



# Exploring Obesity Risk Factors: Focuses on Family History of Overweight and Smoking Behaviour

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

**Background and Objective:** Obesity is a complex health condition with a steadily increasing global prevalence, posing significant challenges to public health. It is estimated that approximately 1 in 8 individuals worldwide are affected by obesity, with the prevalence among adults more than doubling and the rate among adolescents increasing fourfold over the past few decades. Obesity is influenced by a complex interplay of genetic, environmental, and behavioral factors.

**Methods:** A cross-sectional study was conducted to examine the associations between body mass index (BMI), smoking status, and family history of overweight, with statistical analyses used to assess their strength and potential interactions.

**Results:** The findings demonstrate a significant association between family history of overweight and the likelihood of developing obesity ( $p = 0.01$ ). Individuals with a familial predisposition to overweight exhibited a markedly higher risk of obesity, independent of smoking behavior.

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**Conclusion:** Individuals with a genetic predisposition to overweight due to family history are more likely to develop obesity.

*Keywords: Obesity; family history; smoking behaviour; risk factors; body mass index.*

## 1. INTRODUCTION

Obesity has become a global epidemic, increasing the risk of chronic diseases such as heart disease, diabetes, and cancer (Koliaki et al. 2023).

The likelihood of obesity is influenced by a complex interplay of genetic, lifestyle, and environmental factors. A family history of overweight and obesity, as well as smoking, are recognized as significant independent risk factors for obesity (Zhang et al. 2021). However, the extent to which a family history of overweight may amplify the impact of smoking on obesity risk is not yet well understood. Understanding this relationship could help inform more targeted interventions for high-risk populations (FRSPH et al. 2020).

Family history of obesity reflects both genetic predispositions and environmental factors. Genetic contributions to BMI account for approximately 40-70% of an individual's likelihood of developing obesity, with factors related to appetite regulation, metabolic rates, and fat storage (Ali et al. 2021). On the other hand, smoking habits have shown a complex relationship with body weight: smoking is sometimes associated with weight reduction, but it also promotes central fat accumulation, which increases obesity-related health risks (Taylor et al. 2023). According to Riskesdas statistics, an analysis of individual food consumption surveys indicates that many Indonesians still do not maintain a balanced diet. The eating habits of the general population tend to favor fatty foods while failing to meet the body's essential needs for vitamins, minerals, and fiber (Thamrin et al. 2022). To address the rising obesity rates, innovative approaches involving various government and community stakeholders are necessary. One potential solution is to implement health interventions that focus on behavioral factors. Given the urgency of addressing the obesity issue, this study is crucial for identifying the factors that contribute to the incidence of obesity (Van et al. 2023).

A genetic background of obesity refers to strong indicator of obesity risk, due to both genetic

predispositions and familial environmental factors (Loos and Yeo, 2022). Children and adults with obese family members often have similar eating habits and lifestyles, which increases the risk of obesity (Mahmood et al. 2021). In addition, familial obesity is also associated with similar psychological and social factors, such as food consumption habits and sedentary behavior patterns, which increase the prevalence of obesity among family members (Karakitsiou et al. 2024).

Smoking is associated with changes in fat distribution and metabolic activity, contributing to abdominal obesity, especially in heavy smoker (Behl et al. 2023). Interestingly, smoking cessation is often followed by weight gain, with an average increase of 4-5 kg within a year. This phenomenon is attributed to metabolic changes and an increased appetite after quitting smoking (Cepeda-Benito, 2020). Individuals with a genetic predisposition to obesity may have a higher risk of gaining weight after quitting smoking (Bouchard, 2021). Limited research has explored the potential interaction between a family history of obesity and smoking habits. Individuals with a genetic background of overweight may use smoking as a weight control strategy, complicating the relationship between these two factors (Zimlichman et al. 2005) the tendency to gain weight after quitting smoking appears to be more pronounced in individuals with a family history of overweight or obesity, suggesting that genetic and behavioral factors may mutually exacerbate each other's influence on obesity risk (Driva et al. 2022).

This study explores the relationship between a family history of overweight and smoking habits in connection to obesity. It specifically looks at whether individuals with a genetic tendency toward obesity are more prone to weight gain linked to smoking or smoking cessation.

## 2. METHODOLOGY

### 2.1 Study Design and Participants

This study employs a cross-sectional design, utilizing statistical observational analytics to

investigate associations within the dataset. Cross-sectional studies analyze samples at one specific time, allowing for the assessment of relationships between variables without drawing causal conclusions. The sample for this study comprises 2,111 participants. Participants were selected based on the availability of BMI, smoking status, family history of overweight, and gender (Nachman and Parker, 2012).

