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Food and Nutrient Intake Pattern of Three Generations Living Together in Middle Income Urban Households of Delhi, India

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ABSTRACT The aim of the study was to assess the inter-generational differences in food and nutrient intake of three generations (grandparents, parents and children) living together. A cross-sectional survey assessed the food group and nutrient intake, changes in the intake over the years by using 24-hour dietary recall repeated over three days and focus group discussions. A total of 226 middle income families including 1,038 participants, grandparents (n=302), parents (n=423) and children (n=313) completed the diet survey. Focus group discussions with different generations explored the dietary transition over a period of time and the generation(s) responsible for menu related decisions. Children had significantly higher intake of cereals, other vegetables, sugars and fats as compared to their parents and grandparents ($p<0.001$) and highest mean percent adequacy of energy, protein and calcium ($p<0.001$). Information generated can be used to understand dynamics of food selection within a household and improve diet quality of all generations.

INTRODUCTION

Making healthy food choices is vital for good health. Food habits are governed to a certain extent by home food environment. Family can play an integral part in influencing the dietary intakes of members living together. Grandparents and parents serve as role models for their children and can positively influence the dietary intakes of their children if they are well informed and knowledgeable (Jongenelis et al. 2020; Gubbels et al. 2011). Studies have reported familial role in affecting the food choices and influencing the food and nutrient intake of the family members (Bogl et al. 2017; Hebestreit et al. 2017; Lahmann et al. 2017). A number of factors like nutrition knowledge, food availability and family income have been found to play a pivotal role in influencing the food consumption patterns of the family members (Sirasa et al. 2019). According to NSSO (2014), over the years there has been a rise in intake of fat, milk, refined sugars and decline in the intake of pulses, cereals, proteins among urban Indians. Misra et al. (2011) found that there has been an increase in the calories derived from fats by six percent in the last three decades among adults. Zarei and Ahmadi (2015) in a study conducted on mothers and their daughters concluded a significant difference in nutrient intake patterns and food habits among the two generations. Brombach et al. (2014) in a cross generational study revealed changes in the food intake for some of the food groups over generations. Some cohort studies over the decades have demonstrated the transition in dietary intake from childhood through adulthood (Harris et al. 2015; Madruga et al. 2012; Park et al. 2005; Briefel and Johnson 2004; Demory –Luce et al. 2004). Rao et al. 2018 reported that nutrient intakes of about two- third of the population is found to be deficient in most of the micronutrients that highlights a need to study the dietary intakes of the people from all age groups in order to tackle the dual burden of malnutrition.

Objectives

Poor family diets can have disastrous health consequences for all members. The study was designed to explore the changes in the diet over the years among grandparents and parents, the similarities and differences in the intakes of the three generations living together and, to see which generation influenced family meal composition the most.

MATERIAL AND METHODS

The present study had a cross-sectional survey design and was conducted on participants

from three generations living together in the same household. A total of 15 housing colonies from Delhi's four geographical zones (North, South, East and West) were selected purposively. Families with three generations living together (N=226) were sampled with the help of key informants in the colonies and/or through residents' welfare associations. A total of 1,038 participants completed the survey with 302 grandparents, 423 parents and 313 children (5-17 years old).

Both qualitative and quantitative data were collected. For exploring the changes in diet over the years, 8 focus group discussions (FGDs) were conducted on grandparents (n=40) and parents (n=45) from all four geographical zones (North, South, East and West) of Delhi. Information on who decides the daily menu, the type of foods to be purchased and cooked was taken from all the three generations (grandparents, n=35; parents, n=44 and children, n= 40) from a set of 12 FGDs. The themes and probes were pre-defined and pilot tested for getting the desired information. The food and nutrient intake patterns were assessed using a 24-hour dietary recall repeated over three days (two working/ school days and one holiday). The average intake of the food items over three days was calculated. Following which the food group and nutrient intakes were analysed using 'DietCal' software version 5.0 (Profound Tech Solution; http://dietcal.in/), based on the values from Indian food composition database (Gopalan et al. 2014). Percent adequacy of intakes was assessed using the Indian Council of Medical Research (ICMR) recommended dietary allowances (RDAs) for nutrients (National Institute of Nutrition 2010) and suggested daily amounts of foods given in the Dietary Guidelines for Indians (National Institute of Nutrition 2011).

