Factors Associated With Smoking And Diabetes Mellitus Linked To Increased Mortality And Morbidity: A Study In Guangdong, China

1st Sun Xueming, 2nd Datin Hafizah Che Hassan, 3rd Faridah Mohd Said

Abstract

About 34% of the people in guangdong province, china, smoke, and about 20.8% of the people have diabetes. This is a big public health problem. Both of these rates are higher than or equal to the national averages. Smoking cigarettes raises the chances of getting diabetes mellitus, which also raises the chances of being ill or dying in the general population. This inquiry was the impetus for conducting this research initially. The purpose of this research was to find out whether smoking increases the chance of getting diabetes. Case-control studies have not sufficiently examined the association between smoking and diabetes in chinese communities where such a correlation exists. Researchers in guangdong conducted a case-control study to examine the association between habitual cigarette smoking and the onset of diabetes. The results show that there is a clear dose-response relationship and that heavy smokers are more likely to get diabetes than non-smokers in the community. These results are quite similar to what previous studies in china and other countries have shown. The first thing that stands out to the reader is that smoking is connected to metabolic disorders like diabetes and more prevalent but potentially deadly conditions like heart disease and lung disease. These strategies may help lessen the effects of these problems. The goals of these treatments should be to lower the number of individuals who smoke and ameliorate the diabetes epidemic. In light of all the evidence, the results of the case-control studies done in guangdong add to the increasing body of evidence that smoking cigarettes considerably increases the chance of getting diabetes.

Keywords: metabolic disorders, lung disease, diabetes epidemic, smoking, diabetes mellitus

1. Introduction

The reasons for mortality and incapacity that may be avoided by smoking tobacco and having diabetes issues have lately become more well-known across the globe. These risk factors are too responsible for the huge surge in death and sickness rates. This is a big problem in china: smokers are 30–40% more likely to have type 2 diabetes, and those who smoke frequently live nearly 10 years less than people who don't smoke. Diabetes mellitus, especially type 2, is becoming more common, and with it come a lot of problems that might last a lifetime. There may be problems with the heart, kidneys, nerves, and eyes (retinopathy). These things are primarily to blame for the shorter average lifetime. These effects shorten people's lives and make it harder for doctors to provide them the care they need. Diabetes and cardiovascular disease, along with other chronic non-communicable diseases (ncds), have emerged as the primary causes of mortality in china (luo et al., 2025).

this is closely related to the recent rise in urbanisation and changes in how diseases spread in the country. More and more people are smoking, and diabetes is becoming more common in guangdong. These are problems that affect the entire country. In this case, any of these causes may make the bad health impacts of each one considerably worse. There has been little research examining the interaction between smoking and diabetes in rural chinese communities to assess their combined impact on mortality and morbidity. Even though there hasn't been a lot of research in guangdong, this has nonetheless happened. Meta-analyses and cohort studies done in china show that people with diabetes who smoke are far more likely to die or have heart problems. Some data suggests that smoking may increase the risk of cardiovascular

events. People with diabetes are thought to be around 1.5 times more likely to smoke than people who don't smoke (zheng et al., 2022).

2. Background of the study

More and more research is showing that chronic ncds are the leading cause of death throughout the world. This is especially true in areas where the economy is growing quickly. This vast subject covers a lot of different medical problems. Here are a few examples: heart disease, diabetes, and copd. Also, the insurance may cover a wide range of health problems. There might be a lot of reasons why the number of chinese individuals diagnosed with type 2 diabetes mellitus (t2dm) is going up so quickly. Some of the things that are making the situation worse include an ageing population, changes in lifestyle, and more people moving to cities. However, not everyone fits within this group. All of the things described above probably had something to do with the occurrence being looked into (zhai et al., 2023).

it is plausible to posit that at least one of these reasons may be accountable for the alarming rise when all are evaluated together. The international diabetes federation (idf) says that in the previous several years, around 140 million people in china have been diagnosed with diabetes. It has been shown that all of these folks have diabetes. People who are at high risk of getting diabetes need to be found and helped. For the simple reason that an increasing number of people are jeopardising their health by risking diabetes. The huge number of people who smoke and use tobacco in china is a big public health problem, especially for men's health (liu et al., 2023).

this is a big deal for public health. Right now, this issue is affecting cities around the country more than it is affecting other locations. People have become accustomed to smoking and even promoted it since it has been legal for a long time. The progressive loosening of rules against smoking is a big reason why this problem is becoming worse. Smoking cigarettes may cause a lot of health concerns, including type 2 diabetes, insulin resistance, glucose intolerance, heart disease, and being overweight. There is a link between metabolic problems and any of these illnesses. Smoking makes nicotine's bad effects on the heart and lungs even worse. Nicotine is a substance in cigarette smoke (ye et al., 2025).

