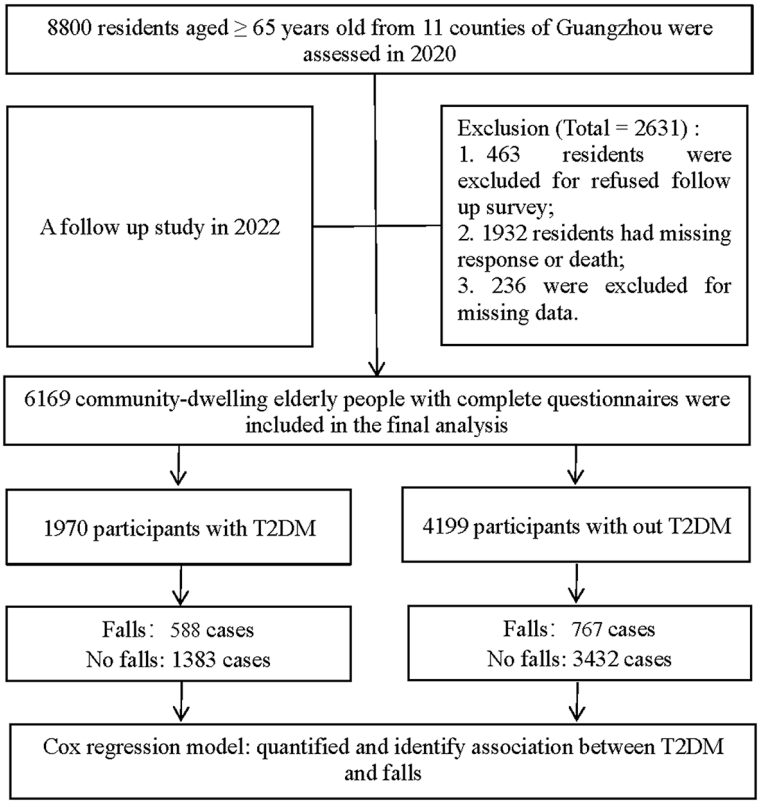

Fig. 1 Flow diagram of study participants in Guangzhou, China

marital status, and education. Age was categorized into four groups as follows: 65–69, 70–74, 75–79, and ≥80 years. Marital status was categorized as married and single, while single included unmarried, divorced, or widowed. Education was categorized according to the highest level of school the participants completed: primary school and below, secondary school, and college and above. Lifestyle behaviors included cigarette smoking, alcohol drinking, and physical exercise. Chronic diseases, which mainly included hypertension, coronary heart disease (CHD), chronic obstructive pulmonary disease (COPD), stroke, and T2DM, were diagnosed by physicians or medical examination at baseline.

T2DM

In this study, T2DM was defined as anyone of the following standards: those who were previously diagnosed with T2DM by physicians or taking glucose-lowering agents; baseline medical examinations of elevated fasting plasma glucose level (≥7.0 mmol/L); 2-hour oral glucose tolerance test or random blood glucose (≥11.1mmol/L) [25].

Follow-up and outcomes assessment

Following up through 2022, physicians at community health centers of Guangzhou conducted health examinations and face-to-face surveys (Supplementary material 1) to collect information on falls and the health status of participants. When participants refused to undergo health examinations, physicians conducted telephonic interviews to gather information on their falls and health status. A fall event was defined as an unexpected, unintentional change in position that caused an individual to remain at a lower level [26]. Falls were assessed during the 2022 follow-up by asking, "Have you ever fallen during the follow-up period?" and "When have you fallen?"

To mitigate the possibility of elderly individuals forgetting about fall events, participants' occurrences of falls were reported by the Guangzhou Injury Monitoring System during the follow-up period, which was also acknowledged after verifying the accuracy with the participants.