Ethical Clearance

The study was approved by the Institutional Ethics Committee of Lady Irwin College, University of Delhi, New Delhi, India. Informed consent from adult participants and assent from children was taken after explaining the purpose and other details of the study.

Statistical Analysis

Data was analysed using SPSS, version 14.0. As part of univariate analyses, mean and standard deviation were calculated for continuous normal variables while median and inter-quartile range (IQR) were calculated for non-normal variables or where the sample size (n) was < 30. The intake of food groups and nutrients by different generations was compared with age and gender specific Indian reference standards (recommended daily amounts and RDAs). Differences between three generations were assessed using appropriate statistical tests with a level of significance set at $p<0.05$.

RESULTS

General Profile

Mean age of the participants from all three generations were 66.6±0.4 years (grandparents), 38.8±0.2 years (parents) and 12.7±0.1 years (children) respectively. Almost half of the grandparents and parents were graduates and children were at secondary school level. The proportion of males and females was almost equal in each generation. Out of 226 families, around one-third had a family size of 5. The families belonged to the middle-income group as determined by NCAER-CMCR report (Shukla 2010). Majority (60%) of the families were from northern India and 73.4 percent were Hindus. A total of 85 grandparents (n=40) and parents (n=45) formed part of the FGDs conducted to assess the changes in diet/food group consumption with time. While a total of 119 participants from all three generations formed part of FGDs on food s election.

Changes in Diets with Time

The FGDs on changes in the consumption of different food groups with time revealed that almost half of the grandparents had not experienced a major change in the consumption of the type of and quantity of cereals over the years. Among parents, almost half of them reported a change towards increased wholegrain consumption while the others reported an increase in intake of refined cereals. Most of the participants

from both the generations reported that 'millets' were consumed rarely by them even earlier (when they were younger). Intake of whole pulses and legumes had reduced for grandparents, both in terms of frequency and quantity and most of them also reported an increased intake of split pulses over whole ones due to digestibility issues. On the other hand, most of the parents did not report much change in frequency and type of pulse consumption, though the quantity of intake had increased compared to when they were younger.

As far as the intake of other food groups was concerned, most of the respondents from both the generations reported a reduced consumption of meats, raw fruits and vegetables, fats and oils, and sugars. Various reasons were reported by the respondents from both the generations for the reduced intake of these foods. Most of them reported increased health awareness and increased incidence of diet related diseases that had restricted their consumption of meat, fats and sugars. "*When we were young, we used to have lot of meat, fish and chicken, but now with increasing age, intake has reduced*" – 65-year-old grandfather, South Delhi. "*Earlier intake of ghee (*clarified butter*) was more but now it has reduced very much and is rarely consumed due to health problems…we restrict the intakes of fat*"- 33-year-old mother South Delhi. Another respondent from the parents' generation highlighted how diseases had altered food intake with time- "*The intake of sweets has reduced very much now, as I have diabetes, so I avoid sweet dish but I do take little sugar in tea and milk as without sugar I do not get the taste. The day I eat sugar, I work out more to balance its negative health effects*"- 37-year-old mother, West Delhi. The reasons reported for decreased intake of raw fruits and vegetables were increased costs, diminished quality and also inability to chew by grandparents. "*Intake of fruits has reduced very much from the earlier times and raw fruits are difficult to chew. If fruit is incorporated in some dish, then I can have little*"- 70-year-old grandmother, South Delhi. "*Nowadays, all foods are adulterated with chemicals, colours, etc. so why to eat fruits, eating such foods won't be beneficial for our health, in fact it is better not to eat them*"- 47-year-old mother from South Delhi.