3. Purpose of the study

The objective of this research was to examine the influence of diabetes mellitus on the elevated mortality rate among residents of guangdong, china. The research focused on the mechanisms by which the existence of the disease and its advancement contribute to heightened mortality risk at a younger age. There was a specific focus on how the condition itself raises the risk of mortality at a younger age. After analysing potentially confounding factors, including smoking and co-morbidities, the objective of this study was to ascertain the relative impact of diabetes mellitus on mortality outcomes. The research specifically sought to ascertain the correlation between obesity and death. The study's purpose was to collect empirical data on mortality trends associated with diabetes. This was achieved by the use of quantitative research methods and simple random sampling approaches. People with diabetes have a lot of health problems because of the disease, which is what was revealed. The purpose of this study was to help create better therapies, preventive measures, and healthcare systems that would cut mortality rates. The objective of this study was to aid healthcare practitioners, public health authorities, and policymakers in guangdong in comprehending the needs of their diabetic patients more effectively.

4. Literature review

Research indicates that smoking and diabetes mellitus, particularly type 2, mutually worsen each other as indicators of compromised health. Type 2 diabetes is a classic example of this. When these risk factors are looked at separately, they are more likely to lead to bad health outcomes such heart disease, renal failure, stroke, infection, and early death (zhang et al., 2021).

This problem becomes evident when these risk variables are examined separately. A lot of meta-analyses and prospective cohorts show that smoking now is linked to a higher risk of type 2 diabetes. The dose-response gradient does not vary whether it is shown as a function of pack-years or the number of cigarettes smoked each day. It does not matter whether the smokers have ever tried smoking or not; this is the right thing to do in every case (najafi et al., 2020).

Nicotine is also believed to affect other biological processes, such as the onset of endothelial dysfunction, the stimulation of sympathetic nerves, prolonged systemic inflammation, and alterations in adipocyte interactions. The risk of microvascular and macrovascular issues rises with smoking. A compelling example of this assertion is that smokers are at a heightened risk of developing heart disease. Evidence specific to china is equivalent to evidence about global events occurring elsewhere in the globe. There has been a significant rise in diabetes diagnoses, and studies indicate that a considerable proportion of individuals, especially males, engage in smoking. There are a lot of reasons why diabetes is spreading so swiftly. Some of these problems include urbanisation, changing food habits, and an older population. When researchers take into consideration both the intensity and length of smoking, they frequently find greater links between the two factors (miron-celis et al., 2023).

5. Research question

- How does diabetes mellitus influence elevated mortality?

6. Research methodology

6.1 research design

The quantitative data analysis used spss version 25. The researchers used a 95% confidence interval and odds ratio to evaluate the direction and intensity of the statistical link. The researchers set a statistically significant level at $p < 0.05$. A comprehensive analysis showed the data's core properties. Quantitative approaches are often used to assess data obtained from polls, questionnaires, and surveys, in addition to data examined by computational tools for statistical examination.

6.2 sampling

Participants in the research filled out questionnaires to provide data. Using the rao soft tool, researchers found out that the study included 657 people. Researchers sent out 896 surveys to the general population. The researchers received 823 responses, excluding 45 for incompleteness, resulting in a final sample size of 778.

6.3 data and measurement

The research primarily used data obtained from a questionnaire survey. The participant's basic demographic information was collected initially. After that, the participants were given a 5-point likert scale to rate the online and offline channels. The researchers meticulously examined several resources, particularly online databases, for this secondary data collection.

