



Assessment of Portion Sizes of Food items commonly consumed by Urban Indian Adults: A Preliminary Study

VIDISHA SHARMA* and RAVINDER CHADHA

Department of Food and Nutrition, Lady Irwin College, University of Delhi,
Sikandra Road, New Delhi, India.

Abstract

Estimation of food portion sizes is crucial for accurate and comprehensive assessment of dietary intake and nutrition counselling. The present study aimed to assess food portion sizes of adults residing in urban Delhi. A sample of 60 adults (25-60 years, male=female=30) belonging to families with earning members (male/female) engaged in government/private service within the monthly income range of Rs.40,000 to Rs.1,80,000 was selected purposively. Twenty four hour diet recall was conducted for two non-consecutive days for each participant. Data on commonly consumed food items were extracted from recalls and a list of 23 frequently eaten food items was finalized. Standardization of cooking methods and recipes was done for all the selected food items and estimated portion sizes were converted to weight equivalents. The mean, 25th, 50th (median) and 75th percentiles for food portions of the selected items were calculated for the participants. Food portion sizes were compared between male and female participants to identify gender differences. Tea, chapati, milk (as beverage), boiled rice and biscuits were the top five most frequently consumed food items, having the median portion sizes of 170 ml, 2 (in units), 306ml, 140g and 2 (in units), respectively. Male participants consumed significantly larger portion sizes than females for 12 food items ($p<0.05$). The methodology of this study can be utilized to prepare food portion size database for various population groups which can be used to develop more precise tools for diet assessment that are more suited to Indian population.



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Introduction


Accurate assessment of dietary intake is crucial in nutrition and epidemiological research; to plan

and monitor nutrition strategies as well as their evaluation. The accuracy of data generated from food consumption surveys is dependent on the

CONTACT Vidisha Sharma ✉ vidisha0893@gmail.com 📍 Department of Food and Nutrition, Lady Irwin College, University of Delhi, Sikandra Road, New Delhi, India.



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accuracy of assessment of food portion sizes consumed by individuals as food group and nutrient intake is derived from these.¹ Hence, estimation of food portion sizes is one of the most important steps while collecting dietary intake data.²⁻⁹ Food portion size is defined as the quantity of a food served or consumed per eating occasion including the successive helpings and minus the leftovers.^{10,11} It is not a consistent amount and varies among individuals.¹² The utility of information on food portion sizes is not limited to collection of dietary data but it extends to dietary counselling and portion size education.¹³⁻²⁰ The prevalence of overweight, obesity and diet related non-communicable diseases is increasing in India.²¹⁻²³ The effect of consuming larger portion sizes on high energy intake and high body mass index has been reported in many studies.²⁴⁻²⁷ However, in India most of the researches focus only on daily total food group and nutrient intake and limited data is available on food portion sizes. Also, lack of any national database on food portion sizes makes interpretation of dietary data difficult. Hence, this study was undertaken to: identify the food items commonly consumed by adults residing in urban Delhi; standardize their methods of preparations and to prepare a list of their portion sizes using percentile approach and evaluate gender differences between the food portion sizes consumed.

Materials and Methods

Study Design

A cross-sectional study was undertaken using a combination of qualitative and quantitative methods. The research was reviewed and cleared by Institutional Ethics Committee, Lady Irwin College, University of Delhi, New Delhi, India (Registration no. ECR/212/INDT/DL/2014).

Sample Selection

Free living adults (n=60, male=female=30, 25-60 years) residing in urban Delhi and belonging to families with earning members (male/female) engaged in government/private service within the monthly income range of Rs.40,000 to Rs.1,80,000 were selected from residential colonies and government offices using purposive sampling. Persons who were diagnosed with some health condition because of which they were on special diet (diet that is modified from the one habitually

consumed by the participant because of a specific health condition such as overweight, diabetes, high blood pressure, heart disease etc.), were not included in the study. Informed written consent was taken from all the study participants.

Tools and Techniques

General Profile

Information on family type, income, education and occupation of the participants was elicited using a questionnaire.

