

A Review on the Current Situation of Online Food Delivery Consumption among University Students and Its Relationship with Overweight and Obesity

Jing Gao

Shanghai Jian Qiao University, Shanghai 201306, China

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Abstract: The rapid growth of online food delivery (OFD) services, driven by internet technology and socioeconomic development, has reshaped modern dietary habits, particularly among urban populations. While global OFD consumption continues to rise, China's market has expanded at an especially notable pace. In parallel, obesity and related metabolic diseases have emerged as critical public health concerns worldwide. University students, a key consumer group with unique lifestyle and dietary patterns, increasingly rely on OFD due to campus resource constraints and academic demands. However, limited research has examined the association between OFD consumption and health outcomes such as overweight and obesity in this population. Focusing on students at a university in Shanghai, this study analyzes the characteristics of OFD usage and its correlation with overweight/obesity risks. The findings aim to address a research gap and provide insights for targeted health interventions to promote healthier eating behaviors and improve students' well-being.

Keywords: Online food delivery; University students; Overweight and obesity

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1. Introduction

The widespread application of internet technology and sustained socio-economic progress have fueled a quantum leap in the online food delivery (OFD) service industry in recent years. As a novel dining model characterized by convenience and diversity, OFD services have become deeply integrated into the daily dietary structure of modern urban residents. International research data indicates a stable growth trend in the global OFD consumption scale, with continuous market expansion. Particularly noteworthy is the exceptionally rapid development of China's OFD market. Fierce competition among major service platforms has not only expanded consumers' choices but also significantly enhanced service quality levels.

Concurrently, obesity and related metabolic diseases are gradually evolving into a major global public health challenge. According to statistical reports from the World Health Organization (WHO), the incidence

of overweight and obesity has shown a significant upward trend over recent decades, posing a severe threat to population health. A substantial body of existing empirical research, by analyzing the associations between key factors such as lifestyle, dietary structure, and obesity, has laid an important theoretical framework for in-depth investigation into health risk factors.

As a specific consumer group within higher education institutions, university students exhibit distinct characteristics in terms of lifestyle and consumption patterns. The insufficient supply of catering resources around campuses, coupled with heavy academic burdens and frequent social activities, makes takeout services a primary dietary choice for this demographic. It is important to note that the university stage coincides with a critical period for individual physiological development and the formation of health behaviors. Dietary choices during this period have long-term impacts on physical health status. However, existing research on the relationship between OFD consumption and the university student population remains significantly limited. Not only is the number of related studies scarce, but they also predominantly focus on analyzing consumer behavior and market characteristics, while research on the association between OFD consumption and health issues like overweight and obesity is even more deficient.

As one of China's most international metropolises, Shanghai boasts dense higher education resources and a large population of university students. This study focuses on the characteristics of OFD consumption behaviors among students at a specific university in Shanghai and systematically analyzes the correlation with the risk of overweight and obesity. This research holds significant social value. It can not only fill the current academic gap in this field but also provide theoretical support for universities to implement precise health education intervention measures. This, in turn, can effectively guide students to form scientific dietary concepts, optimize their dietary structure, reduce the incidence of overweight and obesity, and ultimately achieve an overall improvement in the physical and mental health levels of university students.

