

## FACTORS RELATED TO SMOKING AND DIABETES MELLITUS ASSOCIATED WITH ELEVATED MORTALITY AND MORBIDITY: A STUDY IN GUANGDONG, CHINA.

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### ABSTRACT

The high rates of smoking (around 34%) and diabetes (more than 20.8%) in Guangdong Province, China are a big public health issue since they are greater than or equivalent to the national guidelines. Smoking cigarettes raises the chance of getting diabetes mellitus, which in turn raises the risk of being sick or dying in the general population. This study aimed to address such inquiry. This study was carried out to ascertain if smoking influences the likelihood of acquiring diabetes. There is a scarcity of case-control studies examining the association between smoking and the development of diabetes in Chinese populations. Researchers in Guangdong used a case-control study design to examine the link between daily cigarette smoking and the incidence of diabetes. The numbers show that there was a definite dose-response association and that heavy smokers had a higher risk of diabetes than non-smokers. These outcomes are in line with what other researchers have found in China and other places. This approach allows for the derivation of two distinct conclusions. To begin with, it stresses that smoking is linked to metabolic disorders like diabetes as well as more common ailments like heart and lung diseases that are increasing mortality rate. These steps might help decrease these effects. These interventions should aim to reduce smoking rates and ameliorate the diabetes pandemic. In short, the case-control studies done in Guangdong provide us further proof that smoking cigarettes dramatically raises the risk of getting diabetes.

**Keywords:** Smoking, Diabetes Mellitus, Mortality, Morbidity.

### INTRODUCTION

Diabetic complications and tobacco use are two significant avoidable causes of mortality and disability that have lately gained prominence globally. These risk factors are too responsible for the dramatic increase in death and disease rates. This is a big problem in China: smoking raises the likelihood of getting type 2 diabetes by 30–40% and cuts the life expectancy of many smokers by more than 10 years of continuous usage. There are many long-term problems that come with the condition, and diabetes mellitus, especially type 2, is becoming more common among persons who have it (Amiri et al., 2021).

Possible problems include heart disease, renal disease, nerve damage, and damage to the eyes (retinopathy). These effects are a major reason why the average lifetime of people is shorter.

These effects shorten people's lives on average and make it harder for healthcare workers to do their jobs. Chronic non-communicable diseases (NCDs) including diabetes and heart disease are now the main causes of death in China. This is a direct result of the country's recent rise in urbanisation and changes in the way diseases spread. Guangdong is seeing the same national trends that are affecting the rest of the country: more incidences of diabetes and a lot more people smoking tobacco. In this instance, the adverse health impacts from any of these causes may be exacerbated due to their possible combination (Diaz-Santana et al., 2022).

There is a deficiency of research investigating the possible elevation of mortality and morbidity resulting from the interplay of smoking and diabetes among rural Chinese communities. The little research done in Guangdong reveals that there is a dose-response association between smoking cigarettes every day and getting diabetes. Even though there hasn't been much thorough investigation in Guangdong, this has happened. Meta-analyses and cohort studies conducted in China indicate that smoking substantially elevates the risk of mortality and cardiovascular incidents in individuals with diabetes. Some data suggests that smoking increases the risk of cardiovascular events. People with diabetes are thought to be roughly 1.5 times more likely to smoke than people who do not smoke (Guo et al., 2024).

## **BACKGROUND OF THE STUDY**

A rising amount of research shows that chronic non-communicable diseases (NCDs) are the leading cause of death on Earth. This is especially true in places where the economy is growing quickly. There are a lot of different medical problems in this category. Some examples include diabetes, Chronic Obstructive Pulmonary Disease (COPD), and heart disease. In addition to that, the insurance might pay for a number of diseases and conditions (Zhu et al, 2022).

The alarming growth in the number of Chinese individuals diagnosed with Type 2 Diabetes Mellitus (T2DM) may be attributable to several factors, any of which might explain the surge. There are a variety of things that are making this situation worse, such as an ageing population, changes in people's lives, and more people relocating to cities. But this classification doesn't include everyone. It's likely that all of these things had a hand in what happened that was being looked at (Hu et al., 2020).

