

Sodium Content in Takeaway Meals Sampled from Three Large China Cities

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Abstract

Objective: The aim of the present study was to evaluate salt levels in popular hot takeaway meals in three large China cities, and to compare the difference in sodium content in different types of takeaway meals. **Methods:** We randomly collected a total of 4450 samples of 7 different types of takeaway meals, which were the most consumed by local residents from takeaway platforms. The main ingredients, auxiliary ingredients, as well as the weight used in takeaway meals were collected. The sodium content in takeaway meals was obtained by calculation. **Results:** Obtained results show that the sodium content in three large China cities is alarmingly high. Comparing medians (interquartile range) of takeaway meals from different cities, Beijing contained the highest sodium content per portion (1371.3 mg (890.3 - 2137.4)), followed by Hangzhou (1348.45 mg (694.25 - 1541.62)) and Shanghai (340.1 (259.75 - 942.25)). In addition, the sodium content between pasta and porridge, Chinese meals, and western meals show significant differences ($p < 0.05$). Compared with Chinese Dietary Reference Intakes, the average sodium content exceeded dietary recommendations for one takeaway meal. The sodium content differed among takeaway meals prepared with various cooking methods and meats. **Conclusion:** Notable differences are detected in takeaway meals' sodium content between several large cities in China. To meet China's target salt intake, consumers in these cities are highly recommended to reduce sodium content in their everyday meals.

Keywords

Sodium Content, Takeaway Meals, Online Meal Order, Large Cities

1. Introduction

Nowadays, more and more people prefer takeaway food. Takeout is popular because of its variety, convenience, and taste. However, its disadvantage is also obvious [1]. From the perspective of taste, different types of restaurants have different tastes, from spicy to salty. Excessive ingestion of spicy food and salty food, however, invites health problem. Salt is an indispensable condition in people's daily diet. Almost all foods need to use salt to improve their taste. Chinese medicine believes that a salty taste enters the kidneys. It has the function of regulating the osmotic balance of human cells and blood and normal water and sodium. Potassium metabolic function, especially after a lot of sweating, properly supplemented with light saline can avoid the symptoms of electrolyte disturbance [2]. However, excessive salt intake is also a prominent problem in today's diet, which also increases the occurrence of some chronic non-communicable diseases [3]. A high-salt diet is the first dietary risk factor for cardiovascular metabolic death in Chinese residents. A high-salt diet will aggravate the mechanism of cerebral ischemic injury. Excessive intake of salt in the daily diet will become an important risk factor in the development of cerebral ischemic disease [4]. One of the common causes of hypertension is excessive salt intake. Hypertensive patients who do not strictly control sodium intake in their daily diet may aggravate the symptoms and course of hypertension [5] [6]. Studies have shown that reducing salt intake in the diet can delay or prevent the occurrence of antihypertensive treatment, can promote blood pressure reduction in patients with hypertension after receiving drug treatment, and may be a simple way to reduce cardiovascular morbidity and mortality cost-saving intermediaries [7]. Studies have shown that the salt intake of residents in northern China has reached an average of 11.2 grams per day, which is a decrease from 12.8 grams in the 1980s. The salt intake of residents in the South increased from an average of 8.8 grams per day in the 1980s to 10.2 grams today [8]. According to the "Dietary Guidelines for Chinese Residents", the daily salt intake of Chinese residents should not exceed 6 g [9]. This study selects Beijing, Shanghai, and Zhejiang, three large Chinese cities, which have a high frequency of Internet takeaway consumption. By analyzing the sodium content of takeaway food in these regions, the sodium content level in takeaway food was evaluated. Provide a basis for reducing the content of salt in takeaway food.

2. Materials and Methods

Collection and analysis of takeaway meals

For the purpose of this study, a takeaway meal was defined as food sold on an Internet platform, which was ready for immediate consumption. Regarding the Internet takeaway catering consumption data of local residents, select some takeaway restaurants in Beijing, Shanghai, and Hangzhou, and analyze the types of takeaway meals contained in the restaurants. This study collected a total of 4450 food items from 68 takeaway restaurants, including 30 in Beijing, 20 in Shang-

hai, and 18 in Hangzhou.

We collected various data of takeaway meals in randomly selected restaurants, including dish name, weight per serving, and weight of ingredients and accessories. According to the nature of takeaway meals and the types of main ingredients, takeaway meals were divided into two categories: Category 1: Chinese food, Western food, and Beverages; Category 2: Fried foods, spicy foods, meat dishes (meat, eggs, and aquatic products), vegetarian dishes (vegetables, soybeans and products), combined staple food, porridge, soup, and juices. According to the data in the “China Food Composition” (Volumes 1 and 2 of the Standard Edition), all ingredients in the takeaway food were calculated, and the sodium content in each serving and per 100 grams (edible portion) of the takeaway food was calculated respectively. The sodium content of raw materials and ingredients of takeaway meals that were not in the “China Food Composition” were replaced by the data of similar food.