Diet Recalls

Information regarding the commonly consumed food items and preparations and their portion sizes was gathered using 24-hour diet recall during January-March, 2018. The diet recalls were conducted face-to-face on two non-consecutive week days (working and non-working day) and care was taken to not include fasting and festival days. Diet recalls were conducted as per the methodology suggested by Gibson, 2005; Gibson and Ferguson, 2008; Baranowski, 2012.^{3,4,28}

Estimation of Food Portion Size

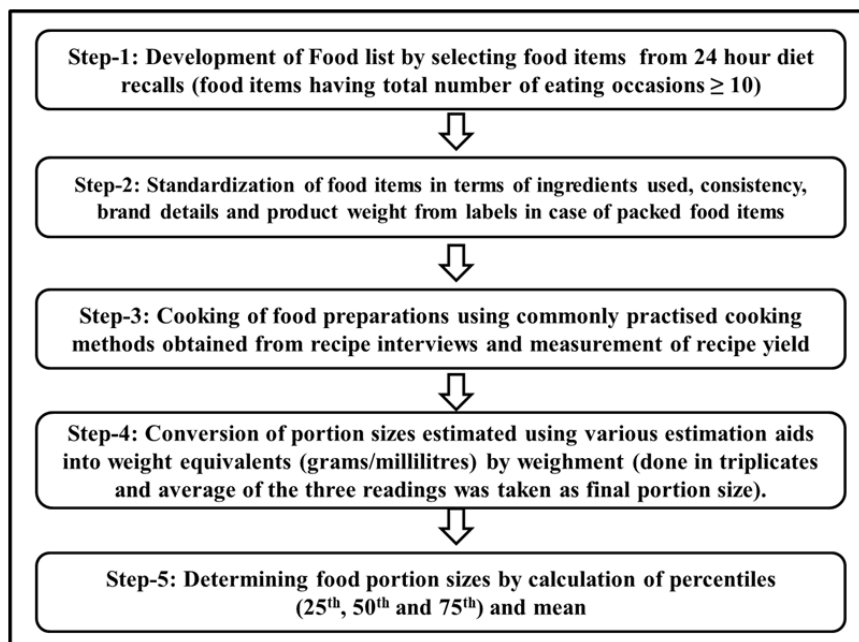
Various portion size estimation tools were used for facilitating accurate assessment of food quantity consumed by the study participants (figure-1). A thorough review on effectiveness of food portion size estimation aids was done before finalizing the estimation tools.²⁹ All the tools were standardized and pretesting was done on a subsample before data collection to ensure that the participants were able to recall quantities of various food items consumed by them using these tools. Recipe interviews were conducted with thirty participants (29 females and one male who were engaged in food preparation on regular basis) to gather detailed information about the various food preparations; their detailed recipes and the amounts of different ingredients included.

Selection of Food Items

Most frequently consumed food items were selected on the basis of frequency of consumption estimated from the total number of eating occasions derived from two days of 24 hour diet recall per participant, i.e., the number of times any specific item/dish/beverage appeared in 120 diet recalls of the sixty participants.



Fig.1: Portion size estimation aids used in the study



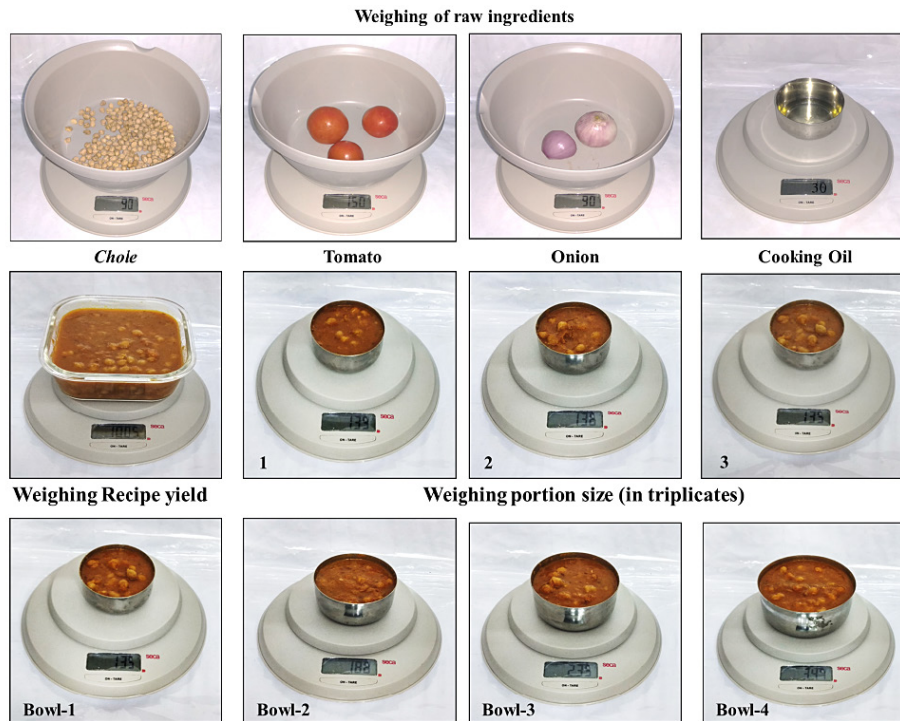
Note - In case of mixed dishes made with multiple ingredients or preparations that varied in terms of consistency, multiple variations of a single dish were prepared and weighed. The preparations which did not vary much with respect to consistency and proportion of ingredients used, an average proportion of major ingredients were estimated and used for standardization.