Taking all of these things into account, it seems sense to think that one or more of them may be to blame for the worrying rise. The International Diabetes Federation (IDF) thinks that more than 140 million people in China have been diagnosed with diabetes in the previous few years. Each of these persons has been diagnosed with diabetes. It is becoming more important to identify and help those who are at high risk of getting diabetes. This is because the number of people placing themselves at risk of getting diabetes is expected to keep going up (Hu et al., 2021).

A lot of people in China smoke and use tobacco products, which is a big public health problem, especially for men's health. This is a big worry for public health. For now, this issue is affecting

the country's cities more than it is affecting other areas. People have been able to tolerate and even promote smoking for a long time since it has been legal for a long time (Zheng et al., 2021).

This problem has become worse, mostly because smoking regulations that used to be in place are slowly being lifted. Cigarette smoking may cause a lot of health issues, including type 2 diabetes, insulin resistance, glucose intolerance, heart disease, and obesity. People with any of these conditions are more likely to have metabolic problems, and the two are linked. When people smoke, the bad consequences of nicotine on lungs and heart become more obvious. Nicotine is a substance that is found in tobacco products (Jiang et al., 2019).

### **PURPOSE OF THE STUDY**

The purpose of this study is to enhance comprehension of the significance of the correlation between smoking habits and diabetes mellitus concerning elevated mortality and morbidity rates among the residents of Guangdong Province, China. There has been insufficient comprehensive study into the synergistic effects of smoking and diabetes, despite both being recognised as separate risk factors for chronic illness. Consequently, the cumulative effect of these two factors on the public health of rural Chinese populations has not been sufficiently investigated (Khalil et al, 2023).

It is essential to do research on this matter to ascertain if smoking substantially influences the start and course of diabetes mellitus heart and lung diseases that are increasing mortality rate. This study aims to determine the correlation between the frequency and intensity of smoking and the risk of developing diabetes or the pace of its progression. This study seeks to address the deficiencies in our comprehension of the matter. Combining high-risk habits like smoking with diabetes greatly increases the risk of heart disease, kidney failure, and early death. This is the situation because diabetes makes people more likely to have heart disease and renal failure. When this is taken into account, it is very important to understand how the two are related (Kouhkan et al., 2021).

### **LITERATURE REVIEW**

Research indicates that smoking and diabetes mellitus (DM), particularly type 2, mutually worsen each other as indicators of compromised health. This is especially true for type 2 diabetes. This is particularly noteworthy with regard to diabetes type 2. It is especially important to take this into consideration with reference to type 2 diabetes. These risk factors, when taken by themselves, increase the probability of developing cardiovascular disease, renal failure, cerebrovascular accident, infection, and mortality at a younger age. When these risk variables are viewed in isolation, this is the situation that becomes apparent. The findings of the research that has been conducted over the course of the last twenty years provide credibility to the declaration that has been made. Those who are now smoking have a higher risk of developing type 2 diabetes, as shown by the findings of a number of prospective cohorts and meta-

analyses. This is in contrast to those who have never smoked and who have never smoked and who have never smoked (Liang et al., 2023).

It does not make a difference whether the dose-response gradient is presented in the form of pack-years or the number of cigarettes smoked on a daily basis; this is always the case. This is the right response to provide in each and every circumstance, regardless of whether or not the smokers have ever even attempted to participate in the act of smoking. In addition, it is believed that nicotine has an effect on other biological processes, including as the change of the manner in which adipocytes interact with one another, the development of endothelial dysfunction, prolonged systemic inflammation, and the stimulation of sympathetic nerves (Miron-Celis et al., 2023).

