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An exploration and comparison of food and drink availability in homes in a sample family of White and Pakistani origin within the UK

Abstract

Objective: To explore home and drink food availability in UK homes. Knowledge of the types and quantities of foods and drinks available in family homes supports the development of targeted intervention obesity prevention or management programmes, or for overall diet improvement. In the UK, contemporary data on foods that are available within family homes are lacking.

Design: An exploratory study using researcher conducted home food availability inventories, measuring all foods and drinks within the categories of fruits, vegetables, snack foods and beverages.

Setting: Bradford, a town in the North of the UK

Subjects: Opportunistic sample of mixed ethnicity families with infants approximately 18 months old from the Born in Bradford birth cohort.

Results: All homes had at least 1 type of fruit, vegetable and snack available. Fresh fruits commonly available were oranges, apples, satsumas and grapes. Commonly available fresh vegetables included potatoes, cucumber, tomatoes and carrots. The single greatest non-fresh fruit available in homes was raisins. Non-fresh vegetables contributing the most were frozen mixed vegetables, tinned tomatoes and tinned peas. Ethnic differences were found for the availability of fresh fruits and sugar sweetened beverages, which were both found in higher amounts in Pakistani homes compared to White homes.

Conclusions: These data contribute to international data on availability and provide an insight into food availability within family homes in the UK. They have also supported a needs assessment of the development of a culturally specific obesity prevention intervention in which fruits and vegetables and sugar-sweetened beverages are targeted.

Background

There has been increasing interest in the role that food availability in the home has on food consumption and obesity [1-7]. Such information has the potential to increase understanding of the causes of energy over-consumption and provide direction to help create effective obesity prevention interventions. However, research in this area is limited by the methods used to assess food availability. Much of the literature uses data collected using food checklists; a quick and relatively inexpensive method to assess the presence or absence of a predefined list of selected foods using participant self-report. Data collected using this method is limited to the items that have been pre-defined and cannot therefore, capture information on ethnically diverse habits or unexpected patterns. An alternative method to self-report checklists is to conduct researcher administered inventories of the home food environment. These involve researchers going in to participants homes and recording all foods and drinks available (fully exhaustive inventories) or all foods and drinks available within pre-defined categories (partially exhaustive inventories). They are not limited to recording only foods that the researchers have previously assumed to be available in a pre-defined list. However, few attempts have been made to collect this kind of data owing to issues related to the feasibility of collection and analysis.

A review of methods to collect home food availability data in 2006 [8], identified just three other published studies that had used fully or partially exhaustive inventories since 1975. Since then, some investigators have used this approach, [9-12] however, the majority of work has continued to focus on data collection using pre-defined checklists [5, 6, 13]. This work has so far, been dominated by the USA, and indicates that the availability of foods is generally related to consumption in infants and children [5, 14-16] and weight status [2, 5, 6] though findings are somewhat equivocal, likely due to the methodologies employed.

To our knowledge, there are no published studies describing home food availability, collected using a researcher conducted approach within populations in the UK. We aimed to explore the home food environment as part of an objective to develop a culturally appropriate obesity prevention intervention within the Born in Bradford-1000 Programme of research [17]. Since no other data of this kind have been collected in a mixed-ethnic sample in the UK (and thus, no appropriate checklist was available), open inventories of foods and drinks within pre-specified categories of fruits, vegetables, snack foods and drinks were conducted by researchers within participant homes using a well-defined protocol already tested by the authors as part of their work in the US [10, 11].

This study reports our findings from the inventories to explore which foods were available in the homes of a sample of families of mixed ethnicity when their infants were approximately 18 months old and to identify any differences in availability between White British and Pakistani homes.