Fig.2: Steps in Standardization of Food items and determination of Food Portion sizes

Standardization of Recipes of Food Preparations

Standardization of recipes of selected food items was done on the basis of information obtained regarding method of preparation, ingredients used, consistency and brand related details (of items purchased from outside) from 24 hour diet recalls and recipe interviews (figure-2). As most of the

cooked food items were prepared at home, cooking methods commonly practised by the participants were followed. In case of food preparations for which recipe data were not available, the most similar recipe was used. Survey of utensils commonly used for serving food items was also conducted for standardization of food portion sizes.



Conversion of portion sizes estimated in Household utensils into weight equivalents (grams) by weightment
 *Chole curry (Bengal gram whole): Prepared by sautéing (in pan/pressure cooker) onion, tomato, condiments (ginger and garlic) and spices (cumin seeds, salt, red chili powder, turmeric) in oil to which pre-soaked and boiled *bengal* gram whole is added which is sautéed again and cooked in water till soft.

Fig.3: Standardization of Chole Curry

Conversion of Estimated Portion Sizes to Weight Equivalents

The quantities of raw ingredients (except spices, condiments and seasonings) reported by the participants in household measure were converted to grams or millilitres, weighed on the digital food scale (Diet and Kitchen Scale, SECA Culina 852) which had precision of 1gram and capacity of 3,000 grams. The dish was then cooked and weight of the final yield was taken at room temperature. The portion sizes were then converted into weight equivalents by weighing the quantity reported by the participants in household measures in respective bowls or serving spoons. Portion size was set in the unit of grams. In

case of liquids, it was set in the unit of millilitres and was determined using measuring cup or cylinder. In case of fruits and vegetables having peels, skin or seeds, weight of edible portion was considered.

Determination of Food Portion Sizes

Food Portion sizes of various food items were calculated on the basis of weights estimated from 24 hour diet recalls. After conversion to weight equivalents (grams or millilitres), 50th percentile (median), 25th percentile, 75th percentile, mean and range of food portion sizes were derived. This approach of determining portion sizes has been reported by several researches.^{10,31-37} The calculation

of median portion sizes is preferred as it removes outliers i.e., very small or very larger portion sizes. If any food item (for e.g. chapati, boiled rice or tea) was consumed more than once on the same day then the median portion size as well as 25th and 75th percentiles were calculated taking into account all eating events i.e. all eating occasions of that food

item for all participants. However, the number of non-consumers of that food item were excluded from the portion size computation. The food portion sizes of frequently consumed food items were computed for the entire group and were also computed for each gender separately.

Table 1: General profile and Characteristics of participants (n=60)

| Characteristics | Categories | No. of participants (%) |
|---|----------------------------------|-------------------------|
| Age (years) | 25-29 years | 9 (15) |
| | 30-34 years | 5 (8.3) |
| | 35-39 years | 5 (8.3) |
| | 40-44 years | 11 (18.3) |
| | 45-49 years | 11 (18.3) |
| | 50-54 years | 14 (23.3) |
| | 55-60 years | 5 (8.3) |
| Gender | Male | 30 (50) |
| | Female | 30 (50) |
| Educational Qualification | High school | 13 (21.7) |
| | Graduation | 35 (58.3) |
| | Post-graduation | 10 (16.7) |
| | Professional | 2 (3.3) |
| Occupation | Home makers | 19 (31.7) |
| | Government service (permanent) | 29 (48.3) |
| | Government service (contractual) | 6 (10) |
| | Private service | 3 (5) |
| | Self-employed | 1 (1.7) |
| | Unemployed | 2 (3.3) |
| Family Type | Nuclear | 39 (65) |
| | Joint | 21 (35) |
| Monthly Family Income range (Rs) | 45,000-54,999 | 3 (5) |
| | 55,000-64,999 | 6 (10) |
| | 65,000-74,999 | 3 (5) |
| | 75,000-84,999 | 18 (30) |
| | 85,000-94,999 | 1 (1.7) |
| | 95,000-1,00,000 | 10 (16.7) |
| | >1,00,000 | 19 (31.7) |
| Dietary habit | Vegetarian | 28 (46.7) |
| | Non-vegetarian | 30 (50) |
| | Ovo-vegetarian | 2 (3.3) |
| Frequency of Consumption of Meals from outside | Daily | 1 (1.7) |
| | 2-3 times/week | 9 (15) |
| | Once a week | 12 (20) |
| | Once in 15 days | 15 (25) |
| | Once a month | 17 (28.3) |
| | Rarely | 6 (10) |

Data Entry and Analysis

All data were entered into Microsoft Excel 2010 and analysis was done using SPSS version 23. Median food portion sizes (50th percentile) along with 25th and 75th percentiles and mean of portion sizes of all food items were calculated. Comparison between distribution of food portion sizes of male and female participants was done using Independent samples Mann - Whitney U Test. All results were tested at 5% level of significance.