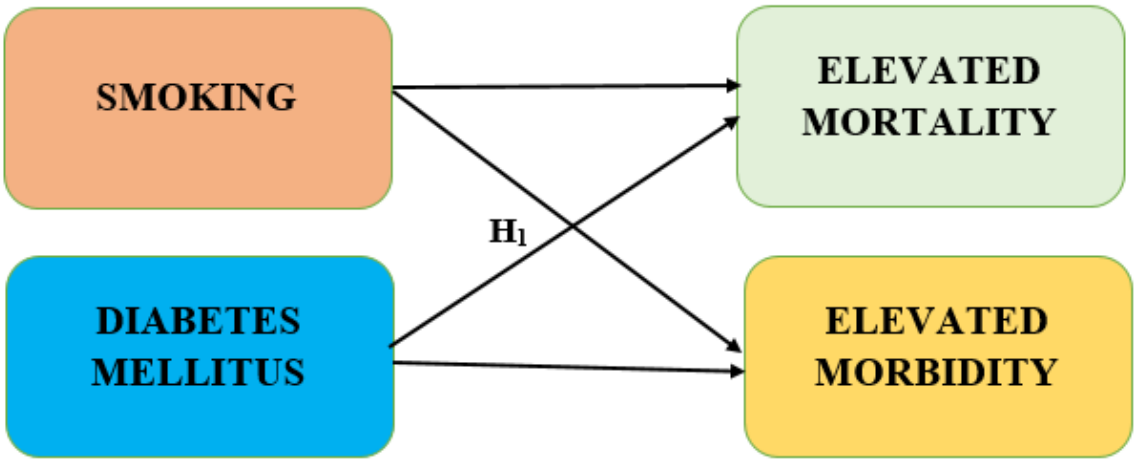
6.4 statistical software

The statistical analysis was performed with spss 25 and ms excel.

6.5 statistical tools

Descriptive analysis helped us understand the main features of the data. The researcher must analyse the data using anova.

7. Conceptual framework



8. Result

- **Factor analysis**

People typically use factor analysis (fa) to uncover hidden factors in data that can be seen. When there aren't any clear visual or diagnostic symptoms, it's typical to utilise regression coefficients to make assessments. Models are very important for success in fa. The objectives of modelling are to detect flaws, intrusions, and perceived connections. The kaiser-meyer-olkin (kmo) test is one way to look at datasets that have come from a lot of regression studies. They examine to see whether the model and the sample variables are representative. Based on the statistics, it seems like there is duplicate data. When proportions are less, it's easier to understand the data. Kmo gives a whole number between 0 and 1. A kmo value between 0.8 and 1 is what the researcher mean by a "sufficient sample size." kaiser says that these are the limitations that are okay: kaiser has set the following requirements for admission:

A very low 0.050 to 0.059, which is worse than the usual 0.60 to 0.69
Most middle school grades fall between 0.70 and 0.79.
Getting a quality point score of 0.80 to 0.89.
They discover amazement between 0.90 and 1.00.
Testing for kmo and bartlett's sampling adequacy (table 1) the kaiser-meyer-olkin 917 scale

The findings of bartlett's sphericity test are as follows: chi-square, sig.=.000, and roughly 190 degrees of freedom this demonstrates that the assertions about sampling were valid. The researchers used bartlett's test of sphericity to ascertain the relevance of the correlation matrices. The kaiser-meyer-olkin measure says that a sample is good enough if it has a value of 0.917. The p-value from bartlett's sphericity test is 0.00. If bartlett's sphericity test gives a positive result, the researcher knows that the correlation matrix isn't an identity matrix.

Table 1: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.917
Bartlett's Test of Sphericity	Approx. Chi-Square	3252.974
	df	190
	Sig.	.000

Bartlett's test of sphericity also showed that correlation matrices are widely used. The kaiser-meyer-olkin metric of sample adequacy is 0.917. The researchers used bartlett's sphericity test, yielding a p-value of 0.00. A significant outcome of bartlett's sphericity test indicated that the correlation matrix was inadequate.

❖ **Independent variable**

- **Diabetes mellitus**

Diabetes mellitus is a metabolic condition characterised by persistently elevated blood glucose levels. Diabetes mellitus is more often referred to as diabetes. This sickness may arise from inadequate insulin synthesis or inefficient insulin action. Type 1 diabetes occurs when the body's immune system attacks and kills the pancreatic beta cells, leading to a complete absence of insulin. Type 2 diabetes, on the other hand, arises when the body's cells become resistant to insulin, rendering it only partially effective. These are the two main types of diabetes that belong to this category of disorders. Insulin resistance is a common trait of both forms of diabetes. Diabetes is a significant cause of death and disability across the world because excessive blood sugar levels may lead to long-term problems. These problems may damage many organs, which is one of the main reasons why diabetes is one of the most common causes of mortality and disability. The sickness, which is a dangerous non-communicable disease, has a big effect on the country's economy and the total expense of healthcare for everyone. Because it is becoming more common, and things like urbanisation, lack of movement, obesity, and an ageing population are making it worse, it is very important to find effective ways to prevent and cure it (american diabetes association, 2022). This is due to the fact that the prevalence is increasing. Diabetes has been associated with heightened risks of cardiovascular disease, infections, and early death over an extended period, further illustrating its substantial influence on public health. Changes to a person's lifestyle, drug treatments, and regular check-ups are the three main parts of diabetes care today. One of the main aims of diabetes treatment is to cut down on the amount of fatalities and problems that come with the disease.