Experimental Methods

Sample: Participants were opportunistically recruited from Born in Bradford 1000 (BiB1000); a nested cohort within 'Born in Bradford' (BiB). BiB is a longitudinal multi-ethnic birth cohort aiming to examine environmental, psychological and genetic factors that impact on health and development perinatally, during childhood and subsequent adult life, and those that influence their parents' health and wellbeing. All mothers booked in for a delivery of their baby in Bradford Royal infirmary from March 2007 to December 2010 were invited to take part in the research during their routine 26-28 week glucose tolerance test. A total of 12,453 pregnant women enrolled who subsequently gave birth to 13,776 babies. A full account of the methods is published elsewhere [18]. All mothers recruited to the main BiB cohort study between August 2008 and March 2009 (and who had completed the baseline questionnaire) were approached to take part in 'BiB 1000' and a total of 1,736 agreed. One hundred participants were then drawn opportunistically from the BiB 1000 cohort to take part in the current food availability study during the 18 month BiB 1000 assessment in which all approached agreed to take part. Due to the exploratory nature of the research, a formal sample size calculation was not performed. Inventory data from 100 homes was chosen as this was considered comparable to previous research [8]; within calculations to detect small to moderate group differences [19]; and due to issues of feasibility.

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Bradford Research Ethics Committee; (07/H1302/112). Written or verbal (for mothers unable to read and/or speak English) informed consent was obtained from all participants. Verbal consent was witnessed and formally recorded.

Data collection

Researcher conducted food availability inventories: Researcher conducted inventories were conducted in 100 homes when infants were approximately 18 months old. Data collection method, staff training and quality assurance were conducted using a standardised protocol using well-established methodologies from previous research [10, 11]. Participants were told that researchers

would be visiting their homes and that they would need access to all places in their homes were foods were stored. No incentives were provided. Researchers measured the availability (yes/no), quantity and size of all foods from all food storage areas in participants homes within the higher categories of fruit (with sub-categories: fresh, tinned, dried and frozen), vegetables (with sub-categories fresh, tinned and frozen), snack foods (with sub-categories: crisps/tortillas, biscuits, salted nuts, chocolate, sweets, cakes and ice-cream) and beverages (with sub-categories sugar-sweetened and sugar-free). These categories were chosen because; (1) they are often the target of obesity interventions; (2) there is some evidence that their intake is related to obesity in children [20, 21]; (3) and/or literature indicates a relationship between availability in the home and either diet [3, 22] or obesity [6, 23]. Our previous studies also indicated that these items could be reliably and validly collected [10, 11]. Within each sub-category, open 'exhaustive' data were collected rather than using a pre-defined checklist of items (i.e. details on all of the available foods and drinks available were recorded). This method was used as this was an exploratory study with no a-priori data to suggest the nature or type of foods which were present in the homes of this sample. For fresh produce, researchers recorded the number of whole pieces (e.g. apples) or the number of handfuls (e.g. grapes). For non-fresh items, researchers recorded the number of foods and drinks within pre-specified size ranges of small, medium and large units. These were defined by weight and were based on data previously collected [10] plus the actual package sizes available to purchase in the UK. For example, tinned vegetables that weighed less than 250g were defined as small; those weighing between 250-450g were considered to be medium and any weighing more than 450g were defined as large.

Other measures pertinent to these analyses: The majority of demographic data were obtained at recruitment including (26-28 weeks of pregnancy): household structure; marital status; residence type, educational status and ethnicity. Maternal smoking behaviour was ascertained at this point to determine whether participants were currently smoking during pregnancy by self-report. All questionnaires were transliterated into Urdu and Mirpuri language, as the majority of Pakistani populations residing in Bradford are of Mirpuri origin and one of the official languages of Pakistan is Urdu. The process of transliteration involved translation, back-translation and several rounds of piloting by bilingual and monolingual groups in collaboration with local experts in Bradford (Bradford Talking Media). Since Mirpuri does not have a written form, transliterations were made available for administration by bilingual study administrators. There were no language restrictions for eligibility into this study and bilingual staff were trained to collect data from homes in which the parents were unable to speak English.