Results and Discussion

General Profile and characteristics of Participants

A total of 60 participants (male=female=30) in the age range of 25-60 years were part of this study. The mean age of participants was 42.78 ± 9.33 years (range: 25-56 years), with mean age of men and women being 42.70 ± 9.81 years (range: 26-56 years) and 42.86 ± 8.99 years (range: 25-53 years), respectively. A high proportion of the participants were graduates or had studied up to high school (80%), belonged to nuclear families (65%) and were engaged in government/private service (63.3%).

The mean monthly family income of the group was Rs 1,00,083.33 \pm 50,836.15 (range: Rs 50,000 - Rs 4,00,000) (table-1).

Diet and Meal Pattern

Most of the meals were prepared at home except mid-morning and tea time in case of employees. The total number of meals in a day comprised three main meals (breakfast, lunch and dinner) and five in between meals (early morning, mid-morning, tea time, before dinner and bed time). More than one-third of the participants consumed six meals in a weekday (38.3%, mean: 5.83 ± 1.12 meals, range: 4-8 meals) as well as weekend day (35%, Mean: 5.66 ± 1.15 meals, range: 3-8 meals). Mid-morning, breakfast, lunch, tea-time and dinner were the meals consumed by majority of the participants. The main meals (breakfast, lunch and dinner) usually comprised a cereal, vegetable and/or pulse preparation along with some accompaniment such as curd, salad or pickle. The in between meals usually included a beverage along with a snack or sometimes a fruit or soup.

Box-1: Description of certain locally consumed Food Items

| Food Items | Description |
|----------------------|---|
| <i>Chapati</i> | Prepared by making a well kneaded dough of wheat flour and water which is rested for minimum 30 minutes. It is then rolled into flat circles and cooked on both side on hot griddle. Sometimes salt and/or cooking oil is also added in the dough. |
| Plain <i>paratha</i> | Preparation is similar to <i>chapati</i> but shallow fried on hot griddle using oil or <i>ghee</i> . Sometimes salt, carom seeds and /or <i>ghee</i> are applied while rolling the dough. |
| Pulse preparations | These are prepared by cooking (in pan/pressure cooker) any type of pulse with appropriate amount of water and salt, until soft. Whole pulses are also soaked before cooking. The preparation is tempered with seasonings (such as red chili powder, turmeric, cumin seeds), condiments (ginger, garlic etc) and vegetables (tomato and onion) which is cooked in oil or <i>ghee</i> . |
| Mix pulse | A type of pulse preparation which is made by mixing a number of pulses together instead of using only one type of pulse while cooking. |
| Mix vegetable dry | A type of dry vegetable preparation which is made by mixing a number of vegetables together (usually potato and \geq two vegetables) instead of using only one type of vegetable while cooking. |
| Mix salad | A type of accompaniment with main meals, which is a combination of two or more raw vegetables (such as cucumber, onion, tomato, carrot, radish), cut in rounds, slices or slit into long halves and sometimes also seasoned with lemon juice or salt. |
| <i>Boondi raita</i> | Beaten curd is mixed with seasonings and <i>boondi</i> (made by making a batter of Bengal gram flour and water and deep frying into very small crisp balls). It is served as a savoury accompaniment with <i>chapati</i> , boiled rice and pulse or vegetable preparation. |
| <i>Namkeen</i> | A popular crispy savoury snack prepared by making dough of Bengal gram flour which is mixed with seasonings. Thin strands are prepared from this dough which are then deep fired. Nuts like peanut, cashew and specific flavours (sweet and sour) are also added sometimes to enhance flavour and increase variety. |

Table 2: Mean and Median portion sizes of Food items commonly consumed in main meals (n=60)