Statistical analysis

The data were analysed using Excel tables and SPSS version 25, $p < 0.05$ was considered statistically significant, and results were shown as 95% confidence intervals. Due to non-normal distributions, data are expressed as medians with interquartile range (25th and 75th percentiles). The takeaway meals were classified into three groups according to their origin: 1) Chinese meals, 2) Western fast food, 3) Porridge. Salt levels in takeaway meals were compared with the China target of 6 g (Dietary guidelines for Chinese Residents, China, 2016).

3. Results

3.1. Distribution of Online Ordering Time

The online ordering time of Chinese residents in large cities is shown in **Table 1**. According to data from the takeaway platform, namely the Lazarus Network Technology (Shanghai) Co., Ltd., the takeaway meals ordering time was mainly concentrated on lunch, dinner, breakfast, afternoon tea, and night snack were relatively small.

3.2. Types of Takeaway Meal

In total, the takeaway meals of Beijing, Shanghai, and Hangzhou mainly focus on Chinese meals, followed by Western fast food with the fewest juices. The takeaway

Table 1. Time slot and quantity of takeaway consumer orders (%).

Region	Breakfast	Lunch	Afternoon tea	Dinner	Night snack	Total
Beijing	19 (0.8%)	1564 (67.3%)	13 (0.6%)	682 (29.3%)	46 (2.0%)	2324 (100%)
Shanghai	5 (0.2%)	1356 (42.2%)	132 (4.1%)	1667 (51.8%)	56 (1.7%)	3216 (100%)
Hangzhou	1 (0.1%)	747 (51.2%)	39 (2.7%)	624 (42.8%)	48 (3.3%)	1459 (100%)
Total	25 (0.4%)	3669 (52.4%)	184 (2.6%)	2973 (42.5%)	150 (2.1%)	7001 (100%)

meals of Beijing had the most orders for meat dishes, followed by porridge, Shanghai had the most orders for vegetarian dishes, followed by meat dishes, and Hangzhou had the largest order for combined staple foods, followed by fried foods.

3.3. Sodium Content of Takeaway Meals

The sodium content of takeaway meals in three large China cities was shown in **Table 2**. It can be seen that in Beijing the weight of per takeaway meal, the median sodium content per meal and per 100 g was 430 g, 1371.3 mg, and 322.6 mg, in Shanghai was 750 g, 340.1 mg, and 66.2 mg, in Hangzhou was 385 g, 1348.4 mg, and 432.2 mg.

The sodium content in different types of takeaway meals was shown in **Table 3**. It was shown that the sodium content of vegetarian vegetables in each region was significantly higher than that of meat vegetables, and all exceed the recommended values of Dietary guidelines for Chinese Residents, China, 2016. Except in Shanghai, the sodium content of Chinese and western foods in Beijing and Hangzhou were excessive. The sodium content of western food has significant differences in different regions, $p < 0.05$. There were significant differences in the sodium content of pasta and porridge in different regions, and the results were statistically significant. Pasta: $p < 0.05$; Porridge: $p < 0.001$.

4. Discussion

In this study, takeaway meals from Beijing, Shanghai, and Hangzhou were selected as the research object. A series of data about takeaway meals were collected to analyze whether the sodium content in takeaways exceeded the standard. Now more and more people choose takeout to solve the three meals. According to the "Report on China's Takeaway Industry Survey", the overall development of the Chinese takeout industry is good in the first three quarters of 2019. It is expected that the annual takeaway transaction volume will exceed 600 billion yuan [10]. This also shows that takeaways are becoming an increasingly important part of daily life, and the safety of takeaways should be guaranteed. It is discovered in this study that the sodium content of takeaway food in the above mentioned three large cities exceeds the standard, which results in people who choose takeaway food taking in excessive sodium and which in turn causes a series of health problems [11].

In the results of this study, the sodium content of takeaway meals in Beijing

Table 2. Quartiles of takeaway weight and sodium content by region.

Region	n	Weight g per meal	Sodium mg per meal	Sodium mg per 100g
Beijing	2035	430 (275 - 468)	1371.3 (890.3 - 2137.4)	322.6 (170.8 - 374.4)
Shanghai	1348	750 (185 - 750)	340.1 (259.8 - 942.2)	66.2 (34.7 - 486.0)
Hangzhou	1067	385 (235 - 450)	1348.4 (694.2 - 1541.6)	432.2 (336.9 - 523.6)

Table 3. The sodium content in different types of takeaway meals.

