Research Articles

Acculturation, weight status, and eating habits among Chinese-American preschool children and their primary caregivers: a pilot study

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Abstract

This study investigated acculturation, eating habits, and weight status among 53 Chinese-American children and their primary caregivers. Caregivers’ mean acculturation score was 2.1, indicating low acculturation. Caregivers’ mean body mass index (BMI) was 23.3; 21% were overweight (BMI ≥ 25). Children’s mean BMI was 16.6; 17% were overweight (BMI ≥ 95th percentile). The food groups most commonly consumed at the child care center were dairy (15%), mixed dishes (15%), fruits (13%), 100% fruit juice (13%), and vegetables (11%). Of the food groups consumed at home, 43% reflected Chinese food, 26% reflected American food, and 31% reflected food that were shared by both cultures. Of the Chinese food, 26% were mixed dishes, 23% were bread, 16% were vegetables, 11% were meat, and 11% were soup. For American food consumed at home, 19% were desserts, 14% were sweetened beverages, and 11% were bread. Understanding acculturation, eating habits, and weight status of Chinese-American families is critical for designing and monitoring nutrition programs for this understudied population.

Keywords: Child nutrition; Chinese Americans; Weight status; BMI

1. Introduction

The Healthy People 2010 goals target risk factors for disease in special populations [1]. Chinese Americans are among the most rapidly growing ethnic groups in the United States [2-4]. Houston, Texas, alone, has more than 120,000 Chinese-American residents [5].

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Studies on eating behaviors among Chinese immigrants to the United States have shown that, with acculturation, they have consumed a more Westernized diet (increased fat and cholesterol and less fiber than their traditional diet) and that this acculturated diet has been associated with a higher prevalence of diet-related chronic diseases including coronary heart disease, stroke, and some cancers [6-10]. Furthermore, acculturation-related changes in eating behaviors may be associated with the increasing prevalence of obesity and obesity-related diseases such as type 2 diabetes and some cancers, observed among Chinese Americans [11,12]. Most of these studies have focused on college students and adults [6,13-16].

Overweight is an increasing public health problem among children in the United States [17-21]. Between 1976 and 1994, the percentage of overweight 2- to 5-year-old children had increased from 5.8% to 10% [22]. However, at this time, we do not know the prevalence of overweight from a comparative national survey of Chinese-American preschool-aged children.

Parallel with childhood overweight, the percentage of overweight and obese adults in the United States has increased markedly in recent decades [23,24]. Findings from the most recent national survey, the National Health Examination Survey 1999, indicated that an estimated 61% of American adults are either overweight (body mass index [BMI], 25-29.9 kg/m²) or obese (BMI ≥ 30 kg/m²), with the prevalence of obesity nearly doubling since 1980 (15% to 27%) [24,25]. There is a lack of comparative national data on obesity status among adult Chinese Americans [26,27]. However, Klatsky and Armstrong [28], in a cross-sectional study of more than 13,000 adult Asian Americans (~6000 Chinese) who volunteered for an examination at a northern California prepaid health plan, found that 27% of the Chinese-American men and 13% of the Chinese-American women were overweight (BMI ≥ 25).

Because eating habits and preferences are learned early in life [29-31], research is needed to understand factors that influence their development. Thus, the preschool period is of particular interest. Although there is a substantial body of literature on influences on dietary behaviors among preschool children of various ethnic and racial backgrounds [32-34], very little is known about Chinese Americans. Additional studies are needed to better understand the health status and lifestyle of this understudied population [35-37]. The goal of this pilot study was to gather preliminary data on the level of acculturation, eating habits, and weight status among Chinese-American preschool children and their primary caregivers. These preliminary data will provide the basis for a much larger epidemiological study assessing the health status and lifestyle of Chinese-American families living in Houston, Texas.

2. Methods and materials

2.1. Subjects

Participants were 53 Chinese-American children (27 boys and 26 girls) aged 3 to 5 years (mean age, 4.2 years; range, 3.0-5.8 years) and their primary caregivers (defined as the individuals who prepared most of the meals for the children; n = 49). Four of the caregivers had 2 age-appropriate children in the study. Primary caregivers, who had to be Chinese
American, included 40 women and 9 men (78% mothers, 4% grandmothers, 18% fathers) with a mean age of 38 years (range, 31-64 years). The study children were selected from 2 child care centers (50%-75% Chinese American) in Houston, Texas. The primary caregivers were recruited personally through a number of techniques (eg, distributing flyers and making presentations at parent meetings) by the research staff, which included individuals bilingual in Cantonese English and Mandarin English. We received approval from the Human Subjects Review Committee of the Baylor College of Medicine. Signed informed consent was obtained from all caregivers.