| Sn | Food Items | No. of eating occasions ^b | Food Portion sizes (g) | | Median portion size in HHMs |
|---|---|--------------------------------------|------------------------|--------------------------------------|-----------------------------|
| | | | Mean ± SD | Median (P50) Portion size (P25, P75) | |
| Cereal preparations (g) | | | | | |
| 1. | Chapati (grams of wheat flour) | 196 | 77.75±39.64 | 70 (60,90) | - |
| | Chapati (in number) | 196 | 2.63±1.23 | - | 2 (2,3) |
| 2. | Boiled rice, plain ^a | 58 | 178.89±91.32 | 140 (110,205) | Bowl-2 |
| 3. | Plain paratha (grams of wheat flour) | 19 | 81.84±57.35 | 60 (35,90) | - |
| | Plain paratha (in number) | 19 | 2.05±1.07 | - | 2 (1,3) |
| Pulse preparations (g)^a | | | | | |
| 4. | Mix pulse ^c | 27 | 275.07±106.74 | 255 (234,352) | Bowl-2 |
| 5. | Red gram dal ^c | 15 | 291.33±136.64 | 242 (212,341) | Bowl-2 |
| 6. | Chole curry ^d | 13 | 263.46±154.09 | 188 (184,356) | Bowl-1 |
| 7. | Red lentil ^c | 12 | 264.16±158.75 | 196 (150.25,347) | Bowl-1 |
| 8. | Rajmah curry ^d | 10 | 299.90±151.37 | 236 (228.5,343) | Bowl-2 |
| Vegetable preparations (g)^a | | | | | |
| 9. | Mix vegetable dry | 21 | 157.42±59.59 | 156 (105,191) | Bowl-1 |
| 10. | Cauliflower Potato dry | 19 | 189±78.02 | 220 (105,220) | Bowl-2 |
| 11. | Fenugreek leaves potato dry | 14 | 160.07±53.48 | 154 (96,203) | Bowl-1 |
| Accompaniments (g) | | | | | |
| 12. | Curd | 19 | 176.8±89.07 | 142 (142,208) | 3/4 th Bowl-1 |
| 13. | Mix salad | 18 | 39.11±21.05 | 29.5 (24,55.5) | - |
| 14. | Boondi Raita | 13 | 153.23±29.81 | 169 (126,169) | Bowl-1 |

g: grams, **SD:** Standard deviation, **HHMs:** Household Measures, **P25:** 25th percentile, **P50:** 50th percentile, **P75:** 75th percentile

Capacities of household utensils (0.5ml below brim): Bowl-1: 200ml, Bowl-2: 250 ml

^a Portion size of cooked food item

^b total number of times the food item appeared in 120 diet recalls of the sixty participants

Most commonly consumed pulse preparations were of medium consistency (raw pulse, g/water, ml):

^c 30/117 = 0.256 and ^d 30/155=0.193

Commonly Consumed Food Items

Food items were ranked on the basis of the total number of eating occasions derived from 24 hour diet recalls conducted on two non-consecutive days for each participant (table-2 and 3). The Food items (n=23) which had sufficient number of observations overall and for both the genders were selected. The description of certain locally consumed food items is given in box-1. Among cereal preparations, chapati

and plain boiled rice were most frequently consumed and were part of almost all main meals especially lunch and dinner. These cereal preparations were regularly eaten in combination with any pulse and/or vegetable preparation. Mix vegetable dry (carrot, potato and pea) and mix pulse curry (red gram dehusked and bengal gram dals) preparations were the most commonly consumed. Plain paratha was eaten most often in breakfast along with tea or some

vegetable preparation. Accompaniments such as salad or curd were also an important part of lunch and dinner. Carrot and radish were most frequently consumed in combination as mix salad. Other raw vegetables eaten as salad were cucumber, onion and tomato. Biscuits (especially local bakery, marie and glucose biscuits) or namkeen (such as potato bhujia

and mixture namkeen) along with some beverage, usually tea, green tea or coffee were frequently consumed early morning or in between main meals. Milk as a beverage was mostly consumed at bed time or with breakfast. Nuts, mainly almonds, were generally eaten early morning or with breakfast.

Table 3: Mean and Median portion sizes of Food items commonly consumed in between main meals (n=60)

| Sn | Food Items | No. of eating occasions ^b | Food Portion sizes (g/ ml ^a) | | Median portion size in HHMs |
|----|---------------------------------|--------------------------------------|--|--------------------------------------|-----------------------------|
| | | | Mean ± SD | Median (P50) Portion size (P25, P75) | |
| | Fruits (g) | | | | |
| 1. | Apple | 19 | 149±17.43 | 153 (153,153) | - |
| | Beverages (ml) | | | | |
| 2. | Tea | 213 | 192.05±55.91 | 170 (170,170) | Cup-1 |
| 3. | Milk | 75 | 283.61±83.17 | 306 (194,344) | Glass-1 |
| 4. | Green Tea | 28 | 176.28±23.07 | 170 (170,170) | Cup-1 |
| 5. | Coffee | 11 | 198.18±62.28 | 170 (170,258) | Cup-1 |
| | Snacks (g) | | | | |
| 6. | Biscuit (by weight in grams) | 52 | 14.57±9.53 | 12.8 (8.8,17.2) | - |
| | Biscuits (in number) | 52 | 2.59±1.34 | - | 2 (2,3) |
| 7. | Namkeen | 19 | 20.31±11.05 | 20 (10,28) | - |
| | Nuts (g) | | | | |
| 8. | Almonds | 12 | 5.08±0.99 | 5 (5,5) | - |
| | Sugars (g) | | | | |
| 9. | Jaggery | 15 | 41.4±6.89 | 42 (34,47) | - |

g: grams, ml: millilitres, SD: Standard deviation, HHMs: Household Measures, P25: 25th percentile, P50: 50th percentile, P75: 75th percentile