2. Current research status domestically and internationally

2.1. Domestic research status

In current research on university student health and lifestyle, the association between OFD consumption behaviors and health status has become an important topic, particularly its effects on health indicators such as overweight/obesity and sleep quality. Multiple empirical studies have explored this using different sampling methods and statistical models: A survey of 2,610 students in Jiangxi Province by Su *et al.* ^[1] showed that high-frequency consumption of “fast food and boxed meal” categories via OFD significantly increased the risk of overweight and obesity. Zhu ^[2], in a study of 4,482 students from “Double First-Class” universities in the Yangtze River Delta region, found that the frequency of OFD consumption on weekdays was an independent risk factor for overweight and obesity. Although Sun *et al.* ^[3] did not find a significant association between OFD consumption and physical status in their study of 4,372 students at Shihezi University, they pointed out that the overweight and obesity rate among students at that university required urgent improvement. Zhang's team ^[4], in a multi-stage stratified study of 1,326 university students in Changsha, further confirmed the existence of demographic differences in the prevalence of OFD consumption and its association with overweight and obesity. Sha *et al.* ^[6], analyzing data from 2,610 students in Jiangxi from a socio-economic perspective, found that students from rural backgrounds, non-only-child, and other specific groups were more inclined towards OFD consumption. Notably, a subsequent study by Su *et al.* ^[7] revealed that consuming specific categories ≥ 4 times per week was significantly associated

with decreased sleep quality. Wang's team^[8] supplemented evidence for the association between sleep quality and overweight/obesity through sleep parameter analysis, while Cao *et al.*^[10], in their study of 2,020 students at Shihezi University, clarified the influence mechanisms of gender differences and physical activity levels. These studies collectively construct a multi-dimensional evidence chain linking OFD consumption behaviors to health outcomes among university students.

Existing research explores the phenomenon of OFD consumption among university students from multiple dimensions, focusing on the consumption characteristics, existing problems, and governance countermeasures of this group within the context of the internet economy. Gu and Ji employed mixed research methods through an empirical survey covering nine major regions in China to systematically analyze the operational mechanisms and potential risks of OFD consumption in the O2O model within universities, subsequently proposing collaborative governance solutions from the perspectives of educational management and industrial upgrading^[5]. Addressing regional cases, scholars like Li *et al.*, taking Jiujiang University as the research object, constructed a quaternary analytical framework involving government, university, enterprise, and consumer, providing policy suggestions for standardizing the online food delivery market order^[9]. In the field of food safety, Liu's team used spatial sampling methods to conduct qualification checks on catering merchants around university towns. Using the three universities in Shanghai's Haiwan area as a sample, combined with microbiological testing data, they revealed hygiene hazards in OFD food and proposed standardized supervision schemes^[11]. Zhou's research team applied spatial econometric methods, based on panel data from 278 prefecture-level cities, analyzed the spatial heterogeneity and driving mechanisms of OFD packaging waste, and innovatively proposed differentiated environmental governance pathways^[12]. Other scholars, from a risk management perspective, constructed a full-chain management system of "review-control-supervision-feedback," providing a practical paradigm for OFD safety governance in universities through technological innovation and responsibility mechanism reconstruction^[13]. Wu's research group focused on the end-consumer experience, designing an intelligent self-pickup system based on user behavior data analysis, offering a technical solution to the "last mile" delivery challenge^[14]. Fan systematically evaluated the efficiency of lunchbox waste treatment technologies from an environmental governance perspective, pointing out that material innovation and the construction of a circular economy system would become future research priorities^[15].

Current academic research has explored management innovations and model optimizations in the OFD industry across multiple dimensions, involving key areas such as food safety supervision, packaging waste management, university delivery management, and business model innovation. These studies provide important theoretical support for promoting the standardization and sustainable development of the OFD industry. In food safety, Liu *et al.*^[11] conducted sampling surveys on the business qualifications, food safety records, and packaging material quality of catering merchants around multiple university towns nationwide. Using the Shanghai Haiwan University town as a typical case for microbiological testing, they found that the hygiene status of OFD food in this area urgently needed improvement; their research results provided empirical evidence for regulatory authorities to formulate prevention and control measures. Zhou's team^[12] used spatial econometric analysis methods to systematically study the spatial distribution patterns and driving factors of OFD packaging waste in 278 prefecture-level cities in China in 2018, innovatively proposing differentiated governance strategies, which hold significant guiding value for promoting the green transformation of the OFD industry. Addressing the challenges of OFD management in universities, researchers^[13] constructed comprehensive solutions from both institutional design and technological innovation dimensions, incorporating elements such as qualification review, process supervision, and