The possibility that a person may have complications with their microvascular and macrovascular systems is increased when they smoke. For instance, the fact that those who smoke have a higher chance of developing heart disease is an excellent example of this point. Evidentiary evidence that is unique to China is equivalent to evidence that is representative of universal occurrences that take place in every region of the globe. There has been a statistically significant rise in the number of individuals who have been diagnosed with diabetes, and it has been shown that a sizeable proportion of individuals, especially males, are smokers. There are a lot of factors that might be responsible for the fast increase in the incidence of diabetes. Some of these factors include urbanisation, changes in dietary habits, and the rising number of people who are becoming older. When both the intensity of smoking and the amount of time spent smoking are taken into consideration, there is a tendency for research to find larger connections between the two components (Najafi et al., 2020).

## RESEARCH QUESTION

What is the influence of smoking on elevated mortality?

## RESEARCH METHODOLOGY

### Research Design

The SPSS version 25 was used for the quantitative data analysis. A 95% confidence interval and odds ratio were used by the researchers to assess the direction and strength of the statistical association. A statistically significant criteria was established by the researchers at  $p < 0.05$ . The data's basic features were revealed via a thorough investigation. Quantitative methods are often used to evaluate data collected via polls, questionnaires, and surveys, as well as data analysed using computing tools for statistical evaluation.

### Sampling

Research participants completed questionnaires to furnish data for the study. Utilising the Rao soft tool, researchers ascertained that the study comprised 657 individuals. Researchers

disseminated 896 questionnaires to the public. The researchers obtained 823 replies, eliminating 45 due to incompleteness, yielding a final sample size of 778.

### Data and Measurement

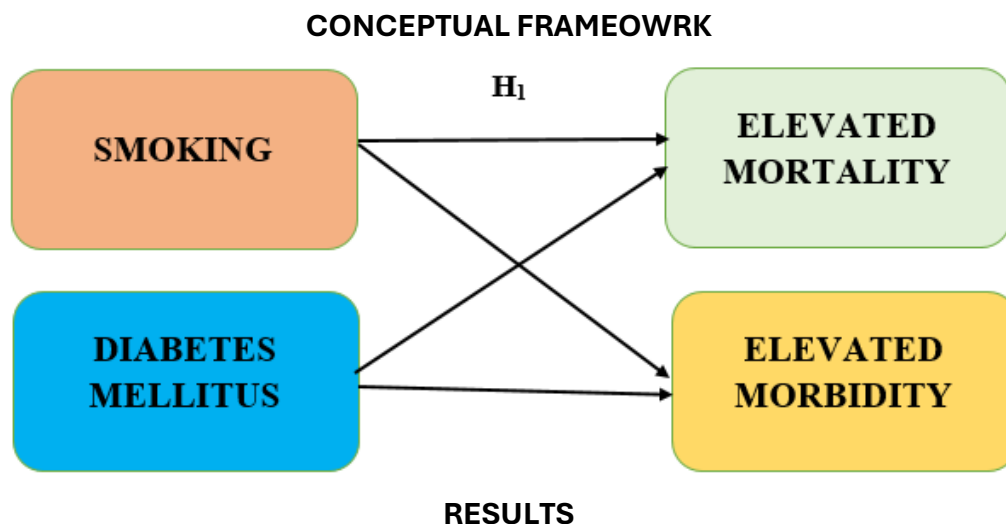
The study mostly utilised data acquired from a questionnaire survey. The participant's essential demographic information was requested first. Participants were subsequently given a 5-point Likert scale to evaluate the online and offline channels. The researchers rigorously analysed several resources, especially internet databases, for this secondary data acquisition.

### Statistical Software

The statistical analysis was conducted using SPSS 25 and MS Excel.

### Statistical Tools

The primary characteristics of the data were understood via the use of descriptive analysis. Using ANOVA, the researcher must examine the data.



**Factor Analysis:** Factor Analysis (FA) is often used to find hidden variables in observable data. It is common practice to use regression coefficients to generate ratings when there are no easily visible visual or diagnostic signs. Success in FA is highly dependent on models. The goals of modelling are to identify errors, intrusions, and apparent linkages. The Kaiser-Meyer-Olkin (KMO) Test is one tool for evaluating datasets that have been generated by numerous regression analyses. The representativeness of the model and the variables in the sample are checked by them. There seems to be data duplication based on the numbers. Data is more easily comprehensible when proportions are smaller. The output of KMO is an integer from 0 to 1. A sufficient sample size is defined as a KMO value between 0.8 and 1. According to Kaiser, these are the acceptable limits: The standards that Kaiser has established for admission are as follows:

A dismal 0.050 to 0.059, worse than the typical 0.60 to 0.69

The typical range for middle grades is between 0.70 and 0.79.