Capacities of household utensils (0.5ml below brim): Cup-1: 170 ml, Glass-1: 306ml

^a in case of beverages, portion sizes are in millilitres

^b total number of times the food item appeared in 120 diet recalls of the sixty participants

Food Portion Sizes

The portion sizes of commonly consumed food items derived from 24 hour diet recall data have been classified into nine food categories which are listed in table nos. 2 and 3. The portion size was calculated for the cooked weight of food preparation except in case of mix salad, curd, boondi raita, apple, almonds and jaggery. In cereals, the portion size of chapati was two in number and 70g in terms of amount of wheat flour. The most commonly consumed size of chapati was prepared from 30g of wheat flour with

a diameter of 15.5 cm and thickness of 0.30 cm. The median portion sizes of boiled rice and plain paratha were 140g and 60g, respectively. Median portion sizes of pulse preparations were higher than that of vegetable preparations. In case of pulse preparations, the portion size ranged from 188g (chole curry) to 255g (mix pulse) while for vegetable preparations (dry) it ranged from 154g (fenugreek leaves and potato dry) to 220g (cauliflower potato dry). The highest median portion size was recorded for milk (306ml) in the beverage category while tea,

green tea and coffee had an equal median portion size of 170ml each. Apple was the most frequently consumed fruit with a median portion size of 150g. The consumption of biscuits was more frequent than

namkeen as a snack between meals with median portion size of 12.8g (2 in number) for biscuits and 20g for namkeen.

Table 4: Gender wise data for Portion sizes of Food items commonly consumed in main meals

| Sn | Food items | Male participants (n=30) | | Female participants (n=30) | | p value | | |
|---|---------------------------------------|--------------------------------------|---|--------------------------------------|---|---------------------|--------------------|-------|
| | | No. of eating occasions ^b | Food Portion sizes (g) Median, P50 Mean \pm SD (P25,P75) | No. of eating occasions ^b | Food Portion sizes (g) Median, P50 Mean \pm SD (P25,P75) | | | |
| Cereal preparations(g) | | | | | | | | |
| 1. | Chapati (in number) | 100 | 3 (2,4) | 3.15 \pm 1.41 | 96 | 2 (2,2) | 2.08 \pm 0.66 | .000* |
| | Chapati (weight of wheat flour) | 100 | 90 (60,105) | 93.35 \pm 46.10 | 96 | 60 (50,70) | 61.51 \pm 22.12 | .000* |
| 2. | Boiled rice, plain ^b | 32 | 140 (110,205) | 178.84 \pm 105.82 | 26 | 205 (110,205) | 178.96 \pm 71.63 | 0.361 |
| 3. | Plain paratha (in number) | 12 | 2 (2,3,75) | 2.50 \pm 1.08 | 7 | 1 (1,2) | 1.28 \pm 0.48 | .017* |
| | Plain paratha (weight of wheat flour) | 12 | 85 (50,175) | 99.16 \pm 64.41 | 7 | 45 (30,80) | 52.14 \pm 25.14 | 0.056 |
| Pulse preparations (g)^a | | | | | | | | |
| 4. | Mix pulse | 7 | 255 (249,365) | 344 \pm 167.41 | 20 | 255 (203,256) | 250.95 \pm 66.17 | 0.263 |
| 5. | Red gram dal | 8 | 242 (199.2,340.2) | 278.50 \pm 94.50 | 7 | 212 (212,341) | 306 \pm 180.76 | 1 |
| 6. | Chole curry | 7 | 350 (188,362) | 332.85 \pm 183.53 | 6 | 188 (137,205.20) | 182.50 \pm 44.23 | 0.101 |
| 7. | Red lentil | 6 | 344 (226,437.50) | 359.33 \pm 181.21 | 6 | 169 (142,196) | 169 \pm 29.57 | .015* |
| 8. | Rajmah curry | 4 | 289.5 (160.2,599.5) | 349.75 \pm 239.09 | 6 | 236 (228.5,343) | 266.67 \pm 60.25 | 0.762 |
| Vegetable preparations (g)^a | | | | | | | | |
| 9. | Cauliflower Potato dry | 8 | 220 (220,322) | 243.87 \pm 75.47 | 11 | 105 (105,220) | 149.09 \pm 53 | .012* |
| 10. | Fenugreek leaves potato dry | 7 | 203 (154,203) | 184 \pm 56.13 | 7 | 154 (96,154) | 136.14 \pm 41.35 | 0.128 |
| 11. | Mix vegetable dry | 13 | 156 (125.5,196) | 156.69 \pm 60.43 | 8 | 151 (105,187) | 158.62 \pm 62.30 | 0.75 |
| Accompaniments (g) | | | | | | | | |
| 12. | Mix salad | 7 | 55 (39,59) | 55 \pm 21.79 | 11 | 24 (24,30) | 29 \pm 13.40 | .006* |
| 13. | Curd | 6 | 142 (127.7,289.8) | 209.08 \pm 164.58 | 15 | 142 (142,208) | 164 \pm 32.20 | 0.85 |

