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Research report

Determination of salt content in hot takeaway meals in the United Kingdom ☆

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ABSTRACT

High sodium intake is associated with negative health outcomes, including an independent correlation with high blood pressure which increases the risk of cardiovascular disease. A high proportion of sodium intake in the UK is from processed and out of the home food; this includes takeaway food which is increasing in popularity. The aim of the present study was to evaluate salt levels in popular hot takeaway meals. A total of 411 samples of 23 different types of takeaway meals were analysed. Obtained results show the salt content in these kinds of foods is alarmingly high. Comparing medians (interquartile range) for different meal categories, Pizzas contained the highest salt content per portion (9.45 g (6.97–12.83)), followed by Chinese meals (8.07 g (5.47–10.99 g)), Kebabs (6.21 g (4.01–8.35)) and Indian meals (4.73 g (3.61–6.10)). In addition, significant differences in the salt content between meals within the same category were reported. To enable the consumer to meet the UK's target salt intake, a significant reduction in the salt content of hot takeaway meals should be considered.

Introduction

High sodium intake, which is mostly consumed as sodium chloride, has been reported to be associated with increased blood pressure in many epidemiological studies (Mohan & Campbell, 2009). In addition, excessive sodium consumption has been shown to be an independent risk factor of coronary heart disease and stroke (Nagata, Takatsuka, Shimizu, & Shimizu, 2004; Tuomilehto et al., 2001). Furthermore, high salt intake may also be associated with other adverse health conditions, including kidney stones, gastric cancer, asthma and osteoporosis (He & MacGregor, 2010a).

In the United Kingdom (UK), the Reference Nutrient Intake for sodium in adults is 1600 mg per day; this is the salt equivalent of 4 g per day (Scientific Advisory Committee on Nutrition, 2003). However, UK current targets are a reduction in average salt intake across the population to 6 g per day per adult (Food Standards Agency, UK, 2009). This target of 6 g per day by 2015 is deemed to be achievable, rather than ideal and further reduction targets have been set to 3 g per day by 2025 (National Institute for Health and Clinical Excellence, 2010).

Following the 2003 report published by the Scientific Advisory Committee on Nutrition (SACN) on Salt and Health, the UK Food Standards Agency initiated a major salt campaign targeting the food industry (Food Standards Agency, UK, 2009). Recent evaluations of this campaign show a reduction of average salt intake from 9.5 to 8.6 g per day, an approximate 10% reduction (Shankar, Brambila-Macias, Traill, Mazzocchi, & Capacci; Wyness, Butriss, & Stanner, 2011). While the UK has made progress and raised consumer awareness, further reductions to reach the UK target of 6 g per day are warranted (National Institute for Health and Clinical Excellence, 2010).

It seems that a crucial factor for development of a proper strategy to reduce the salt intake in the UK population is identification of dietary sodium sources. It has been estimated that in UK diets about 80% of daily sodium intake comes from processed food and the catering industry, including takeaway foods (Gilbert & Heiser, 2005; He & MacGregor, 2010b; Henderson et al., 2003). Eating out of home statistics show 42% of surveyed British consumers ate takeaway foods once a month or less and 32% two or three times a month (Neilsen, 2005). Similarly, the Food Standards Agency, UK (2007) reported that 22% of Britons purchase foods from takeaway outlets at least once a week and 58% a few times a month.

Foods prepared outside the home are generally considered to be higher in salt than meals cooked at home, and it has been estimated that approximately 15% of the UK's salt intake is from foods eaten outside the home (Guthrie, Lin, & Frazao, 2002; He & MacGregor, 2010a; He & MacGregor, 2010b). However, the majority of previous studies have focused on fast or processed food (products bought from fast food chain outlets or supermarkets) only, not taking into account other out of home meal options such

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as takeaway food (Ni Mhurchu et al., 2011; Webster, Dunford, & Neal, 2010). It has been reported that ethnic cuisine, especially Chinese and Indian, is one of the most popular types of takeaway foods in the UK (Mintel Report, 2009). Furthermore, sodium intake in Northeast Asia is extremely high and ranges from 4651 to 6267 mg per day (11.6–15.7 g salt per day) depending upon region, which reflects the traditional cooking practices such as using monosodium glutamate, pickles, soy sauce and other sauces which contain sodium (Anderson, Appel, Pkuda, Chan, et al., 2010; Brown, Tzoulaki, Candeias, & Elliott, 2009). It may be expected that meals prepared in oriental takeaway outlets in the UK also contain a high level of sodium.

Taking into account the high prevalence of takeaway food consumption and a lack of information regarding nutritional quality of takeaway meals, there is an urgent need to determine the nutritional content of takeaway dishes. Therefore, the aim of the present study was to evaluate salt levels in popular hot takeaway meals from small, independent outlets in the Merseyside and Wirral region, UK.