2.2. Acculturation measurement

Each primary caregiver’s level of acculturation was assessed using the Suinn-Lew Asian Self-Identify Acculturation Scale (SL-ASIA) [38]. This questionnaire has been used in previous studies with Chinese Americans and has good reliability and validity (Cronbach’s \( \alpha = 0.72-0.91 \)) [39-41]. The survey questions were translated into simplified and traditional Chinese, back translated to ensure lexical equivalence, reconciled, and pretested [6].

The Suinn-Lew scale measures 6 dimensions: language, identity, friendship choices, behavior, geographic history, and attitudes [38]. The instrument consisted of 21 items, with a 5-point Likert-type scale of 1 to 5, which were then summed and divided by 21 for a final score of 1 to 5 (1 = low acculturation or high Asian identification; 3 = bicultural; and 5 = high acculturation or high Western identification) [38].

2.3. Anthropometry

The height and weight for each child/primary caregiver pair were collected using standardized protocols. Height was measured without shoes and in light clothing using a portable stadiometer and recorded to the nearest 0.1 cm. Weight was measured on an electronic scale to the nearest 0.1 lb and converted to kilograms.

The height and weight for each pair were measured in duplicate and the average was used to calculate the BMI (weight/height^2) used to classify overweight status among the children and adults. For children, cutoff criteria based on the age- and sex-specific 2000 Centers for Disease Control and Prevention (CDC) BMI reference standards were used [42]. Although the CDC reference standards were based on nationally representative US population data (which included few Asian-American youths), expert committees and the World Health Organization (WHO) have recommended the CDC growth charts for international comparisons [42]. Children with BMI values from the 85th to the 95th percentile were categorized as at risk of being overweight. At the 95th percentile and above, children were classified as overweight [43-45]. Adult BMI was categorized as overweight (25.0 \( \geq \) BMI < 30.0 kg/m^2) or obese (BMI \( \geq \) 30 kg/m^2) according to the National Institute of Health (NIH) [46] and the current WHO reference standards [45,47].

2.4. Dietary methodology

Two 24-hour intakes were collected on each study child, resulting in 106 records. The method used has been shown to be valid for assessing short-term intakes of preschool children [48-51]. The 24-hour intake protocol used for the current study was a combination
of: (1) direct observation of the children as they ate their meals (breakfast and lunch) and afternoon snack to determine amounts of food and beverages consumed by the children at the child care center merged with (2) caregiver reports of food and beverages consumed by their preschool child outside the center, including time and place of consumption, on the same day [52,53]. Standardized protocols were followed for quality control. For example, a product identification notebook was used to stimulate recall of commonly forgotten food and beverages.

Observers estimated the amount of food and beverages consumed at the child care center by recording the total amount of each food served as well as the weighed amount of food lost to spillage or waste [52,53]. Three individuals were extensively trained on observations and collecting food record data for 1 month before the study at a child care center not used in the study. Interrater reliability was established at 80% to 90%.

Study staff members trained each primary caregiver on how to record portion sizes for all food and beverages consumed by their preschool child using 2-dimensional visual models [54]. For all recipes, a recipe documentation form was also completed. Caregivers were requested to provide information on food with enough accuracy that another individual could purchase a similar food at a food market or a recipe could be duplicated. The staff members reviewed the food records upon return and resolved discrepancies and filled in missing information such as product brand names or food preparation method. The 24-hour intakes were completed on weekdays because observations could only be conducted when the center was open and bilingual research staff members were available to review food records returned the next day.

Table 1
Food group descriptions used in the study of Chinese-American preschool children (n = 53)