The intake of milk had not changed much among most of the grandparents and parents in terms of frequency and quantity while the intake of milk products like cheese, butter, *khoa* and high fat milk (full- cream) had reduced for both the generations with time. "*Earlier we used to have a lot of milk and milk products like cheese, khoa* (semi-dehydrated milk product) *but now it has reduced. With age, the intake has also changed as now I can't eat anything that's heavy to digest. Milk also I take low fat as I have high blood cholesterol levels*"- 72-year-old grandfather, East Delhi.

Almost all the respondents from both the generations felt that the consumption of ultra-processed foods (like ready to eat foods and premixes) and packaged food products by them and their families had increased as compared to the times when they were younger. "*In our times, so many packaged foods were not available, but now everything is ready, just heat and eat and lot of variety is also there*"- 69-year-old grandfather, East Delhi. They reported that earlier the availability and consumption of ultra-processed foods like biscuits, savouries, wafers, noodles etc. was less but now it has formed an integral part of the family menus. They said that due to fast paced lives, time constraints, female members going out of home for work, changing food preferences and easy availability have encouraged the transition towards the consumption of more of ready to eat ultra-processed convenience foods. Parents also gave similar reasons for their increased intake of ultra-processed foods. They also reported that there had been a tremendous increase in the variety of foods available that sometimes made it difficult for them to choose the best product. "*These days, a lot of variety in foods has come up like different varieties of rice- brown rice, organic rice etc. sold by different brands. In one way it is good but that also makes it difficult for us to choose out of so many products available*"- 38-year-old mother, East Delhi.

Food Selection

All three generations in separate FGD groups were asked about factors which influenced food selection and who in the family was responsible for making decisions regarding the kind of foods

to be purchased. Children mostly decided the daily menu to be cooked at home according to most of the grandparents and parents. While, some other participants reported that adults in the family decided what was to be cooked especially mothers. Most of the children reported that their mothers were the decision makers about the daily menu. Most participants from all generations also reported that mothers decided the type and brands of flour, cooking oil, milk etc. It was also found that type of snack items purchased and consumed in the families were mostly decided by children. Interestingly, few mothers felt that most of the food selection and preparation was influenced by their children, husband and in-laws after marriage. "*There are many limitations after marriage, as we cannot cook as per our wish. Whatever our husband and in-laws say that is only cooked and purchased*"- 34-year-old mother, East Delhi.

Food Group Intake

The intake of food groups- cereals, pulses and legumes, milk and milk products, fruits, other vegetables, green leafy vegetables (GLVs), roots and tubers, meat and poultry, fish, fats and oils, nuts and sugars of three generations is presented in Table 1. Gender wise differences in grandparents and parents were statistically insignificant for pulses, milk and milk products, fruits, other vegetables, meat, poultry, fish and nuts. For grandparents, the intake of cereals, green leafy vegetables, roots and tubers and sugars differed significantly between males and females, with males consuming more of cereals, GLVs and females consuming more of sugars and roots and tubers ($p<0.05$). Among parents, the differences were statistically significant between genders for cereals ($p<0.001$) and fats and oils ($p<0.05$) group with males consuming significantly higher amounts. Food group intake among children was analysed in various age groups (5-6 years, 7-9 years, 13-15 years and 16-17 years) for both the genders as classified by the Indian RDAs (Indian Council of Medical Research, 2010). Gender differences within each age group were insignificant for most of the food groups. Across the five age groups of children, the intake of cereals, pulses, roots and tubers, other vegetables fats and oils, and sugars differed significantly.