❖ **Dependent variable**

- **Elevated mortality**

When a given group of people has a higher death rate than what would be considered normal for people who are in good health, this is called "elevated mortality." the expression is commonly used to talk about a very high death rate that is caused by a specific illness, risk factor, or behaviour that is extremely bad for health. There is a significant correlation between elevated mortality rates and cardiovascular illnesses, respiratory conditions, infections, and other systemic health problems that reduce life expectancy. There is a link between lifestyle factors like smoking and long-term diseases like diabetes mellitus. As has been established, these disorders are strongly linked to a higher chance of mortality. This phenomenon is a

significant sign of public health because it shows how effectively healthcare systems work to stop, find, and cure illnesses, as well as the direct consequences of risk factors associated to behaviour. It also shows how well these systems work to stop, detect, and cure diseases. Epidemiological studies may quantify elevated mortality rates by comparing death rates across diverse groups while considering characteristics such as age, gender, socioeconomic position, and comorbidities. One way to do this is to look at death rates in various groups. By learning about high mortality rates, politicians and healthcare professionals may come up with specific ways to minimise the number of fatalities that happen too soon and improve the general health of the community. With this knowledge, one may learn important things like how much certain diseases cost individuals in terms of their health (world health organization, 2021).

- **Relationship between diabetes mellitus and elevated mortality**

The correlation between diabetes mellitus and its associated complications and comorbidities significantly elevates the risk of premature mortality has been well-documented. Diabetes mellitus, particularly type 2 diabetes, has been shown to accelerate the progression of cardiovascular illnesses, including coronary artery disease, stroke, and heart failure. This is in addition to the fact that diabetes mellitus raises the risk of death. These diseases are still the main causes of mortality for people with diabetes today. Chronic hyperglycemia is a condition that may result in endothelial dysfunction, atherosclerosis, and compromised immune responses. All of these disorders may make a person more likely to get infections and damage their organs (li et al., 2024). Diabetic neuropathy, retinopathy, and kidney dysfunction together diminish quality of life and complicate treatment outcomes, thus elevating mortality risk. Several studies have shown that the death rate among those with diabetes significantly exceeds that of individuals without diabetes. Poor glycaemic control, a longer duration of disease, and other lifestyle factors including obesity and smoking all make this risk worse. The higher death rate linked to diabetes is worse in places with less resources, including those that don't have enough medical services or drugs. Other factors that make the situation worse include delays in identification and treatment that isn't right. Because diabetes is becoming more common across the world, it is putting more strain on healthcare systems. This has made lowering death rates a major public health priority. This is due to the increasing mortality rate from diabetes. In the context of lowering the death rates linked to diabetes and boosting the rates of long-term survival, the need of early screening, lifestyle adjustments, quick drug therapy, and teaching people how to control their own diabetes has become clear (liu et al., 2024).
On the basis of the above discussion, the researcher formulated the following hypothesis, which was analyse the relationship between diabetes mellitus and elevated mortality.

"h_{01}: there is no significant relationship between diabetes mellitus and elevated mortality."

"h_1: there is a significant relationship between diabetes mellitus and elevated mortality."

Table 2: H_1 ANOVA Test

ANOVA					
Sum					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	39588.620	267	5655.517	1055.922	.000
Within Groups	492.770	510	5.356		
Total	40081.390	777			

The outcome is substantial in this research. Statistical significance is achieved with a p-value of .000 (below the .05 alpha level), and the f value is 1055.922. This suggests that researchers might support the alternative view, ***"h_1: there is a significant relationship between diabetes mellitus and elevated mortality"*** is accepted and the null hypothesis is rejected.

Discussion

The findings of this study indicated that diabetes mellitus is consistently and significantly associated with elevated mortality rates. This was a result of what the inquiry found. This lends greater credibility to the notion that the condition significantly affects life expectancy in both direct and indirect ways. In individuals with diabetes, persistent hyperglycemia and metabolic dysregulation directly contribute to several systemic health issues, including cardiovascular complications, renal failure, infections, and premature death. These problems might be bad for the person's health. The study findings indicate that the elevated mortality rate among diabetes patients may be ascribed to many factors, including inadequate disease management, restricted access to healthcare resources, and delays in diagnosis. These factors were acknowledged as contributing reasons. Urbanisation, less physical activity, and poor dietary practices may have exacerbated the already elevated prevalence of diabetes and its accompanying mortality in guangdong. This is comparable to what happened in many other places, where these things also played a role. It was also demonstrated that the risks were substantially greater when there was smoking in the area. Smoking made the cardiovascular system work harder and made it harder for the body to heal from problems related to diabetes. This is why this is the case. These findings made it very clear that integrated health initiatives are highly necessary to lower the death risks that come with diabetes. These methods should all entail finding the problem early, keeping an eye on it, and giving it the best care possible. To reduce the mortality burden associated with diabetes, public health initiatives must focus on enhancing awareness, adopting preventive measures, and promoting lifestyle modifications. This research on the relationship between diabetes mellitus and a higher death rate shows how important it is to take immediate and ongoing steps to improve public health and survival rates. In conclusion, the results of this study demonstrate the need for such actions to be implemented.