<table>
<thead>
<tr>
<th>Food group</th>
<th>Examples of food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>Muffins, bread (including steamed), biscuits, toast, corn bread, congee, pancakes, rice, buns, noodles</td>
</tr>
<tr>
<td>Cereal</td>
<td>Ready-to-eat (sweetened and unsweetened) cereal, instant cereal</td>
</tr>
<tr>
<td>Fruits</td>
<td>Fresh, canned, frozen</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Fresh (Chinese and American), canned, frozen, salad, sweet potato</td>
</tr>
<tr>
<td>Meat</td>
<td>Fish, poultry, red meat, duck, sausage, Wieners, ham, luncheon meat, corn dog</td>
</tr>
<tr>
<td>Eggs</td>
<td>Scrambled, boiled, fried</td>
</tr>
<tr>
<td>Meat alternatives</td>
<td>Peanut butter, tofu, dried beans, pork and beans, soybeans</td>
</tr>
<tr>
<td>Dairy</td>
<td>Milk (all flavors and fat levels), cheese, yogurt, soymilk, condensed milk</td>
</tr>
<tr>
<td>Soup</td>
<td>Broth, ramen, meat based, fish based, dishes labeled as soup</td>
</tr>
<tr>
<td>Mixed dishes and sandwiches</td>
<td>Meat main dishes, cheese main dishes, hot and cold sandwiches, chicken and noodle casserole, noodle with pork and broccoli stir fry, ziti and ground beef with tomato pasta sauce</td>
</tr>
<tr>
<td>Restaurant food</td>
<td>Food obtained from a restaurant (Chinese or fast food)</td>
</tr>
<tr>
<td>Desserts</td>
<td>Cake, pie, cookies, ice cream, pop tarts, fruit roll up, donuts</td>
</tr>
<tr>
<td>Snacks—salty</td>
<td>Pretzels, potato chips, crackers, popcorn, rice crackers, dried olives</td>
</tr>
<tr>
<td>Candy</td>
<td>Vending machine candy, candy bars, marshmallows</td>
</tr>
<tr>
<td>100% fruit juice</td>
<td>Specified on label as 100% fruit juice</td>
</tr>
<tr>
<td>Drinks—sweetened</td>
<td>Beverages, soft drinks, Chinese tea, juices not specified as 100% fruit juice</td>
</tr>
</tbody>
</table>
2.5. Eating habits

The 24-hour intakes were examined for specific eating habits related to food consumption. The foods were first divided into 16 food groups (Table 1) based on similar source characteristics. For example, rice, biscuits, and buns were included in the bread group and pretzels, potato chips, crackers, and popcorn were placed in the salty snacks category. Composite food items such as recipes were assigned to food groups according to primary ingredients. If no single food (other than water) accounted for at least 60% of the weight, the composite item was classified as a mixed dish. The foods were then classified as American, Chinese American, or common to both cultures based on food preparation method, place of purchase, and whether considered American or Chinese. The caregivers’ recipes and food labels provided useful descriptions necessary to separate Chinese food into the food groups. Differentiation between a Chinese and an American designation for the same food (eg, Chinese vegetable vs American vegetable) was based on food preparation method. Some foods were determined to be American such as salty snacks, soft drinks, and fruit beverages. The following were determined to be foods shared (common to) by both cultures: milk, fruit (fresh, frozen and canned), and 100% fruit juices.

2.6. Statistical analysis

All statistical analyses were performed using SPSS-PC version 11 (SPSS Inc, Chicago, Ill). Frequency distributions were used to describe demographic data. Analysis was conducted to determine whether significant relationships existed between the demographic and overweight variables. Mean acculturation score was calculated. Significance was set at $P \leq .05$.

3. Results

3.1. Sociodemographic characteristics of the sample

Fifty-four caregivers were recruited; however, 5 did not complete the study beyond the initial consent form because of time constraints or because the child left the center before he or she could be observed. A total of 53 Chinese-American preschool children and their primary caregivers (n = 49) participated in the study.

Almost three fourths (71%) of the study children were born in the United States (second generation). All the primary caregivers were first-generation Chinese Americans (90% born in an urban area of China). Twenty-six percent of the caregivers had completed high school/GED, some college, or a technical school; almost three fourths (73%) graduated from college, of which more than a third (37%) completed postgraduate studies. The approximate total income of the household in the last year ranged from less than $5000 (2%) to more than $100,000 (6.1%); with 31% reporting an income less than $30,000, 47% less than $60,000, and 22% more than $60,000.

3.2. Acculturation of the caregivers

The mean ($\pm$SD) acculturation score was 2.1 $\pm$ 0.39 (range, 1.4-3.6), indicating low acculturation of the primary caregivers. Only 2 caregivers scored in the range of 3 on the
SL-ASIA. This value reflected a general tendency of the caregivers toward retaining Chinese culture and influence in reading, writing, and selecting the kinds of foods to eat at home and in restaurants. Because of the restricted range of acculturation in this sample, any effect of acculturation on BMI or eating habits could not be tested [38].

3.3. Body mass index

The mean BMI of the primary caregivers was 23.3 (range, 16.5-35.6). Based on the NIH and WHO standards for BMI in risk assessment [46,47], 27% were overweight or obese. Of the 27%, 21% were overweight and 6% were obese. Fifteen percent of the women (n = 6) and 44% of the men (n = 4) were classified as overweight. Eight percent (n = 3) of the women were classified as obese; none of the men were obese.