Table 2 represents the percentage of participants falling under different classifications of percent adequacy of food group intake. The percent adequacy of intake of different food groups under various categories (<50%, 50-70%, 70-100% and >100% RDA) significantly differed across generations ($p<0.001$). Grandparents, had the highest percent of participants under <50% category of percent adequacies for fruits, milk and milk products, green leafy vegetables (GLVs), and roots and tubers intake. Children had the highest mean percent adequacy of cereal intake (142.8%) and median percent adequacy of intake of milk and milk products (115.4%), other vegetables (102.2%), fats and oils (111.8%) and sugars (145%) respectively as compared to other two generations (parents and grandparents). It was found that around 40 percent of the participants from each generation had inadequate intake of fruits. Majority (85-98%) had inadequate intake of GLVs. Also, a large percent of participants from each generation had percent adequacy of intake of fats and oils >70 percent of the recommended daily amounts. It was seen that around 80 percent of children, 51.7 percent of parents and 26.7 percent of grandparents had median percent adequacy of sugar intake >100 percent of the recommended amounts.

Nutrient Intake

Table 3 gives the mean nutrient intake (both macro- and micro-nutrients) by the three generations. Gender wise differences within each generation were found to be insignificant for most of the nutrients. The mean calorie intake did not differ significantly ($p>0.05$) between grandparents and parents. Table 4 represents the percentage of participants falling under different classifications of percent adequacy of nutrient intake. It was found that the mean percent adequacy of intake of total energy was highest among children (104.4%) and lowest in parents (99.0%) and the differences were significant across generations ($p<0.001$). More than half of the parents (53.0%) and children (59.7%) consumed more than 100 percent of the RDA for energy, while about 49.0 percent grandparents consumed calories between 70-100 percent of

Table 1: Food group intake by generations

Generations	*Median intake of food groups (in grams)*											
	Cereal, grains and products#	*Pulses and legumes*	*Milk/ milk products*	*Fruits*	*Green leafy vegeta-bles (GLVs)*	*Roots and tubers*	*Other vege-tables*	*Meat and poultry*	*Fish*	*Fats and oils*	*Nuts*	*Sugars*
Grandparents (N_1=302)												
Males	410	55	190	65	20	110	155	0	0	20	0	20
(n=139)	(114.3)^	(30.80)	(130.330)	(27.105)	(0.25)	(74.160)	(120.180)	(0.95)	0	(15.35)	(0.10)	(19.35)
Females	376	60	213	60	15	128	150	0	0	25	0	25
(n=163)	(108.2)^	(35.84)	(126.313)	(25.105)	(0.25)	(80.175)	(115.175)	(0.73)	0	(15.35)	(0.10)	(20.35)
Significance (p)	0.005**	0.495	0.888	0.643	0.025*	0.018*	0.258	0.486	0.735	0.522	0.298	0.040*
Parents (N_2=423)												
Males	485	542	66	70	25	165	140	0	0	25	0	25
(n=207)	(116.5)^	(30.70)	(165.396)	(24.140)	(0.40)	(100.220)	(95.186)	(0.135)	(0.74)	(20.30)	(0.5)	(20.30)
Females	424.5	51	260	74	15	160	140	0	0	20	0	20
(n=216)	(113.4)^	(30.70)	(165.380)	(45.140)	(0.35)	(111.199)	(90.175)	(0.130)	(0.71)	(20.30)	(0.10)	(15.30)
Significance (p)	0.000***	0.934	0.654	0.111	0.123	0.453	0.439	0.445	0.673	0.022*	0.92	0.107
Children (N_3=313)												
5-6 years												
Boys	253	28	500	62	18	104	81	0	0	32	0	29
(n=08)	(51.0)	(0.37)	(457.642)	(45.136)	(0.24)	(9.161)	(64.89)	(0.41)	0	(26.35)	0	(21.39)
Girls	247	24	545	75	20	83	122	136	70	35	0	25
(n=11)	(79.6)	(12.37)	(505.635)	(60.125)	(0.40)	(68.135)	(63.130)	(0.240)	(0.108)	(20.50)	0	(25.45)
Significance (p)	0.968	0.545	0.272	0.442	0.109	0.206	0.657	0.033*	0.033*	0.84	0.545	0.395
7-9 years												
Boys	308	41	496	75	25	65	125	0	0	40	0	35
(n=15)	(67.3)	(27.55)	(357.600)	(54.125)	(0.35)	(46.110)	(95.140)	(0.95)	(0.65)	(30.45)	0	(25.45)
Girls	379	47	525	85	0	77	125	0	0	35	0	35
(n=16)	(108.5)	(24.64)	(478.587)	(41.129)	(0.31)	(43.84)	(114.153)	(0.56)	(0.36)	(30.40)	0	(30.44)
Significance (p)	0.049*	0.52	0.953	0.922	0.129	0.953	0.299	0.338	0.654	0.232	1	0.77
10-12 years												
Boys	395	40	550	67	0	82	160	0	0	42	0	45
(n=38)	(74.6)	(0.67)	(483.650)	(0.125)	(0.35)	(42.120)	(119.208)	(0.120)	(0.60)	(35.55)	0	(34.55)
Girls	414	42	480	68	0	100	200	0	0	45	0	42
(n=54)	(127.1)	(0.60)	(383.551)	(0.110)	(0.25)	(80.125)	(146.245)	(0.148)	(0.74)	(35.50)	0	(29.56)
Significance (p)	0.595	0.808	0.002**	0.91	0.461	0.042*	0.038*	0.931	0.759	0.106	0.718	0.823
13-15 years												
Boys	442	62	500	65	25	121	180	0	0	40	0	40
(n=49)	(116.3)	(10.90)	(402.597)	(10.115)	(0.40)	(87.150)	(125.223)	(0.132)	(0.82)	(30.50)	0	(30.50)
Girls	431	41	500	68	25	122	210	0	0	35	0	35
(n=35)	(109.0)	(0.60)	(410.550)	(0.135)	(0.45)	(80.145)	(178.240)	(0.188)	(0.108)	(30.45)	(0)	(25.45)
Significance (p)	0.814	0.083	0.285	0.942	0.817	0.939	0.070	0.831	0.661	0.204	0.746	0.314