### 2.2 Data Assembly

The data utilized in this study was sourced from the UCI Machine Learning Repository (12), a well-regarded resource for secondary data, with the specific dataset published in 2019. The dataset consists of various variables capturing demographic, behavioral, and/or health-related attributes relevant to the research objectives. Given the nature of secondary data analysis, no primary data collection was involved (Kabir, 2022).

### 2.3 Data Analysis

The statistical analysis using Mann-Whitney test to compares two independent groups. Assess the correlation between family history of overweight, smoking habits, and obesity.

## 3. RESULTS AND DISCUSSION

Research Results and Statistical Analysis of Body Mass Index (BMI) Based on Family History of Obesity, Smoking, and Gender. This study conducted a statistical analysis to examine the relationship between Body Mass Index (BMI) and other variables such as family history of obesity, smoking habits, and gender.

**Table 1. Statistics of BMI and Family History of Obese**

Test Statistics <sup>a</sup>	BMI
Mann-Whitney U	86345.5
Wilcoxon W	160650.5
Z	-22.979
Asymp. Sig. (2-tailed)	0

Grouping Variable: Family History of Obese

**Table 2. Ranks of BMI and Smoking**

Ranks	Smoking	N	Mean Rank	Sum of Ranks
BMI	Yes	44	1069.43	47055
	No	2067	1055.71	2182161
	Total	2111		

**Table 3. Statistics of BMI and Smoking**

Test Statistics	BMI
Mann-Whitney U	44883
Wilcoxon W	2182161
Z	-0.149
Asymp. Sig. (2-tailed)	0.881

Grouping Variable: Smoking

**Table 4. Ranks of BMI and Gender**

Ranks	Gender	N	Mean Rank	Sum of Ranks
BMI	Male	1068	1033.94	1104253
	Female	1043	1078.58	1124963
	Total	2111		

**Table 5. Statistics of BMI and Gender**

Test Statistics <sup>a</sup>	BMI
Mann-Whitney U	533407
Wilcoxon W	1104253
Z	-1.7
Asymp. Sig. (2-tailed)	0.089

Grouping Variable: Gender

This study analyzed the association between obesity and three variables: gender, family history of obesity, and smoking habits. The statistical analysis yielded p-values of 0.08 for gender, 0.01 for family history of obesity, and 0.88 for smoking habits. These results help interpret the significance of these relationships, indicating that while family history of obesity shows a significant correlation with obesity, gender and smoking habits do not exhibit significant associations in this study.

### 3.1 Family History of Overweight and Obesity (p = 0.01)

The analysis reveals a notable correlation between a family history of overweight and obesity, evidenced by a p-value of 0.01 (p < 0.05). This implies that individuals with overweight family history have a higher likelihood of being obese. This result aligns with the understanding that genetic predisposition plays a substantial role in an individual's risk of developing obesity. Familial influence includes both genetic factors and shared lifestyle behaviors, such as dietary habits and physical activity levels. These factors can amplify obesity risk among individuals with overweight or obese family members, emphasizing the importance of targeting family-based interventions for effective obesity prevention.

### 3.2 Smoking Habits and Obesity (p = 0.88)

The connection between smoking habits and obesity was determined to be statistically insignificant, with a p-value of 0.88 ( $p > 0.05$ ). This large p-value suggests that smoking status (whether current, former, or never smoked) does not significantly impact the risk of obesity in this sample. Although smoking has been associated with changes in metabolism and appetite, this result suggests that smoking habits alone may not consistently predict obesity status. This finding is consistent with some literature that suggests smoking's impact on body weight may be more related to fluctuations in fat distribution and appetite regulation rather than overall obesity risk.

### 3.3 Gender and Obesity (p = 0.08)

Gender was also found to have no statistically significant relationship with obesity, as indicated by a p-value of 0.08 ( $p > 0.05$ ). This implies that, in this sample, males and females had similar obesity risk levels. While there can be differences in fat distribution and metabolic responses between genders, the lack of a significant association here suggests that gender alone is not a primary factor in determining obesity risk. This aligns with findings that obesity risk factors may be more influenced by genetic and lifestyle factors rather than gender itself.

## 4. CONCLUSION

This study underscores the strong connection involving family history of overweight and obesity, suggesting that individuals with overweight family members may benefit from targeted lifestyle interventions to mitigate this risk. Smoking habits and gender, on the other hand, did not show a significant impact on obesity in this analysis. These findings point to the importance of prioritizing genetic and familial influences in obesity prevention efforts, as well as the potential limitations of focusing solely on smoking cessation or gender-based interventions for obesity management.

### CONSENT AND ETHICAL APPROVAL

It is not applicable.

### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors hereby state that no generative AI tools such as large language models (ChatGPT,

COPILOT, etc.) or text-to-image generators were utilized in the creation or editing of this work.

### DATA AVAILABILITY

All relevant data are included in the paper and its supporting information files. This study aims to help researchers identify critical areas related to the obesity risk factors associated with a family history of overweight and smoking habits.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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