intelligent platform construction. In consumer experience optimization, scholars like Wu *et al.* [14] developed a new intelligent self-pickup system based on university student consumption behavior survey data, providing practical references for improving terminal delivery services. Fan [15] conducted an in-depth analysis of lunchbox waste governance paths, pointing out that synergistic advancement is needed in material research and development, policy guidance, and recycling system construction. Furthermore, multiple empirical studies targeting university students indicate significant associations between OFD consumption behaviors and health indicators: Su *et al.* [7] found a statistical correlation between high-frequency OFD consumption and decreased sleep quality; Zhang's team [4] revealed the association between the overweight and obesity phenomenon among university students in Changsha and factors such as OFD consumption frequency; Zhu's [2] research further confirmed a dose-response relationship between OFD consumption behaviors and abnormal weight among university students in the Yangtze River Delta region.

2.2. International research status

The current international academic community has made significant progress in researching the correlation between dietary patterns and overweight/obesity among university students. Specifically, the empirical study by Cheng and Liu on university students in Beijing indicated that excessive intake of foods rich in protein, fat, and sugar, coupled with insufficient fruit and vegetable consumption, significantly increases the risk of obesity in the student population; the study further revealed statistically significant differences in food intake amounts between genders, providing an important basis for implementing differentiated dietary intervention strategies to improve student health status [16].

Existing research shows significant associations between dietary patterns and weight status across different populations. A cross-sectional study by Andrade *et al.* on Brazilian adolescents, through multivariate statistical analysis, revealed a negative correlation between preferences for specific food group intake and overweight/obesity, providing empirical evidence for formulating adolescent nutrition intervention strategies [17]. Meanwhile, the Dinbabo research team, in a study of adult populations in two South African towns, found that dietary pattern dysregulation due to socio-economic status differences significantly influenced food choice behaviors, thereby increasing the risk of overweight and obesity. The researchers accordingly suggested implementing consumer health education programs in low-income communities to address this public health issue [18].

Existing research has also explored the correlation between Ultra-Processed Food (UPF) intake and overweight/obesity. A longitudinal study by Ming *et al.* on the Chinese adult population showed that persistently high UPF intake levels were significantly positively correlated with the risk of overweight/obesity. Their data indicated that from 1997 to 2011, the average daily UPF intake of the study subjects increased significantly from 12.0 grams to 41.5 grams, and its proportion of the total daily diet also rose from 1.0% to 3.6% [19]. The research team of Feng further validated this association, finding a positive correlation between increased UPF intake and overweight/obesity risk among Chinese adults, which was particularly notable among women and residents of small and medium-sized cities, although the overall effect size was relatively limited. This study also emphasized the future need to deeply explore the mechanism of action through which UPF intake affects health outcomes and recommended strengthening nutritional health education to guide residents towards a balanced dietary structure, thereby effectively preventing and controlling overweight and obesity problems [20].

Regarding research on the association between dietary structure and weight status in middle-aged and elderly populations, data from a survey in Chongqing by Wu *et al.* indicated that individuals presenting dietary

characteristics of low fruit and legume product intake frequency coupled with a high proportion of vegetable intake had a significantly increased risk of developing overweight or obesity. More notably, the study also revealed a synergistic effect between unhealthy habits like smoking and alcohol consumption and specific dietary patterns on the risk of abnormal weight ^[21].