Table 1: Contd...

Generations	Median intake of food groups (in grams)											
	Cereal, grains and products#	*Pulses and legumes*	*Milk/ milk products*	*Fruits*	*Green leafy vegeta-bles (GLVs)*	*Roots and tubers*	*Other vege-tables*	*Meat and poultry*	*Fish*	*Fats and oils*	*Nuts*	*Sugars*
16-17 years												
Boys (n=55)	496 (99.3)	70 (52.105)	545 (463.600)	75 (40.140)	15 (0.35)	147 (125.187)	230 (185.260)	0 (0.137)	0 (0.65)	40 (30.50)	0 0	40 (30.50)
Girls (n=32)	454 (100.5)	57 (26.90)	525 (392.597)	66 (20.142)	20 (0.50)	180 (150.204)	212 (186.259)	0 (0.150)	0 (0.72)	35 (30.44)	0 0	35 (26.45)
Significance (p)	0.116	0.053	0.281	0.595	0.517	0.027*	0.641	0.894	0.782	0.077	0.654	0.098

Note: IQR- Inter-quartile range has been given in brackets; ^ Statistics expressed as Mean (SD) rounded off to whole numbers, for normally distributed variables Parametric test (t-test of difference) for assessing difference between genders used; Differences between genders within each generation for rest of the food groups' intake (other than cereals) assessed using Mann-Whitney U test; Significance (p) represents the significance between genders within each generation in their food group intakes; # *p<0.05, **p<0.01, ***p<0.001, Non-significant (p>0.05)

the RDA. Percent adequacy of protein intake was also found to be highest in children (118%) and lowest in parents (80.9%). Yet, more than 60 percent of the participants from each generation had mean percent adequacy of protein intake >70 percent of the RDA. Across generations, the mean percent adequacy of intake of almost all nutrients differed significantly ($p<0.05$). It was also observed that majority (>70%) from all the generations consumed more than 30% of total calories as fat. Also, some of them (grandparents- 18.6%, parents- 15.9% and children- 27.6%) were consuming >35 percent of the total calories as fat which is highly undesirable. Mean percent adequacy of calcium intake for more than 50 percent of the participants from all generations was >70 percent of the RDA. While, the percent adequacy for vitamin A, iron, riboflavin, niacin, folate-total and zinc was below 50 percent of the RDA for majority of the study participants from all generations.