Conclusion

The study results indicated that diabetes mellitus is associated with elevated mortality rates due to many factors, namely cardiovascular disease, renal failure, infections, and other potentially lethal occurrences. The study findings showed that those with diabetes were substantially more likely to die early than people without diabetes. This happened because to a number of things, such as not treating glycaemic levels well enough, the length of the sickness, and lifestyle choices like continuing to smoke. The findings from a research conducted in guangdong indicate that the rising mortality rate associated with diabetes underscores the critical need for improved screening initiatives, expedited diagnosis, and more effective treatment strategies. The results demonstrated that the odds of dying from the disease may be decreased if people know more about it, live better lives, and get medical care when they need it. All of these things could be done. The study emphasised the need of addressing diabetes mellitus as a principal public health issue to enhance long-term health outcomes and decrease perceived elevated death rates.

References

1. american diabetes association. (2022). Standards of medical care in diabetes—2022. Diabetes care, 45(suppl. 1), s1–s264.

2. Li, x., gu, z., & gao, j. (2024). Elevated neutrophil percentage-to-albumin ratio predicts increased all-cause and cardiovascular mortality among individuals with diabetes. *Scientific reports*, *14*(1), 27870.
3. Liu, c., liang, d., xiao, k., & xie, l. (2024). Association between the triglyceride–glucose index and all-cause and cvd mortality in the young population with diabetes. *Cardiovascular diabetology*, *23*(1), 171.
4. Liu, c., pan, h., kong, f., yang, s., shubhra, q. T., li, d., & chen, s. (2023). Association of arterial stiffness with all-cause and cause-specific mortality in the diabetic population: a national cohort study. *Frontiers in endocrinology*, *14*, 1145914.
5. Luo, h., hu, w., xu, y., zheng, x., he, q., lyu, l., ... & zou, f. (2025). Identifying high-risk areas for type 2 diabetes mellitus mortality in guangdong, china: spatiotemporal clustering and socioenvironmental determinants. *Biomedical and environmental sciences*, *38*(5), 585-597.
6. Miron-celis, m., talarico, r., villeneuve, p. J., crighton, e., stieb, d. M., stanescu, c., & lavigne, é. (2023). Critical windows of exposure to air pollution and gestational diabetes: assessing effect modification by maternal pre-existing conditions and environmental factors. Environmental health, 22(1), 26.
7. Najafi, m. L., zarei, m., gohari, a., haghighi, l., heydari, h., & miri, m. (2020). Preconception air pollution exposure and glucose tolerance in healthy pregnant women in a middle-income country. Environmental health, 19(1), 131.
8. World health organization. (2021). Global health estimates: life expectancy and leading causes of death and disability. Geneva: who.
9. Ye, r., zhang, y., & gu, j. (2025). The prevalence of comorbidities and differences in noncommunicable diseases and nonrandom associations of comorbidities between hiv-infected and-uninfected individuals in guangdong province, china. *Bmc public health*, *25*(1), 761.
10. Zhai, z., yang, y., lin, g., lin, w., wu, j., liu, x., ... & hao, g. (2023). The hypertension and hyperlipidemia status among type 2 diabetic patients in the community and influencing factors analysis of glycemic control. *Diabetology & metabolic syndrome*, *15*(1), 73.
11. Zhang, s., mwiberi, s., pickford, r., breitner, s., huth, c., koenig, w., ... & schneider, a. (2021). Longitudinal associations between ambient air pollution and insulin sensitivity: results from the kora cohort study. The lancet planetary health, 5(1), e39-e49.
12. Zheng, x. Y., yi, q., xu, y. J., zeng, x. Y., xu, x. J., chen, g., ... & lin, l. F. (2022). Health transition of the causes of mortality between 2005 and 2015 in guangdong, china. *Postgraduate medical journal*, *98*(1159), 346-353.