Of concern is that most studies examining the risk for adverse health consequences associated with obesity have been based on data from Europe or the United States; limited studies have been conducted with Asian adults. Recent small-scale and cross-sectional studies have demonstrated that the increased risks associated with obesity occur at lower BMIs in Asians because these populations are predisposed to visceral or abdominal obesity. As a result, based on recent studies with Chinese adults and children, the expert panel with the WHO is proposing that Asians are at increased risk of weight-related complications (e.g., type 2 diabetes) at a BMI of 23 kg/m² or higher [55-60]. Using a BMI of 23 kg/m² or higher and of 27 kg/m² or higher to define overweight and obesity, respectively, 13 additional caregivers would be classified as overweight and obese for a total of 26 (53%). Before formal development of revised cutoffs to define obesity among Asians, including Chinese Americans, there is a need for carefully designed and conducted longitudinal studies among Asian populations [64].

The mean BMI of the children was 16.6 (range, 11.9-27.1). Fifteen percent were at risk of being overweight. Seventeen percent of the children were overweight (22% [n = 6] of the men and 12% [n = 3] of the females). There were no statistically significant associations found between BMI and any of the sociodemographic variables.

3.4. Eating patterns

All the foods and beverages consumed at the child care center were American or shared by both cultures. Of all the food groups consumed by the children at the child care center, the food groups most commonly consumed were dairy (reduced fat, 2% milk), mixed dishes, fruits (fresh and canned), 100% fruit juice, and vegetables.

With regard to the foods consumed by the children at home, 43% reflected Chinese food, 26% reflected American food, and 31% reflected foods that were shared by both cultures. The most frequently consumed Chinese food groups consumed at home were mixed dishes (meat and vegetables, usually stir fried) (26%), bread (rice, noodles, or buns) (23%), vegetables (typically stir fried) (16%), meat (usually steamed seafood or poultry) (11%), and soup (11%); all other food groups were each less than 5%. The American food groups most frequently consumed were desserts (19%), sweetened beverages (14%), bread (11%), candy (8%), salty snacks (7%), cereals (6%), and meat (6%); all other food groups were each less than 5%. For the food groups shared by both cultures, 52% were dairy, 33% were fruits, and 12% were
Examples of American and Chinese food consumed by Chinese-American preschool children (n = 53)

<table>
<thead>
<tr>
<th>American food</th>
<th>Chinese food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese pizza</td>
<td>Watercress tofu soup</td>
</tr>
<tr>
<td>Lucky Charms cereal</td>
<td>Stir-fried tomato and egg</td>
</tr>
<tr>
<td>Cheeseburger</td>
<td>Green milk tea</td>
</tr>
<tr>
<td>French toast</td>
<td>Rice dough ball with pork</td>
</tr>
<tr>
<td>Coke</td>
<td>Lotus seed bun</td>
</tr>
<tr>
<td>Blueberry muffin</td>
<td>Noodle with pork and broccoli</td>
</tr>
<tr>
<td>Taco salad</td>
<td>Squid and pork stir fry</td>
</tr>
<tr>
<td>Peanut butter and jelly sandwich</td>
<td>Congee</td>
</tr>
<tr>
<td>Spaghetti with meat sauce</td>
<td>Noodle with sliced chicken, pork, and Chinese cabbage</td>
</tr>
</tbody>
</table>

100% fruit juice. Examples of typical Chinese and American food consumed by the Chinese-American preschool children are presented in Table 2.

The type of ethnic food groups consumed varied by meal period. For breakfast, 89% of the foods consumed were American or shared by both cultures; for dinner, 70% of the foods were Chinese; and 94% of the snacks were American or food shared by both cultures. Only 3% of the foods consumed were from a restaurant. The food groups most commonly consumed at breakfast were dairy, bread, fruits, 100% fruit juice, and cereals. At lunch, the children consumed the following food groups most commonly: mixed dishes, vegetables, dairy, fruits, and meat alternatives in the form of peanut butter or dried beans. The food groups most commonly consumed at dinner were mixed dishes, bread/rice, vegetables, meats, and soup. At snack time, the children consumed most frequently the following food groups: 100% fruit juices, salty snacks (chips, crackers, and pretzels), desserts (cookies, cake, ice cream), dairy, fruits (mostly fresh), and sweetened beverages.