In addition to the food group and nutrient intake, the quantity of cooking oil, *ghee* (clarified butter), sugar and salt purchased and used by each household on monthly basis was used to calculate per capita consumption. Mean per capita consumption of oil was 0.49±0.06 litres/month, clarified butter/*ghee* 0.28±0.1 litres/month and refined sugar 0.52±0.09 kg/month. The consumption of salt was found to be 0.17±0.12 kg/capita/month.

DISCUSSION

The results suggest that food intake in the families had changed over the years, with a greater change observed in the type of foods consumed by grandparents as compared to parents. It was found that decisions about the kind of foods to be cooked and especially the snack items being purchased were influenced mostly by the children. Intake of cereals, fats and sugars was adequate and higher for majority of the study participants as compared to recommendations, with lesser intake of fruits and green leafy vegetables, which ultimately influenced their nutrient intake profiles. For majority of the participants from all generations the micronutrient intake profile was poor for most of the micronutrients while the calorie intake was high. The high intake of calories, a significant amount of

Table 2: Percent adequacy of food group intake among three generations

Generations Food group	Grand parents%	Parents %	Children %	Generations Food group	Grand-parents%	Parents %	Children %
Cereals				*Fruits*			
>100%	64.2	74.9	81.2	>100%	25.5	34.5	31.6
>70-100%	22.3	19.1	16.9	>70-100%	13.6	14.9	15.4
50-70%	9.9	4.3	1.6	50-70%	17.5	14.7	15.0
<50%	3.6	1.7	0.3	<50%	43.4	35.9	38.0
Pulses				*Other Vegetables*			
>100%	30.1	16.3	28.1	>100%	9.3	11.8	49.8
>70-100%	26.2	30.0	26.5	>70-100%	52.6	36.4	32.6
50-70%	15.2	14.7	12.2	50-70%	19.2	23.6	9.9
<50%	28.5	39.0	33.2	<50%	18.9	28.2	7.7
Milk & Milk Products				*Sugars*			
>100%	35.8	48.5	68.4	>100%	51.7	26.7	79.9
>70-100%	19.5	19.1	24.3	>70-100%	23.2	35.7	16.9
50-70%	20.2	14.2	5.4	50-70%	14.2	14.9	2.6
<50%	24.5	18.2	1.9	<50%	10.9	22.7	0.6
Roots & Tubers				*Visible Fat*			
>100%	7.9	25.3	33.5	>100%	41.1	29.3	51.1
>70-100%	33.4	35.7	35.1	>70-100%	26.5	37.8	35.4
50-70%	18.6	15.4	17.3	50-70%	12.9	13.3	10.3
<50%	40.1	23.6	14.1	<50%	19.5	19.6	3.2
Green Leafy Vegetables							
>100%	0.0	0.5	0.0				
>70-100%	1.0	5.4	0.0				
50-70%	0.3	6.6	2.6				
<50%	98.7	87.5	97.4				