Data cleaning

Open, exhaustive data from 836 food and drink items that were identified within the homes of this sample were grouped to 215 individual food and drink types by a nutritionist (MB). For example, a 'packet of chocolate digestive biscuits' was grouped as 'biscuits with chocolate topping' within the sub-category of 'Biscuits/Sweet snacks' (under the higher category of snacks). Similarly, all crisps that were made with corn, were assigned to the group of 'tortillas' within 'Crisps/Savoury snacks' and 'red grapes' and 'green grapes' were grouped as 'grapes' within the sub-category of fresh fruits (under the higher category of fruit). For the purpose of these analyses, 1 handful of fresh produce represented 1 serving. Other fresh produce that were recorded as whole units (e.g. melons) were converted to the number of servings by a nutritionist (MB) using standards provided by http://nutritiondata.self.com/facts and USDA http://ndb.nal.usda.gov/ndb/foods. Scores were generated for the analysis of non-fresh produce based on the number of each food item within pre-defined sizes. Small items were assigned a score of 1 per item; medium, a score of 2; and large, a score of 3 per item. These can be viewed as equivalent to the total number of small sized items. For example, a score of 4 for tinned vegetables is equivalent to having 4 small tins of vegetables in the home, even though it may have actually have been available as 1 large tin (score of 3) plus 1 small tin (score of 1).

Statistical analysis

Descriptive data (with 95% confidence intervals) presenting the types and quantities of each type of food and drink are provided overall, and stratified by ethnicity. General linear regression models (PROC GLM) were then used to compare mean food and drink availability levels between homes with White British and Pakistani groups only (owing to insufficient numbers in the Other ethnicity category). The LSMEANS option was used to estimate the adjusted mean availability for both ethnic groups. Regression model 1 was unadjusted. Model 2 was adjusted for the total number of people reported to live in each household (un-weighted) as this has been shown to impact on home food availability previously [11, 19] and differs between the White and Pakistani families in this cohort [17]. Full covariate adjustment was not deemed necessary here however, given the exploratory nature of the research. Data were analyzed using SAS version 9.2 (SAS Institute, Cary, NC).

Results

Sample

Of the 100 participants that agreed to take part, full food availability data were available from 97 homes (whole categories of foods/drinks were missing from 3 participant homes). There were similar numbers of White British (n=46, 47%) and Pakistani (n=41, 42%) of mothers, with less mothers from a combined ethnicity defined as 'other' category (n=10, 11%). Data from all 3 ethnic categories are provided for the descriptive, exploratory findings; however, only data from White British and Pakistani mothers were included in analyses comparing ethnic differences in food availability. Fifty one percent of mothers were normal weight at the booking appointment; 29% were overweight (BMI $\geq$25kg/m^2), and 17% were obese (BMI $\geq$30kg/m^2).

Presence/absence of foods/drinks in the home

Table 1 shows the frequency of homes that had at least 1 item of food or drink available within higher food categories. All homes had at least 1 type of fruit, at least 1 type of vegetable and at least 1 type of snack available. The majority of homes had at least 1 type of fresh fruit available and this was similar in all ethnicities. Availability of other forms of fruit (i.e. canned, dried and frozen) was less popular; however, around half of all homes had at least 1 type of canned or dried fruit. Availability of crisps/tortillas was also popular, with 80% and 90% available in Pakistani and White British homes respectively. Over 80% of White British and Pakistani homes also had at least 1 type of sweet biscuit available to them. Approximately 65% of White homes had at least 1 type of chocolate available; whereas less than 30% of Pakistani homes had chocolate available. Similarly, there were a higher percentage of cakes and sweets in White homes. Approximately half of all homes had at least 1 type of ice-cream available and this was similar across ethnicities (albeit somewhat lower in homes of 'Other' ethnicities). Eighty five percent of Pakistani homes had sweetened beverages available, compared to 60% of White homes and 50% of homes of 'Other' ethnicity. Conversely, the proportion of homes with unsweetened (or 'diet') drinks available to them was lower in the Pakistani homes (25%) compared to White homes (30%).

Availability of individual foods

Figures 1-4 show the average availability of individual foods within the categories of fruit and vegetables by ethnicity. Fresh fruit commonly available in family homes were oranges, apples, satsumas and grapes. Commonly available fresh vegetables included potatoes, cucumber, tomatoes and carrots. The single greatest non-fresh fruit available in homes was raisins. Within the category of non-fresh vegetables, foods contributing the most were frozen mixed vegetables, tinned tomatoes and tinned peas. Crisps were the most commonly available type of snack food across all ethnic groups (data not shown).