Having a quality point score between 0.80 and 0.89.

Between 0.90 and 1.00, they find wonder.

According to Bartlett's sphericity test, these are the results: chi-square, sig.=.000, about 190 degrees of freedom this proves that the statements made for sampling were legitimate. In order to determine whether the correlation matrices were relevant, the researchers used Bartlett's Test of Sphericity. An adequate sample is defined as one with a value of 0.917 according to the Kaiser-Meyer-Olkin measure. The results of Bartlett's sphericity test provide a p-value of 0.00. Researcher can tell the correlation matrix isn't an identity matrix if Bartlett's sphericity test returns a positive result.

**Table 1.** Testing for Bartlett's Sampling Adequacy and KMO (Kaiser-Meyer-Olkin) 0.917 scale.

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

In addition, the widespread use of correlation matrices was confirmed by Bartlett's Test of Sphericity. The sample adequacy measure, as measured by Kaiser-Meyer-Olkin, is 0.917. Using Bartlett's sphericity test, the researchers obtained a p-value of 0.00. A substantial result of Bartlett's sphericity test demonstrated that the correlation matrix was ineffective.

## INDEPENDENT VARIABLE

**Smoking:** One of the most important modifiable risk factors for the onset and worsening of diabetes mellitus and other chronic illnesses is smoking. Among those with diabetes in Guangdong, China, smoking is associated with an increased risk of death and illness. The harmful effects of nicotine and other tobacco compounds on insulin sensitivity, inflammation, and blood vessel health make it more difficult to maintain a healthy blood sugar level. Cardiovascular issues, renal disease, nerve problems, and poor wound recuperation are more common among diabetic smokers, putting them at a higher risk of disability and early death. The cultural norm of smoking among certain Guangdong people also makes matters worse for their health. Smoking has a multiplicative effect on diabetes, hastening the course of the illness while simultaneously increasing healthcare expenditures and social consequences. Thus,

quitting smoking is essential for diabetes patients in the area to improve health outcomes, decrease complications, and minimise death rates (Nazarpour et al., 2023).

## DEPENDENT VARIABLE

**Elevated Mortality:** When the death rate of a group of people is greater than expected, this is called elevated mortality. This event is typically linked to certain risk factors or health problems that already exist. Researchers in public health see it as an essential indicator since it illustrates how certain habits or diseases diminish life expectancy and escalate healthcare costs. A greater mortality rate may be caused by things like smoking too much, eating badly, and not getting enough exercise. Long-term health conditions including diabetes, heart disease, and cancer may also make people more likely to die. Other important factors that make the situation worse include environmental exposures, socioeconomic inequality, and poor access to healthcare. In the research field, statistics are typically used to look at higher fatality rates. Standardised death ratios, survival analysis, and mortality rates are all examples of these kinds of statistics. To make strategies to minimise the number of preventable deaths, it's important to find out what's driving the death toll to climb. For example, areas where smoking is frequent and diabetes is common have a higher mortality rate. This is because these patients are more likely to have heart attacks, strokes, and organ failure. People's chances of survival may go up a lot if certain risk factors are lowered (Wang et al., 2023).