Statistical analysis

Statistical analysis was performed using R (version 4.0.0) and SPSS (version 25.0, SPSS Inc., Chicago, IL, USA). Baseline characteristics of the participants were summarized as frequency and differences in the incidence of falls, which were analyzed by Chi-square analysis for categorical measures. We used Cox regression models, with the time at baseline as the start of follow-up, to investigate the associations of baseline variables, T2DM, and their combination with the risk of fall incidence. Model

1 was adjusted for gender and age groups. Model 2 was adjusted as in Model 1 and for ethnic groups, marital status, education, cigarette smoking, alcohol drinking, physical exercise, and other four chronic diseases. Regarding the use of Cox regression models, we adhered to the methodological requirements and tested the proportional hazards assumption using the Schoenfeld residuals technique, and no violations were observed. Hazard ratios (HRs) and 95% confidence intervals (95% CIs) were calculated to quantify associations. To assess the robustness and consistency of our findings, we also performed subgroup analyses stratified by age groups and gender and employed competing Cox regression as sensitivity analyses.

All results were considered statistically significant at $P<0.05$.

Results

Baseline characteristics

6169 community-dwelling elderly people with complete data were included in the final analysis, of whom the mean age was 72.53±5.96, and 3138 (50.87%) were female (Table 1). Most of the participants (99.72%) were Han, and 91.81% were married. Referring to education, 1954 (31.67%) participants completed primary school and below, 3010 participants (48.79%) completed secondary school, and the remaining 19.53% completed college and above. Our sample was composed of 12.87% cigarette smokers and 12.76% alcohol drinkers. Besides, half of the participants exercised every day, while the others exercised sometimes or even never. At baseline, out of all the participants, 3602 had hypertension (58.39%), 513 had CHD (8.32%), 37 had COPD (0.60%), 121 had suffered a stroke (1.96%), and 1970 had T2DM (31.93%).

Incidence of falls

The median follow-up time was 885 days, namely 2.42 years. All participants reported no fall events at baseline medical examinations in 2020, and during the follow-up period, 1355 participants (21.96%, 95%CI: 20.93-22.99%) reported having experienced at least one fall. Chi-square analysis (Table 1) showed that differences between falls and gender, age groups, marital status, education, physical exercise, hypertension, stroke, and T2DM were found (all $P<0.01$), while no significant differences were observed among ethnic groups, cigarette smoking, alcohol drinking, CHD, COPD (all $P>0.05$).

The incidence trend of falls by gender and age groups is shown in Fig. 2. An absolute growth in the incidence of falls occurred in both males and females as they aged. Whereas it was intuitively seen that females experienced a higher incidence of falls at first, and the incidence of the two genders became similar among the oldest old.

Associations between T2DM and falls, and factors of falls

According to unadjusted covariates in Cox regression Model 0 (Table 2; Figs. 3a, and Fig. 4), elderly people with T2DM were at a higher risk for falls (HR: 1.781, 1.600-1.983). After adjusting for gender and age groups in Model 1 (Figs. 3b and Fig. 4), elderly people with T2DM remained at a higher risk for falls (1.756, 1.576–1.955). Adjusting for a combination of gender, age groups, ethnic groups, marital status, education, smoking, alcohol drinking, physical exercise, and four chronic diseases in Model 2 (Table 2; Figs. 3c, and Fig. 4), the results remained similar, as the risk of falls in the elderly with T2DM was significantly higher (1.757, 1.577–1.957). Cumulative hazard curves of falls corresponding to all models for T2DM are presented in Fig. 3.

The stable and consistent results were found in sensitivity analysis, and Cox regression in subgroups in gender and age groups found that those with T2DM had an elevated risk for falls (HR ranges: 1.608–1.845, all $P<0.001$), similarly (Fig. 4). The results of the competing Cox regression were similar to those of the previous Cox regression presented in Table 2, indicating that participants with T2DM had a higher risk for falls (1.757, 1.577–1.957).

Meanwhile, results (Table 2) of Cox regression Model 2 showed that female (1.286, 1.136–1.457), older age (≥80: 1.448, 1.214–1.729), single marital status (1.239, 1.039–1.477), lower education level (primary school and below: 1.619, 1.004–1.361), hypertension (1.149, 1.026–1.286) and stroke (1.619, 1.176–2.228) were associated with a higher risk of falls, while everyday physical exercise was associated with a decreased risk of falls (0.793, 0.686–0.918) among community-dwelling elderly people in Guangzhou, China.