Multiple multinational studies indicate that the dietary behaviors and nutritional status of university students exhibit significant regional characteristics. A survey by Oladyinbo *et al.* in Ogun State, Nigeria, showed that undergraduate students commonly exhibited irregular meal patterns, mainly manifesting as skipping at least one meal per day, high-frequency intake of fast food and carbonated beverages, coupled with insufficient fruit and vegetable consumption. Notably, their BMI index was significantly correlated with snacking patterns and soft drink intake, but showed no statistical association with physical activity levels ^[22]. Similarly, research by the Mushaphi team in a rural university in Limpopo Province, South Africa, revealed that overweight issues were closely related to fast food and sugar-sweetened beverage consumption. Specifically, a significant positive correlation was found between the frequency of processed food intake and waist-to-hip ratio, and between sugar-sweetened beverage consumption and BMI. They accordingly recommended guiding students to establish scientific dietary structures through campus nutrition intervention programs ^[23]. Conversely, a survey by Rana *et al.* in a Bangladeshi agricultural university found that although the overweight and obesity rate among students was relatively low, their dietary structure was unbalanced, particularly with insufficient intake of dark green vegetables and fruits, and significant differences in the consumption frequency of different food categories. This provides empirical evidence for conducting targeted nutritional health education ^[25].

Existing research suggests a correlation between adolescent pocket money and weight status. A survey of Chinese junior high school students by Dong *et al.* showed that an increase in the amount of pocket money significantly raised the probability of overweight and obesity in the female student population. However, this association was no longer significant when access to food around the school was restricted. The study also pointed out that the overweight rate among Chinese adolescents showed a continuous growth trend ^[24].

The existing literature indicates that international academic research on the relationship between diet and weight primarily focuses on the correlation analysis between dietary structure characteristics and overweight/obesity risk across different age groups, while also exploring the influence mechanisms of dietary behavior characteristics and socio-economic factors on weight status. It is noteworthy that specialized research focusing specifically on the correlation between OFD consumption behaviors and overweight/obesity among university students is currently a gap in the literature. This study, targeting university students in Shanghai, systematically investigates the characteristics of OFD consumption behaviors and their epidemiological association with overweight and obesity. This will not only help perfect the theoretical system in this field but also provide empirical evidence for formulating nutritional intervention strategies and weight management plans for the university student population.

3. Conclusion

The academic community has achieved important research results in exploring the association between university students' dietary behaviors and overweight/obesity, providing a theoretical basis and practical references for related research. Domestic scholars primarily focus on the association mechanisms between OFD consumption behaviors and health effects among university students. Their research content covers the correlation analysis between OFD

consumption characteristics and health indicators like obesity risk and sleep disorders. Simultaneously, they delve into the current situation, existing problems, and countermeasures of OFD consumption in universities, extending to management innovation areas such as food safety supervision and packaging waste management. In contrast, international research places greater emphasis on the correlation analysis between dietary patterns and obesity risk across different geographical populations. The research perspectives include the influence mechanisms of dietary behavior characteristics and socio-economic factors on weight status. Their research subjects span a wider age range, involving various dietary patterns such as ultra-processed foods, fruit and vegetable intake, and snack consumption, while also examining the potential impact of social determinants like economic conditions on weight management.

Current academic research in this field still faces several limitations that need to be addressed: Firstly, existing domestic literature mainly focuses on comparative analyses across regions and universities, while empirical research targeting the specific geographical unit of Shanghai universities is still lacking. Secondly, most existing studies on the correlation between OFD consumption behaviors and overweight/obesity employ questionnaire surveys and statistical description methods, with insufficient in-depth exploration of the potential mechanisms of action between the two. Furthermore, although the international academic community has accumulated relatively rich research results regarding the association between dietary consumption and overweight/obesity, specialized research specifically exploring the relationship between OFD consumption behaviors and overweight/obesity among university students remains scarce.

Given the current inadequacy of academic research on the correlation between university students' OFD consumption behaviors and abnormal weight, this study selects a specific university in Shanghai as the research object to systematically investigate the characteristics of OFD consumption behaviors among university students and their epidemiological association with overweight and obesity. This research will not only help perfect the theoretical system in this field but also provide empirical evidence for formulating scientific and effective dietary intervention strategies, holding significant practical value for promoting healthy lifestyles among university students.

Disclosure statement

The author declares no conflict of interest.

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