| | | | | | | | |
|------------------|---|------------------|---------------|---|---------------------|--------------|-------|
| 14. Boondi Raita | 7 | 126 (126,169) | 144.42 ±22.98 | 6 | 169 (126,182.20) | 163.50±35.56 | 0.366 |
|------------------|---|------------------|---------------|---|---------------------|--------------|-------|

g: grams, ml: millilitres, **SD:** Standard deviation, **P25:** 25th percentile,

P50: 50th percentile, **P75:** 75th percentile

*median food portion sizes significantly different at p value <0.05 as per Independent- Samples Mann-Whitney U test

^a Portion size of cooked food item

^b total number of times the food item appeared in 120 diet recalls of the sixty participants

Table-5: Gender wise data for Portion sizes of Food items commonly consumed in between main meals

| Sn | Food items | Male participants (n=30) | | Female participants (n=30) | | p value |
|-----------------------|------------------------------|--------------------------------------|---|--------------------------------------|---|-----------------------|
| | | No. of eating occasions ^b | Food Portion sizes (g/ml ^a) Median, P50 Mean ± SD (P25,P75) | No. of eating occasions ^b | Food Portion sizes (g/ml ^a) Median, P50 Mean ± SD (P25,P75) | |
| Fruits (g) | | | | | | |
| 1. | Apple | 5 | 153 (153,153) | 14 | 153 (153,153) | 147.57±20.31 0.823 |
| Beverages (ml) | | | | | | |
| 2. | Milk | 44 | 306 (194,355) | 31 | 306 (194,344) | 282.67±72.50 0.62 |
| 3. | Tea | 94 | 170 (170,170) | 119 | 170 (170,258) | 206.48±65.44 .016* |
| 4. | Green Tea | 23 | 170 (170,170) | 5 | 170 (170,258) | 205.20±48.19 0.173 |
| 5. | Coffee | 4 | 170 (170,170) | 7 | 172 (170,258) | 214.28±75.05 0.315 |
| Snacks (g) | | | | | | |
| 6. | Biscuits (in number) | 16 | 2 (2,2) | 36 | 2 (2,3) | 2.77±1.51 0.097 |
| | Biscuit (by weight in grams) | 16 | 13.4 (12.8,17.2) | 36 | 10.8 (8.8,17) | 13.47±7.61 0.154 |
| 7. | Namkeen | 8 | 24 (20,28) | 11 | 10 (10,28) | 17.90±13.43 0.177 |
| Nuts (g) | | | | | | |
| 8. | Almonds | 2 | 5 (5,5) | 10 | 5 (4.7,5) | 5.10±1.10 1 |
| Sugars (g) | | | | | | |
| 9. | Jaggery | 5 | 34 (30,42) | 10 | 47 (42,47) | 44.30±5.43 .019* |

g: grams, ml: millilitres, **SD:** Standard deviation, **P25:** 25th percentile,

P50: 50th percentile, **P75:** 75th percentile

*median food portion sizes significantly different at p value <0.05 as per Independent- Samples Mann-Whitney U test

^ain case of beverages, portion sizes are in millilitres

^b total number of times the food item appeared in 120 diet recalls of the sixty participants

Gender differences in Food Portion Size

Food portion sizes were also estimated separately for both male and female participants (table-4 and 5). Significant difference in median portion sizes was observed in case of seven food preparations; chapati, plain paratha, lentils, cauliflower potato dry, mix salad and jaggery ($p < 0.05$). Median portion sizes for male and female participants were observed to be the same for eight food preparations; biscuits (in number), mix pulse, apple, milk (as beverage), curd, tea, green tea and almonds. However, a higher mean portion size for male participants than females was observed for sixteen food items. Other researches who have analysed gender differences also showed that for most of the food items, portion sizes were larger for adult male participants than females.^{10,34,38-41} These studies were based on food portion sizes of adults from Australia, Bangladesh, Ireland and Nepal.