Discussion

During the 2.42-year median follow-up time, we discovered that the incidence of falls was 21.96% among community-dwelling elderly people in Guangzhou, southern China. This result is consistent with findings from previous studies, which reported rates of 20.65% in older adult samples in Shantou City, southern China [13], and 22.49% in Chinese longitudinal healthy longevity survey [10]. Interestingly, several studies found a lower incidence of falls in southern China specifically, such as 10.7% in Shenzhen City [14], 15.41% in Guangzhou City [12], and 11.9% in Guangdong province [8, 27], where elderly people experienced at least one fall in the past 12 months. Even in Chinese Longitudinal Survey samples, 14.0% and 17.0% of urban and rural community-dwelling older adults experienced at least one fall in the previous 12 months [26]. The lower fall incidence was also observed in Western Europe, where 13.84% of older adults sought medical treatment for fall injuries in 2017

Table 1 Baseline characteristics of participants and the incidence of falls during the follow-up period

Variables	Total (*n*, %)	Number of falls during the follow-up period (*n*)	Incidence of falls during the follow-up period (%, 95%CI)	Test value	
				χ^2	*P*
Gender				21.713	< 0.001
Male	3031(49.13)	590	19.47(18.06–20.88)		
Female	3138(50.87)	765	24.38(22.88–25.88)		
Age groups, years				44.398	< 0.001
65–69	2562(41.53)	473	18.46(16.96–19.96)		
70–74	1985(32.18)	441	22.22(20.39–24.05)		
75–79	884(14.33)	237	26.81(23.89–29.73)		
≥ 80	738(11.96)	204	27.64(24.42–30.87)		
Ethnic groups				1.035	0.309
Han	6152(99.72)	1353	21.99(20.96–23.03)		
Else	17(0.28)	2	11.76(3.55–27.08)		
Marital status				20.212	< 0.001
Married	5664(91.81)	1204	21.26(20.19–22.32)		
Single [a]	505(8.19)	151	29.90(25.91–33.89)		
Education				12.966	0.002
Primary school and below	1954(31.67)	474	24.26(22.36–26.16)		
Secondary school	3010(48.79)	654	21.73(20.25–23.20)		
College and above	1205(19.53)	227	18.84(16.63–21.05)		
Cigarette smoking				1.749	0.186
Yes	794(12.87)	160	20.15(17.36–22.94)		
No	5375(87.13)	1195	22.23(21.12–23.34)		
Alcohol drinking				1.633	0.201
Yes	787(12.76)	159	20.20(17.40-23.01)		
No	5382(87.24)	1196	22.22(21.11–23.33)		
Physical exercise				26.208	< 0.001
Everyday	3039(49.26)	610	20.07(18.65–21.50)		
Sometimes	1808(29.31)	388	21.46(19.57–23.35)		
Never	1322(21.43)	357	27.00(24.61–29.40)		
Hypertension				14.882	< 0.001
Yes	3602(58.39)	853	23.68(22.29–25.07)		
No	2567(41.61)	502	19.56(18.02–21.09)		
Coronary heart disease				0.232	0.630
Yes	513(8.32)	117	22.81(19.18–26.44)		
No	5656(91.68)	1238	21.89(20.81–22.97)		
Chronic obstructive pulmonary disease				0.121	0.728
Yes	37(0.60)	9	24.32(10.50-38.15)		
No	6132(99.40)	1346	21.95(20.91–22.99)		
Stroke				8.861	0.003
Yes	121(1.96)	40	33.06(24.68–41.44)		
No	6048(98.04)	1315	21.74(20.70-22.78)		
Type 2 diabetes mellitus				104.932	< 0.001
Yes	1970(31.93)	588	29.85(27.83–31.87)		
No	4199(68.07)	767	18.27(17.10-19.43)		
Total	6169(100.00)	1355	21.96(20.93-23.00)		