Types	n	Weight g per meal	Sodium Content (mg per meal)				Sodium Content (mg per 100 g)				P value
			Beijing	Shanghai	Hangzhou	Total	Beijing	Shanghai	Hangzhou	Total	
Bento	429	394 (226 - 746)	1371.3 (1159.0 - 1479.0)	1064.2 (1039.0 - 1089.4)	1523.0 (1418.4 - 1627.5)	1371.3 (1064.2 - 1479.0)	331.3 (274.5 - 369.8)	591.2 (577.2 - 605.2)	386.1 (349.4 - 422.7)	349.4 (283.6 - 448.5)	0.407
Pasta	120	278 (195 - 402)	1472.4 (1156.7 - 1622.8)	339.7 (190.3 - 845.5)	1424.4 (1399.5 - 1455.6)	1424.4 (1216.2 - 1470.0)	613.5 (482.0 - 676.2)	212.3 (46.8 - 582.6)	552.1 (395.8 - 659.2)	552.1 (389.5 - 660.5)	0.019
Porridge	555	580 (277 - 729)	890.3 (95.2 - 1029.1)	266.4 (97.2 - 418.4)	1171.2 (382.4 - 1355.8)	310.1 (158.9 - 830.7)	684.8 (98.7 - 859.2)	35.6 (13.0 - 55.8)	244 (136.2 - 609.5)	41.4 (21.2 - 204.7)	<0.001
Meat dishes	1502	255 (192 - 560)	1785.0 (152.9 - 2955.5)	1039.0 (339.7 - 1089.4)	1578.3 (738.7 - 5496.3)	1121.6 (544.8 - 2777.5)	325.8 (46.3 - 348.4)	577.2 (212.3 - 605.2)	573.0 (450.0 - 701.0)	443.8 (289.5 - 584.2)	0.014
Vegetarian dishes	1135	405 (238 - 743)	2161.4 (384.7 - 2864.6)	4079.3 (2564.3 - 5732.9)	4388.4 (2026.7 - 6750.0)	3120.4 (2060.4 - 6082.3)	1080.7 (463.6 - 3895.1)	589.8 (253.7 - 5428.6)	438.4 (426.7 - 450.0)	765.4 (432.5 - 5369.3)	0.003
Western fast food	360	302 (208 - 400)	1424.6 (1339.9 - 1479.0)	339.7 (221.7 - 1051.6)	1424.4 (1258 - 11500.4)	1419.4 (1284.5 - 1475.2)	331.3 (283.6 - 352.8)	212.3 (29.6 - 584.2)	445.5 (374.7 - 574.5)	365.8 (287.0 - 475.9)	0.044
Chinese fast food	349	373 (224 - 577)	1547.6 (1065.1 - 2420.6)	340.5 (190.3 - 1064.2)	1171.2 (720.0 - 2034.9)	1139.2 (380.3 - 2169.9)	357.5 (283.0 - 506.8)	45.4 (25.4 - 591.2)	480.0 (408.0 - 659.0)	417.4 (168.1 - 576.2)	0.595

and Hangzhou exceeded the standard. Among the three, bento, pasta, and porridge, porridge has the lowest sodium content which may benefit from the way it been cooked. In Hangzhou, the sodium content in both Chinese food and Western food exceeded the standard [12].

The intake of sodium in the human body was mainly through the daily diet, and the sodium content in the diet directly leads to the level of sodium intake in the human body. According to the analysis of the data, it was shown that the takeaway meals in three large China cities was mainly Chinese food, and the sodium content of Chinese food was higher than that of Western food [13]. The ordering period is mainly concentrated on lunch and dinner. In these two periods of time, people need to eat a lot to maintain the energy of the day required, while the sodium content per meal in Beijing and Hangzhou was 1371.3 mg and 1348.4 mg, respectively. Both exceeded the recommended maximum volume of 960 mg, in the three meals ratio. Obviously, the proportion of sodium content in takeaway food in Beijing and Hangzhou was too high. The sodium content of all types of takeaway food in three large China cities exceeded the standard. Long-term consumption may cause adverse effects on the body. Although the sodium content of takeaway meals in Shanghai was lower than the recommended value, in the analyzed data, the takeaway meals in Shanghai have less data and a part of the data comes from porridge, porridge is a low-salt food, which may lead to bias in the conclusion of the analyzed data. Among restaurants, in order to enhance the flavor of their dishes, some restaurants will increase the use of seasonings such as salt to make consumers feel that the dishes are delicious, thereby attracting more customers and increasing their sales. However, a low-salt diet is necessary from a health point of view, because excessive salt intake will increase the possibility of high blood pressure and other diseases [14].

This study also has some shortcomings. First, the collection of takeaway data was not comprehensive enough, and some types of takeaway meals were not involved. Secondly, this study was based on a takeaway meal, but considering that the actual situation is not that all takeaway meals were the same value, the analysis based on standard components may have errors.

According to a scientific research, a quarter less of salt intake effectively reduces death from heart disease caused by sodium [15]. However, there is a long way to go. Restaurant runners do not find a good reason to reduce salt in their food [16]. Diners need to be acknowledged more about the risks of overtaking salt to keep a healthy dietary habit [17]. Therefore, in order to ensure a reasonable intake of sodium and reduce diseases caused by excessive salt, food delivery companies in large China cities should control the content of salt in food to ensure that the content of sodium in food is below a certain recommended value [18].

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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