**Relationship between Smoking and Elevated Mortality:** There is evidence that smoking is linked to higher death rates because tobacco usage is linked to a higher risk of early death. This effect causes more fatalities to happen. The fact that smoking is the most common cause of mortality that can be avoided across the world shows how important it is to take steps to stop it. Some of the harmful chemicals that smokers breathe in include nicotine, tar, and carbon monoxide. These may damage the lungs, blood vessels, and heart. This is because cigarettes have these harmful compounds in them. Long-term smoking greatly boosts the risk of obtaining chronic diseases such lung cancer, COPD, stroke, and heart disease, which are key causes of higher mortality rates. These diseases are a major cause of higher mortality rates. People who smoke cigarettes are also more likely to have infections and have problems with illnesses like diabetes, both of which raise the risk of death. Studies show that smokers tend to have shorter lives than non-smokers, and heavy smokers have mortality rates that are significantly higher than those of non-smokers. The association is dose-dependent, indicating that health effects are proportionate to the frequency and duration of smoking. Programs that help individuals quit smoking are very important for saving lives since quitting smoking lowers the chance of mortality at any age (Ye et al., 2022).

On the basis of the above discussion, the researcher formulated the following hypothesis, which was analyse the relationship between Smoking and Elevated Mortality.

*“ $H_{01}$ : There is no significant relationship between Smoking and Elevated Mortality.”*



*“H<sub>1</sub>: There is a significant relationship between Smoking and Elevated Mortality.”*

**Table 2.** H1 ANOVA Test.

ANOVA					
Sum					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43188.718	305	5862.523	1088.474	.000
Within Groups	628.315	472	5.386		
Total	43817.033	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 1088.474. This suggests that researchers might support the alternative view, ***“H<sub>1</sub>: There is a significant relationship between Smoking and Elevated Mortality”*** is accepted and the null hypothesis is rejected.

## DISCUSSION

This research highlights the ways in which diabetes mellitus and smoking both increase the risk of death and disability in Guangdong, a province where the elderly and rapidly urbanising population are putting stress on cardiovascular health. Consistent with overlapping pathways of inflammation throughout the body, endothelial dysfunction, insulin resistance, alongside pro-thrombotic states, the results show that the two exposures have a cumulative, and perhaps synergistic, impact on the health of people with diabetes who smoke. It seems that the increased risk is most pronounced in the elderly, in males who smoke more heavily, and in those with longer durations of diabetes or poor glycaemic management. Due to potential delays in diagnosis, inadequate cessation assistance, and uneven chronic-disease treatment, rural and low-income populations may experience healthcare access and socioeconomic gradients as mediators of the connection. Short counselling, medication, and follow-up as part of diabetes treatment that focusses on helping patients quit smoking might have a significant impact right away. There needs to be more public health education in locations like workplaces and community clinics, more enforcement of smoke-free regulations, and increased tobacco prices. Extra precautions should be taken to lessen the danger by bolstering diabetic primary care, which includes team-based treatment, the use of statins and antihypertensives, and frequent screening for complications. Possible selection bias, self-reported smoking, and residual confounding from food, exercise, and alcohol are some of the limitations. To reduce avoidable mortality and disability in Guangdong, it is recommended that coordinated treatments addressing both cigarette exposure and diabetes management be prioritised, since the direction of effects is consistent.

## CONCLUSION

Researchers in Guangdong found that smoking and diabetes mellitus are major causes of increased mortality and morbidity. There is evidence that the combined impact of these



variables are far more harmful than the sum of their parts, increasing the likelihood of early mortality and disability. The risk of cardiovascular events, stroke, and organ failure is increased when a person smokes because it hinders glucose metabolism, increases oxidative stress, and speeds up vascular damage, all of which are consequences of diabetes. Similarly, the body's capacity to recuperate from smoking's detrimental consequences is impaired by diabetes, leading to a vicious cycle of worsening health outcomes. The critical importance of coordinated efforts to both prevent and treat disease is highlighted by these results. Quitting smoking should be one of the primary goals of public health campaigns, but enhancing diabetes awareness, early identification, and long-term treatment should also be a priority. A substantial decrease in disease burden may be achieved by targeted treatments, especially in groups who are at high risk. Tobacco control strategies and better, more affordable healthcare options for people with diabetes are also crucial in meeting these problems. The study's strong support for prioritising integrated health initiatives is overshadowed by its weaknesses, such as its dependence on self-reported smoking and unmeasured lifestyle variables. Lowering the incidence of smoking and improving diabetes management may ultimately enhance the health of the Guangdong population and reduce unnecessary deaths.

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