Note 95%CI = 95% confidence interval

[a] Single: unmarried, divorced or widowed

[15]. The differences in the definition of falls may contribute to this phenomenon, such as the difference in falls occurring in the past 12 months and during 2.42-year median follow-up time. However, 36% of older men with T2DM had a fall over 2 years in Australia [22]. The higher incidence of falls could be attributed to age differences (average age: 77.0 years vs. 72.5 years). Nonetheless, falls are an important public health problem, and it is crucial

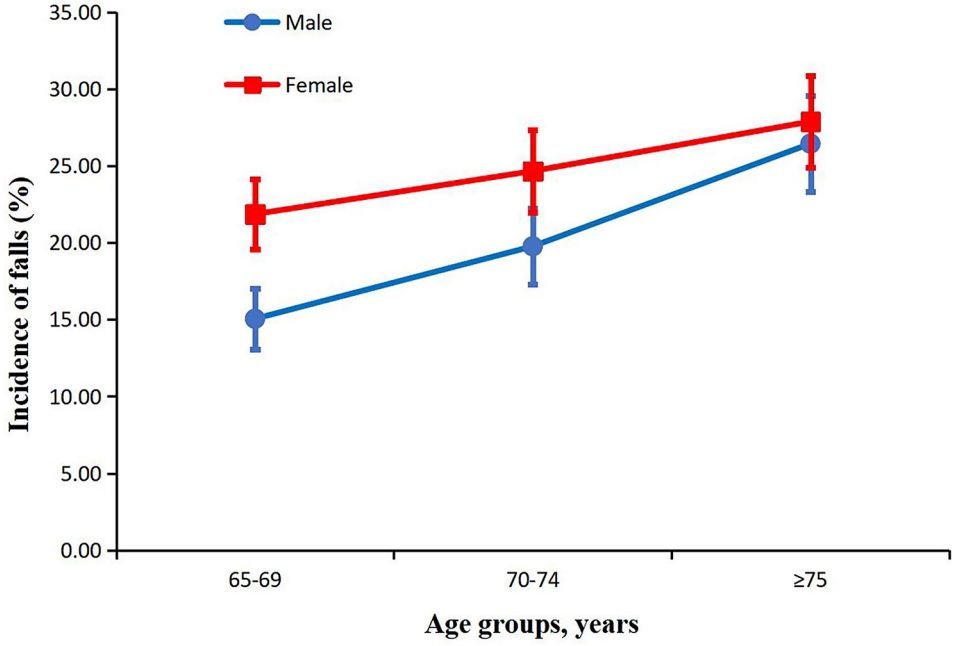

Fig. 2 Incidence of falls by age groups and gender among community-dwelling elderly people

to urgently investigate risk factors and implement interventions among elderly individuals living in the community in Guangzhou, China.

Our study found that after adjusting for covariates in Cox regression models, T2DM remained a risk factor for falls (Model 1: 1.756, 1.576–1.955. Model 2: 1.757, 1.577–1.957) among community-dwelling elderly people in Guangzhou, China, which was similar to previous study (HR:1.48, 1.12–1.95) [19]. Chronic diseases that increase the risk of falls have been examined in previous studies [23, 28]. Stroke is considered a major diabetes-related complication [7, 29], and T2DM is another independent risk factor of falls [29]. On the one hand, poor balance and weakened muscles due to diabetes contribute to the occurrence for falls. On the other hand, falls associated with diabetes are considered to increase the risk of fractures [17, 30]. Older adults with T2DM perform worse on physical function due to a range of long-term complications, such as poor balance, poor grip strength, and poor gait performance, which may explain why participants with diagnosed T2DM are more likely to fall [18, 21]. Interestingly, recent evidence has shown that diabetes incidence is decreasing in several high-income countries [4, 31], suggesting the high quality and specific interventions implemented in these countries to reduce the number of T2DM patients and potentially prevent falls among T2DM patients. However, it is important to consider any potential confounding factors when analyzing the relationship between T2DM and falls, as diabetic vascular diseases have also been associated with long-term fall incidence [32–34].