198

199 Ethnic comparisons

200 Table 2 compares the availability of foods and drinks in homes of White British and Pakistani
201 families. These analyses indicate that Pakistani homes had a greater availability of fresh fruits and
202 sweetened drinks compared to White British homes; with more than twice the amount of these
203 items available, even after adjustment for household size. Eighty five percent of Pakistani homes
204 had sweetened beverages available, compared to 60% of White homes. Conversely, the proportion
205 of homes with unsweetened (or 'diet') drinks available to them was lowest in the Pakistani homes
206 (25%) compared to White (31.1%) and 'Other' ethnicity (78%) homes. Availability of sugar-
207 sweetened beverages in Pakistani homes was equivalent to approximately 16 cans of fizzy drink per
208 household on average, compared to an average of 6 in White British homes.

209

210 **Discussion**

211 Findings from this exploratory study showed that all homes had some form of fruit and some form
212 of vegetable available in them. More homes had fresh fruits and vegetables available compared to
213 canned, frozen and dried fruits and vegetables. At least one type of snack food was also available
214 in all of homes in which inventories were conducted. Of these, crisps and biscuits were most likely
215 to be available. Further exploration of the availability of individual foods showed that apples were
216 available in the greatest quantity, with an average of between 3-8 apples available in each home.
217 The vegetable that was available in the greatest quantity was potatoes, with an average of
218 approximately 8-12 servings available in each home. Within non-fresh items, items that were
219 available in the greatest quantities included raisins, frozen mixed vegetables and tinned tomatoes.
220 Ethnic differences between homes of White British and Pakistani participants were found for the
221 availability of fresh fruits and sugar sweetened beverages, which were both found in higher
222 amounts in Pakistani homes, even after adjustment for household size.

223

224 It is difficult to compare these findings to those of existing data, since there are currently no other
225 comparable contemporary data on foods that are actually available within families homes in the
226 UK. The UK Office of National Statistics collects self-reported availability by asking families to
227 report availability via purchasing habits. These data have been compared to data from other
228 countries, and indicate that UK households tend to have higher availability of cereals, but lower
229 availability of fresh fruits and vegetables than most of the 10 other countries. However,
230 comparisons do not include availability of beverages and they do not indicate differences by
231 participant characteristics [(24)]. A recent study in the US indicates some differences in home food

availability by ethnicity, in which similar differences are reported, with a greater availability of fresh vegetables and soft-drinks in the homes of Hispanic participant's compared to African American homes [25]. However, these data were collected by self-report. Variability in the methods employed in these studies may well account for inconsistencies in findings. Studies measured using open, researcher conducted inventories that have been published the last decade (i.e. since the last systematic review of home food availability measures [8]) indicate some differences by weight status [23] and provide evidence of a relationship between availability and dietary intake [26]. These provide support for the use of such methods in leading towards interventions to encourage optimising the healthfulness of foods and drink available; however, they do not explore whether findings were dependent on ethnicity and both were conducted in the US.

The present study indicates that availability of sugar-sweetened beverages (predominantly fizzy drinks) was high in family homes, especially in Pakistani homes, with the equivalent of an average of 16 cans per household and 85% having at least 1 sweetened drink available. Though evidence is not always clear, there is general support that consumption of sugar-sweetened beverages contributes significantly to obesity [27-29]. Data from randomised controlled trials support this work, with interventions targeting a reduction in sugar-sweetened beverages showing significant reductions in BMI compared to control groups [30, 31]. Further, previous work indicates that this may also be linked to a greater odds of families consuming fast foods as part of their weekly family meals [32]. Some minority ethnic groups in the UK, including those of Pakistani origin, are more likely to experience poorer health outcomes, such as cardiovascular disease and type II diabetes, compared with the White British population. The etiology of this is likely to be multi-faceted, including impact of acculturation, genetic predisposition and access/use of health care, which are likely to impact on diet and other health behaviours. Data from a UK sample of mixed ethnicity showed that Pakistani boys (11-13 years) in particular were more likely to consume 'fizzy' drinks daily compared to White British boys. These data also suggest that Pakistani boys are less likely to meet targets for consuming 5-a-day for fruits and vegetables [33]. These availability data show that homes with participants of Pakistani origin had a higher availability of fresh fruits compared to White British homes. However, they do not provide details of the patterns of consumption by individual family members. Alarmingly, other data (not shown) from the Born in Bradford 1000 study shows a higher consumption of sugar sweetened beverages in 18 month old infants born to Pakistani mothers compared to those born to White British parents after adjusting for mothers age and parental education (OR 2.03 95% CI 1.53, 2.70). Consumption of water, however, was similar between infants of different ethnicity (OR 1.09; 95% CI 0.84, 1.42).