Diet assessment is an indispensable part of nutrition research especially in the area of nutrition epidemiology and planning of nutrition and health strategies.^{1,42} Accurate assessment of food portion sizes is crucial while collecting quantitative dietary data.^{3-5,7-9,42} Information regarding food portion sizes is crucial not only while conducting diet assessment but also during analysis of the dietary information obtained. Any error or inconsistency in food portion size information during collection of dietary data will lead to incorrect estimates of food and nutrient intake.¹ Comprehensive assessment of nutritional status, in both hospital and as well as community setting, is incomplete without data on portion size of food items. Knowledge regarding usual quantity of food items consumed by individuals at one time facilitates thorough and precise dietary counselling by dietitians. Assessment of actual food portion sizes and determining target groups' 'small', 'medium' and 'large' portion size facilitates nutrition counselling by suggesting practically feasible dietary modifications.¹³⁻²⁰ Consumption of larger portion sizes has been linked with higher energy intake and higher body mass index.²⁴⁻²⁷ With the rise of obesity and other diet related non-communicable diseases in India, portion sizes may act as a reference for dietary guidance especially for portion control in weight management, health promotion and disease prevention. Food manufactures and

restaurants also need current trends in portion sizes for setting appropriate serving sizes and providing its information on food labels.^{1,43,44} Further, data on food portion sizes is extremely useful in development of new and improved diet assessment instruments, food frequency questionnaires, food photograph series and atlases and also nutrition databases.^{1,10,43,45-51}

The current study was conducted in an attempt to assess, standardize and determine the food portion sizes of urban adults (25-60 years) residing in Delhi, as there is scanty published information on food portion sizes among Indian population. The mean age of the participants ($n=60$) was 42.78 ± 9.33 years. Most of them came from nuclear families (65%), were graduates (58.3%) and had average monthly family income of Rs 1,00,000. The data from two day 24 hour diet recalls was utilized to finalize the food list. Based on the information from recipe interviews, portion sizes of frequently consumed food items were standardized and converted to weight equivalents (grams or millilitres). Percentile approach (i.e. calculation of various percentiles specifically 25th, 50th and 75th) was used to determine the portion sizes, which has also been used by a few other researches.^{10,31-37} Gender wise analysis was also done and overall a higher portion size for male participants was observed. This finding was similar to other researches which also assessed gender differences in portion size of adults.^{10,34,38-41} There is lack of national level information on food portion sizes for Indian population as well as published researches that focus on this area. Therefore, Indian data are not accessible with which comparison of the results of the present study can be done. Some studies have been done among various population groups in different countries focussing on standardization of portion sizes.^{10,34,35,38-41,44,52} These databases have been utilized for preparation of food atlases or software for dietary assessment and counselling. The Indian Cuisine predominantly comprises mixed food preparations with vast regional variations in terms of ingredients, their proportion, consistency and method of preparation. Due to this variation in the types of food items/preparations consumed, it becomes difficult to compare portion sizes of Indian food items with international data or even with data from different regions within the country. The present study is a step towards standardization of

portion sizes for a population group using available dietary data. The methodology followed for portion size standardization can be used to determine the food portion sizes of individuals belonging to other regions, communities, age and income groups.

Strengths and Limitations of the Study

A major strength of the present study is the use of a combination of quantitative and qualitative methods, i.e. 24 hour diet recall, recipe interviews and utensil surveys, for assessment of food portion sizes which were standardized with the participation of the target group. Also, the portion sizes were estimated using different innovative 2-dimensional, 3-dimensional and digital aids to facilitate accurate recall of the quantities consumed. This study is a preliminary investigation towards development of a food photograph series for portion size estimation in an urban Indian population sub-group. National or state level database on food portion sizes is a prerequisite for development of such a tool. However, data from large scale surveys are mostly presented in terms of food and nutrient intake and information on portion sizes are not reported. As such published data were not available; this study was conducted as a preliminary exercise on a sample of 60 adults as an effort to generate data on food portion sizes using 24 hour diet recall (on two non-consecutive days i.e. 120 recalls) along with detailed recipe interviews and utensil surveys which was a time consuming and tedious exercise with a high respondent burden. As sample size of the study was small, selected mainly

from Northern region of India and also as there are vast differences in eating habits and food intake within the country, representativeness of the study sample cannot be assured which can be considered as a limitation of the study.

Conclusion

Data on food portion sizes has a number of applications in different areas of nutrition epidemiology and diet researches. The methodology and results of this study can be used in developing diet assessment tools and nutrition databases, nutrition counselling for suggesting appropriate serving sizes and portion control training for health promotion and disease prevention. Further research is required in this area, among different income groups and in different regions of India.

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Conflict of Interest

The authors declare no conflict of interest.

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