In this study, being female was identified as a risk factor for falls, with the incidence rate 4.91% higher in females than in males. However, this finding is less pronounced than the 6.29-10.98% higher incidence of falls in females compared to males as reported in previous studies [12, 27, 35]. The observed inconsistencies in findings can be ascribed to the diversity in research methodologies, regional variations, and the specific attributes of the study cohorts, including their size and demographic profiles. Additionally, females were associated with higher HRs for falls in all models, which may be attributed to postmenopausal osteoporosis in older women. This condition can lead to a decrease in muscle strength and sensory capacity, ultimately resulting in body imbalance and gait instability [36]. An overview of falls on the NHS website has also explained that the increased risk of falls in older female is linked to osteoporosis caused by hormonal changes during menopause [8]. However, the incidence of falls of the two genders became similar among the oldest old. The finding was consistent with a previous study which has acknowledged that the incidence of falls is similar in older male and female [16].

In this community-based prospective cohort study, aging was a recognized risk factor for falls [35]. Our study was consistent with the previous study that people aged 80 and older are generally at the highest risk of falls [16]. We also found that single marital status (unmarried, divorced, or widowed) was a risk factor for falls. Close cooperation may help reduce unintentional falls in those older and living alone [9, 37, 38]. Furthermore, a close relationship plays an important role in encouraging those

Table 2 Multivariate cox proportional hazards regression analysis between variables and falls

Variables	Unadjusted HR (95%CI)	Multivariable HR (95%CI) a
Gender		
Male	Ref	Ref
Female	1.302(1.169–1.449)**	1.286(1.136–1.457)**
Age groups, years		
65–69	Ref	Ref
70–74	1.255(1.102–1.428)**	1.225(1.075–1.397)**
75–79	1.567(1.341–1.832)**	1.488(1.267–1.746)**
≥ 80	1.656(1.405–1.952)**	1.448(1.213–1.729)**
Ethnic groups		
Han	Ref	Ref
Else	0.521(0.130–2.086)	0.594(0.148–2.378)
Marital status		
Married	Ref	Ref
Single [b]	1.481(1.251–1.754)**	1.239(1.039–1.477)*
Education		
College and above	Ref	Ref
Secondary school	1.328(1.133–1.555)**	1.110(0.942–1.308)
Primary school and below	1.163(1.000-1.353)**	1.169(1.004–1.361)*
Cigarette smoking		
No	Ref	Ref
Yes	1.124(0.953–1.326)	1.052(0.873–1.267)
Alcohol drinking		
No	Ref	Ref
Yes	1.135(0.962–1.339)	1.074(0.895–1.288)
Physical exercise		
Never	Ref	Ref
Sometimes	0.712(0.625–0.812)**	0.730(0.638–0.835)**
Everyday	0.769(0.666–0.887)**	0.793(0.686–0.918)**
Hypertension		
No	Ref	Ref
Yes	1.255(1.124–1.401)**	1.149(1.026–1.286)*
Coronary heart disease		
No	Ref	Ref
Yes	1.051(0.869–1.270)	0.910(0.750–1.106)
Chronic obstructive pulmonary disease		
No	Ref	Ref
Yes	1.066(0.554–2.053)	1.044(0.539–2.020)
Stroke		
No	Ref	Ref
Yes	1.654(1.207–2.265)**	1.619(1.176–2.228)**
Type 2 diabetes mellitus		
No	Ref	Ref
Yes	1.781(1.600-1.983)**	1.757(1.577–1.957)**

Note HR = Hazard ratio, 95%CI = 95% confidence interval

[a] Multivariable HR was adjusted for gender, age groups, ethnic groups, marital status, education, cigarette smoking, alcohol drinking, physical exercise, hypertension, coronary heart disease, chronic obstructive pulmonary disease, stroke and type 2 diabetes mellitus

[b] Single: unmarried, divorced or widowed

*$P < 0.05$; **$P < 0.01$

who are depressed or fearful of falling, as these emotions have been linked in earlier research to fall [39–41]. Earlier studies have shown that falls are very common in people with cognitive impairments, which also suggests the need for more care in close relationships [42, 43].