Seasonality, in terms of the month in which inventories were completed may have an impact on the foods available. Inventories were conducted every month over the period of one year, but there were fewer conducted during August and December due to staffing issues (coinciding with Ramadan and Christmas holidays). The influence of seasonality was considered by re-running analysis with adjustment for the month of data collection and did not change the findings; Pakistani homes had more fresh fruit and sugar-sweetened beverages than White British homes and no other foods were found to differ significantly between ethnicities (data not shown).

The impact of other variables such as socio-economic status on home food availability and their influence on the relationship between food availability and outcomes such as diet and obesity was not the focus of the current study. However, comparisons of food availability by maternal weight status did not identify any clear relationships (data not shown). Correlations with child BMI were not assessed in the 18 month old infants but it is possible that the influence of home food availability on diet and BMI is greater in young children compared to adults, who are more likely to eat away from home [26]. Studies examining the relationship between home food availability and diet or BMI in children report inconsistent findings with variability in the strength of this relationship [5-7, 32, 34],although there is general agreement that the relationship is positive (especially for intake of vegetables). Few studies report the impact of socio-economic status. Ding et al., (2012)[7] found an influence of household income, with more 'healthy' foods reported in homes with higher incomes. However, this study did not observe a reverse relationship with unhealthy foods. Clearly, more work is required to un-piece the explanatory factors and mediators that impact on the relationship between foods in the home and diet and health outcomes such as obesity.

Although this exploratory study has a relatively small sample size, it is comparable (if not greater) to other studies that have collected home food availability data using direct observations by researchers. Previous work indicates that 63 households would be required per comparison group to detect a moderate different of 50% of 1 SD and only 28 households per group would be needed to detect a difference as large as 75% of 1 SD (based on one measurement per household) [19]. It is possible that other ethnic differences in availability might have been identified with a greater sample size. However, as there are currently no other studies that have measured, in-depth, the types of foods and drinks within White British and Pakistani homes in the UK, the aim of this study was more exploratory in order to inform potential targets for the development of future interventions. It could also be argued that, due to the transitionary nature of foods in the home (i.e. changing via purchasing and consumption), more than one visit would be required for accurate

estimates of availability. Previous evidence actually suggests that the within household variability of food availability is considerably lower than the between household variability and that addition of multiple visits does not appreciably impact on estimates [19]. A further argument may be that participants changed their shopping habits in advance of the inventories due to social desirability. Following extensive data collection in a different cohort, this was found to be unlikely [11] and when the participants were fully aware of the procedures (i.e. after they had already had completed an inventory), no efforts were made to change the environment for subsequent inventories, as within house variability was very low [19].

Knowledge of the types and quantities of foods and drinks available in family homes supports the development of targeted intervention programmes wishing to improve the foods available within family homes for obesity prevention or management, or for overall diet improvement. This has the ability to identify population subgroups at nutritional risk and implement appropriate health promotion and disease prevention programmes. Descriptive data shown here indicates that potential targets might be: (a) promoting the variety, availability and quantity of all types of fruits and vegetables (e.g. encouraging purchase of tinned/frozen fruit in addition to fresh fruit); (b) reducing purchase of crisps and biscuits (which were both available in over 80% of homes); and (c) discouraging purchase of sweetened beverages, especially within homes of Pakistani mothers (in which 85% of homes had at least one type of sweetened beverage available). This information has been fed into a needs assessment stage of an intervention mapping process in which a culturally appropriate obesity prevention intervention has been developed in Bradford (a city in the North of the UK).

Figure legends

Figure 1. Availability of individual fresh fruits

Figure 2. Availability of individual fresh vegetables

Figure 3. Availability of individual non-fresh fruits

Figure 4. Availability of individual non-fresh vegetables

Supplementary material

Table S1. Participant demographics

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