Materials and methods

Collection and analyses of takeaway meals

For the purpose of this study, a takeaway meal was defined as food purchased from out of home food outlets or ordered for home delivery, which was ready for immediate consumption and not eaten in outlets. Takeaway meal samples were collected between December 2005 and January 2006 from small, independent takeaway establishments (Indian, Chinese, Kebab Shop, Pizza Shops and Fish & Chips Shops) within the Liverpool boundary by Liverpool City Council, Trading Standards and between July and September 2008 in Wirral Borough by Wirral Metropolitan Borough Council, Trading Standards Division. As part of the Trading Standards ongoing project work to investigate the nutritional quality of foods in their area, samples of takeaway food were collected from 215 outlets (140 and 75 from Wirral and Liverpool City Councils respectively). This is an approximate 50% and 20% representation of takeaway outlets from Wirral and Liverpool respectively (Evans, 2011; Liverpool City Council, 2011 – spoken data). A total of 411 samples of 23 different types of takeaway meals were purchased, with permission recently granted to the authors to use the data for publication. All meals were purchased once from each selected outlet.

All samples were frozen immediately after collection and stored frozen at −18 °C until analysis. Sodium concentration was determined by microwave acid (HNO_3) digestion followed by inductively coupled plasma optical emission spectrometry (ICP-OES) (Kira, Maio, & Maihara, 2004). Salt content was calculated from sodium concentration by multiplying by 2.542. The analysis was performed at Eurofins Laboratories Ltd., Chester, UK and Eurofins Laboratories Ltd., Birkenhead, Wirral, UK for Wirral and Liverpool Trading Standards respectively.

Statistical analysis

The data were analysed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA) and $p < 0.05$ was considered statistically significant. The adjusted significance level of 0.004 was used when multiple comparisons were made. The normality of distribution of analyzed variables was checked with histograms, Kolmogorov–Smirnov and Shapiro–Wilk tests. Due to non-normal distributions, data are expressed as medians with interquartile range (25th and 75th percentiles). The takeaway meals were classified into five groups according to their origin: (1) Chinese meals, (2) Indian meals, (3) English meals, (4) Pizzas, (5) Kebabs. Differences in salt levels between meal categories and between different kinds of meals in the same category were tested with the use of the Kruskal–Wallis test and the Mann–Whitney *U*-Test. Salt levels in takeaway meals were compared with the UK target of 6 g (Food Standards agency, UK, 2009).

Results

The median salt content in takeaway meal categories is shown in Table 1. Pizzas were characterised by the highest salt content per portion (9.45 g (6.97–12.83), followed by Chinese meals (8.07 g (5.47–10.99 g)), Kebabs (6.21 g (4.01–8.35)) and Indian meals (4.73 g (3.61–6.10)).

Chinese meals had the highest salt density (7.4 g/1000 kcal (5.49–10.76)) amongst all analysed takeaway meal categories ($p < 0.001$). The salt content in English takeaway foods was significantly lower ($p < 0.001$) than the salt content in the other categories, and this was observed for comparisons made per 100 g, per portion and per 1000 kcal.

In addition, significant differences in the salt content between meals in the same category were reported (Table 2) emphasising the difference between the lowest and highest salt content between meals. Results showed, an overall significant difference within Chinese, Indian, English and Kebab meals with amount of salt per meal, salt per 1000 kcal and comparison with Food Standards Agency, UK, (2006) target ($p < 0.05$); Chinese, Indian and English meals also showed significant differences between meals with salt per 100 g ($p < 0.05$), Chinese, Indian and Kebab meals

Table 1
Salt content in analyzed take away meals by meal category.

Meal category*	Weight† g per meal	Salt† g per 100 g	Salt† g per meal	Salt† g per 1000 kcal	Salt† %FSA‡
Chinese ($n = 92$)	852 (728–947)[c,d,e]	0.99 (0.70–1.37)[b,c,d]	8.07 (5.47–10.99)[b,c]	7.40 (5.49–10.76)[b,c,d]	134 (91–183)[b,c]
Indian ($n = 95$)	803 (731–864)[d,e]	0.61 (0.46–0.79)[a,c,d,e]	4.73 (3.61–6.10)[a,c,d]	3.61 (2.59–4.85)[a,c,d,e]	79 (60–102)[a,c,d]
English ($n = 95$)	748 (653–837)[a,e]	0.41 (0.30–0.59)[a,b,d,e]	3.01 (2.23–4.48)[a,b,d,e]	1.86 (1.33–2.79)[a,b,d,e]	50 (37–75)[a,b,d,e]
Pizzas ($n = 54$)	676 (559–781)[a,b,e]	1.47 (1.17–1.70)[a,b,c,e]	9.45 (6.97–12.83)[b,c,e]	5.28 (4.04–6.08)[a,b,c]	157 (116–214)[b,c]
Kebabs ($n = 75$)	505 (436–711)[a,b,c,d]	1.09 (0.89–1.40)[b,c,d]	6.21 (4.01–8.35)[c,d]	5.08 (3.98–7.99)[a,b,c]	103 (67–139)[c,d]

n = total number of meals. *Data presented as median (interquartile range).
Significant difference ($p < 0.001$; Mann–Whitney's test) of paired comparison of meal categories,
[a] Chinese.
[b] Indian.
[c] English.
[d] Pizzas.
[e] Kebabs.
† Significant difference between all meal categories ($p < 0.001$; Kruskal–Wallis test).
‡ FSA target, 6 g salt per day (Food Standards Agency, UK, 2009).