Previous studies have reported that a lower education background was considered one of the risk factors for falls and fall-related injuries [37, 44]. People with better education are more likely to emphasize health and are more willing to put safety education into practice. This

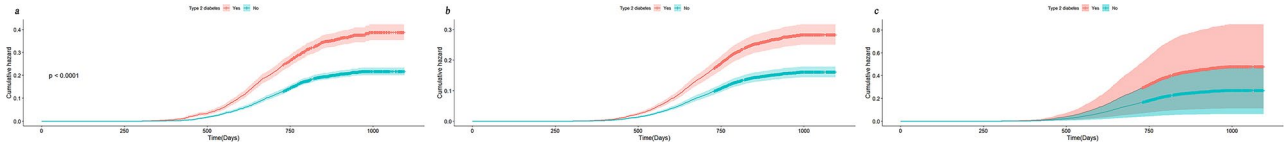

Fig. 3 Cumulative hazard for follow-up time to falls form Cox regression models. **a** Unadjusted covariates. **b** Adjusted for gender and age groups. **c** Adjusted for gender, age groups, ethnic groups, marital status, education, cigarette smoking, alcohol drinking, physical exercise, hypertension, coronary heart disease, chronic obstructive pulmonary disease and stroke

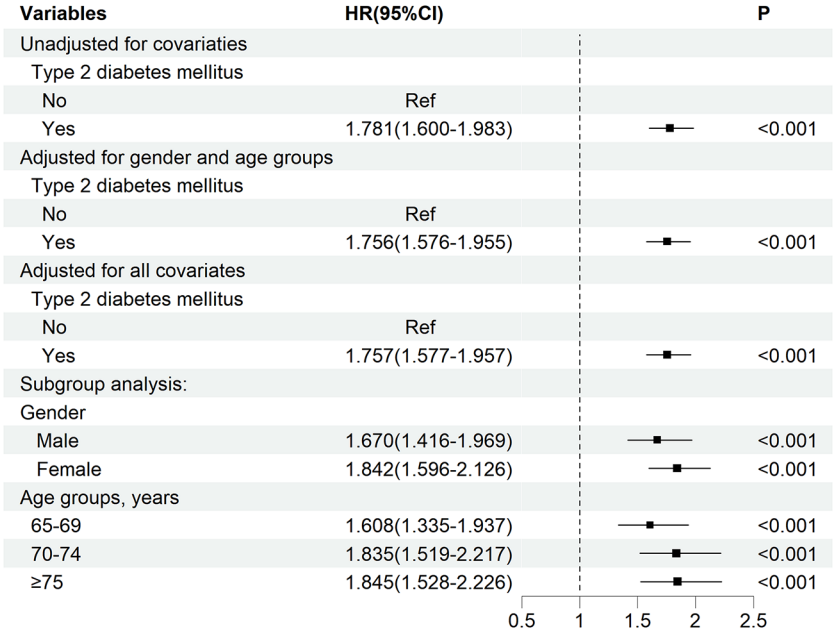

Fig. 4 Associations between T2DM and falls, and subgroup analysis of form Cox regression models. HR = Hazard ratio, 95%CI = 95% confidence interval. Subgroup analysis was adjusted for all covariates. Adjusted for all covariates: adjusted for gender, age groups, ethnic groups, marital status, education, cigarette smoking, alcohol drinking, physical exercise, hypertension, coronary heart disease, chronic obstructive pulmonary disease and stroke

might also explain why, with more highly qualified personnel concentrated in the urban areas which are political, economic, and educational centers, there is a higher occurrence of falls in the suburban areas, where there are fewer highly qualified personnel.

Non-smoking has been considered a protective factor against falls in older age [9]. However, in this study, we noted that cigarette smoking and alcohol drinking were not statistically significant risk factors for falls. A previous study has suggested that former drinkers might have stopped drinking due to poor health status, which predisposes them to risk of falls [14], and similarly, we speculate that the same may apply to smoking. Whereas, another study has figured out that former drinkers experience a higher risk of falls than those who never drink [44].