4. Discussion

Examinations of demographic characteristics of the Chinese-American caregivers in this study revealed that all were foreign born, relatively highly educated, and in a middle-income group who preferred their native language—Mandarin or Cantonese. These characteristics are consistent with recent United States and Houston census data that indicate that Chinese Americans are, as a whole, 80% to 85% foreign born, prefer their native language (70% vs 67% in our sample), and have the highest percentage of college graduates of any ethnic group in Houston [27,61,62].

The proportion of overweight (17%) was high in this sample of Chinese-American preschool children but considerably lower than other ethnic groups [22]. Twenty-seven percent of the caregivers were overweight or obese (BMI ≥ 25 kg/m²) according to NIH and WHO standards [46,47,63]. Using the recently proposed WHO standard (BMI ≥ 23 kg/m²) for this population [54], 53% of the Chinese caregivers would be considered overweight or obese.

The higher rates of some chronic diseases seen in Chinese Americans have been largely attributed to changes in dietary intake with acculturation [6-12]. This pilot study is the first attempt to document the eating habits of Chinese-American preschool children.
In this study, the preschool children consumed 2 meals, breakfast and lunch, and an afternoon snack at the child care center. All the foods consumed by the children at the child care center were American food. Because there was a mixture of children eating breakfast at the child care center or at home, both traditional Chinese and American food were consumed.

Most of the children consumed traditional Chinese food at dinner and included mixed dishes, breads/rice, vegetables, meats, and soup. Snacks were a combination of snacks at home and at the child care center and, thus, were a combination of Chinese and American snack food. Snacks included 100% fruit juices, salty snacks, desserts, fruits, and sweetened beverages.

The data suggest that level of acculturation may be influencing the types of food being consumed by Chinese-American children at home. Studies have shown that Chinese Americans generally increased their consumption of sweet/salty snack food, dairy products, including milk, yogurt, ice cream, and nontraditional protein food including hot dogs and hamburgers after they immigrated to the United States [6,14-16,65]. In addition, caregivers often chose cookies, cakes, and sweet buns as breakfast items for their children in the misconception that such foods are nutritious [66]. According to the model proposed by Kocturk-Runefors [67], when new foods are incorporated into the diets of Chinese immigrants, they frequently are foods comprising the accessory food group, including sweets, salty snacks, and soft drinks. Consistent with this model and other studies [6,14-16,65], the intake of American food in this study sample consisted of desserts (cookies, cakes, ice cream, pop tarts), sweetened beverages (soft drinks, fruit drinks, and fruit ades), bread (enriched bread, hot dog, and hamburger buns), candy (candy bars and vending machine candy), salty snacks (chips, crackers, pretzels), high-fat meat (sausage, hot dogs), and cereals (ready-to-eat unsweetened and sweetened cereal). Similar acculturation-related changes in diet have been observed among children of other immigrant groups in the United States (eg, Hispanics, Japanese, and Korean) [15,68].

There are potential limitations to this study. The small sample in this pilot study was restricted to the Houston Chinatown; thus, the results of the study may not be generalizable to other ethnic enclaves such as the San Francisco Chinatown. The demographic and socioeconomic status characteristics among various Chinese-American enclaves in the United States may be different. The percentage of meals eaten at restaurants was low, which may have been a result of food records completed only on weekdays. Food intake, including meals consumed at restaurants, may vary for individuals from weekdays to weekends [69]. Two weekday 24-hour intakes were collected on each child, which may not accurately characterize the usual diet of an individual [69]. However, the 2 days of intake may be representative of the eating patterns of this low-acculturated sample [70,71]. The caregivers were first-generation immigrants who, despite the increase of American food, still retained the Chinese culture of traditional dinners with their family at home [15].

There are potential limitations to using BMI for classifying adiposity such as body build and body proportion differences (eg, fat distribution) among ethnic populations and sensitivity and specificity of the cutoff points [72-74]. However, limitations are of greatest concern when guidelines for weight classification are used at the individual level and of less concern when the guidelines are applied on a population basis [75]. Because large-scale overweight prevalence data cannot be assessed from a study of this size, the goal of this study
was to provide preliminary data on weight status and eating practices among Chinese-American preschool children and their primary caregivers.

Understanding acculturation, eating habits, and weight status of Chinese-American children is critical for more effective targeting, delivery, and monitoring of nutrition programs. Because of the large influx of Chinese Americans into the United States, we can no longer ignore the health needs including obesity and obesity-related diseases (eg, type 2 diabetes) of this understudied population. Continued research is needed to assess the health status and lifestyle of Chinese-American families in a much larger epidemiological study so that the needs of this select population can be understood and addressed.

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References