Consistent with our findings, physical exercise was an effective intervention measure to prevent falls for the elderly [37]. Taking more exercise to strengthen the body may fundamentally curb the trend of falls and fall-related fractures. Besides, as previously described, fear of falling is associated with falls, and exercise also helps reduce the fear of falling in older people living in the community in a way [40]. Referring to clinical guidelines, the management of T2DM generally includes nutrition management, increasing physical activity, monitoring blood glucose, and controlling health behaviors [9, 45]. Considering our findings that older adults with T2DM who lack physical exercise are more likely to fall, more individualized intervention measures on physical activity are required. These are strongly recommended by a global initiative for falls, balance challenges, and functional exercises (e.g., sit-to-stand, stepping), which are suggested to be incorporated into sessions three or more times a week that are individualized and progressive in intensity for at least 12 weeks [45].

Our study has several advantages. Firstly, we revealed the incidence of falls, relationships between T2DM and falls, and factors associated with falls among community-dwelling elderly people in a prospective cohort study design. Secondly, all hospitalization records were validated and reviewed by trained community service staffs. However, some limitations need to be acknowledged and recognized. First, although our results are similar to previous studies and data from the Guangzhou Injury

Monitoring System as a supplement to fall events, fall events were primarily based on the responses to individual perspective questions, which introduced recall bias. The recall bias may be even greater in the participants who refused to undergo health examinations and were only informed about falls and health status by telephonic interviews. Second, we did not identify whether the fall event was severe or injurious. Third, some possible risk factors for falls were neglected, such as history of falls, diabetes complications, cognitive function, depression, medication use, and glycaemic control. Fourth, our findings may not be generalisable to the other population as the present study was conducted among community-dwelling elderly people in Guangzhou, China. Fifth, as with any observational study, our study cannot establish causality. Therefore, to confirm the causal relationships in the present study, a larger, more comprehensive evaluation of influencing factors and prospective cohort studies would be required in future studies.

Conclusion

Falls are common, the risks between T2DM and falls were quantified, the individuals with T2DM are exposed to a greater risk of falls, and several factors are also investigated in the longitudinal cohort study. These findings provide evidence supporting the associations between T2DM and the risk of falls among community-dwelling elderly people, which can serve as a valuable reference for developing targeted interventions to reduce falls and the associated disease burden in this population.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12877-024-05314-5.

Supplementary Material 1

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Author contributions

WQL supervised the study data collection and quality control, conducted the literature review, conducted the data analyses, drafted the manuscript, and finalized the manuscript with inputs from all authors. YXL conducted the data analyses, and drafted the manuscript. JYW conducted the literature review. LXY drafted the manuscript. SYS and YX conducted the literature review. CW supervised the study data collection and quality control. QZ supervised the study data collection and quality control. XYL supervised the study data collection and quality control. MYS supervised the study data collection and quality control. LYL supervised the study data collection and quality control. HL supervised the study data collection and quality control, and finalized the manuscript with inputs from all authors.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval for the Guangzhou Falls and Health Status Tracking Cohort was obtained from the Ethics Committee of the Center for Disease Control and Prevention of Guangzhou (GZCDC-ECHR-2023P0061), and informed consent was obtained from all subjects.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Basic Public Health, Center for Disease Control and Prevention of Guangzhou, Guangzhou 510440, China
[2]Institute of Public Health, Guangzhou Medical University & Guangzhou Center for Disease Control and Prevention, Guangzhou 510440, China
[3]School of Public Health, Guangzhou Medical University, Guangzhou 511436, China
[4]Institute of Applied Health Research, University of Birmingham, Birmingham B152TT, UK
[5]Brain Hospital of Guangzhou Medical University, Guangzhou Huiai Hospital, Guangzhou 510370, China
[6]School of Public Health, Southern Medical University, Guangzhou 510515, China

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