Table 4: Nutrient intake adequacy among three generations

Generations Food group	Grand parents%	Parents %	Children %	Generations Food group	Grand-parents%	Parents %	Children %
Energy	%	%	%	*Vitamin A*	%	%	%
>100%	36.8	53.0	59.7	>100%	6.0	5.0	12.5
>70-100%	49.0	44.0	38.1	>70-100%	22.5	32.1	30.0
50-70%	12.5	3.0	2.2	50-70%	21.9	27.4	21.7
<50%	1.7	0.0	0.0	<50%	49.6	35.5	35.8
Protein				*Thiamine*			
>100%	36.1	15.6	65.8	>100%	15.6	19.9	17.6
>70-100%	33.1	56.2	24.0	>70-100%	28.8	35.0	31.3
50-70%	22.5	23.7	8.6	50-70%	27.5	32.6	29.4
<50%	8.3	4.5	1.6	<50%	28.1	12.5	21.7
Calcium				*Riboflavin*			
>100%	26.0	18.9	26.5	>100%	1.3	0.9	0.6
>70-100%	34.3	47.0	41.5	>70-100%	9.3	9.7	16.3
50-70%	18.6	21.1	19.5	50-70%	28.9	32.2	30.0
<50%	21.1	13.0	12.5	<50%	60.5	57.2	53.1
Iron				*Niacin*			
>100%	7.0	11.8	2.6	>100%	4.3	6.6	10.2
>70-100%	15.5	21.3	9.9	>70-100%	15.9	24.4	19.8
50-70%	27.8	28.8	19.8	50-70%	20.3	24.8	26.2
<50%	49.7	38.1	67.7	<50%	59.5	44.2	23.8
Folate-Total				*Zinc*			
>100%	2.0	9.3	17.2	>100%	5.6	4.0	2.2
>70-100%	13.2	35.9	24.0	>70-100%	7.3	7.6	16.9
50-70%	23.8	26.7	24.3	50-70%	12.6	21.3	22.4
<50%	61.0	28.1	34.5	<50%	74.5	67.1	58.5

Table 3: Nutrient intake by different generations

Generations	*Energy (Kcal)*	*Protein (g)*	*Fat (g)*	*Carbo-hydrate (g)*	*Calcium (g)*	*Vitamin A(mcg)*	*Iron (mg)*	*Thiamine (mg)*	*Ribo-flavin (mg)*	*Niacin (mg)*	*Folate-Total (mcg)*	*Zinc (mg)*
Grandparents (N_1=302)												
Males	2136.6	51.5	87.5	289.3	594.9	330.3	10.4	0.78	0.62	6.9	93.3	4.1
(n=139)	(361.6)	(18.7)	(25.7)	(71.0)	(205.0)	(152.0)	(5.0)	(0.3)	(0.2)	(3.1)	(41.3)	(2.3)
Females	2127.9	49.2	87.5	285.4	517.7	349.4	10.3	0.82	0.6	7.9	98.9	4.9
(n=163)	(470.3)	(18.9)	(26.1)	(74.1)	(208.2)	(104.0)	(5.5)	(0.3)	(0.2)	(4.3)	(41.5)	(2.6)
Significance (p)	0.859	0.044*	0.998	0.1	0.001**	0.526	0.957	0.323	0.925	0.020*	0.245	0.010*
Parents (N_2=423)												
Males	2449.7	48.5	90.8	349.4	487.7	382.1	12.1	0.93	0.68	8.6	136.8	4.6
(n=207)	(408.1)	(9.7)	(22.6)	(70.4)	(128.9)	(139.3)	(5.5)	(0.28)	(0.22)	(3.4)	(48.6)	(2.0)
Females	2419.8	44.5	97.6	338.1	465.2	351	12	0.9	0.63	9.1	133.4	5.1
(n=216)	(438.2)	(11.8)	(28.5)	(72.5)	(150.9)	(151.0)	(6.2)	(0.35)	(0.27)	(4.1)	(49.4)	(2.4)
Significance (p)	0.469	0.000***	0.007**	NS	0.248	0.029*	0.812	0.294	0.029*	0.187	0.476	0.557
Children (N_3=313)												
5-6 years												
Boys	1444.6	26.1	59.1	208.4	586.8	319.8	6.9	0.45	0.4	5.4	62	3.3
(n=08)	(162.5)	(10.9)	(6.7)	(56.4)	(77.4)	(43.9)	(2.7)	(0.1)	(0.1)	(1.0)	(27.2)	(1.1)
Girls	1450.1	34.4	57	210.1	708.8	354.5	6.9	0.5	0.5	6.9	64.3	2.9
(n=11)	(342.2)	(6.8)	(12.7)	(60.4)	(149.8)	(57.2)	(2.7)	(0.1)	(0.1)	(2.8)	(41.9)	(1.3)
Significance (p)	0.395	0.075	0.968	0.778	0.001**	0.206	0.968	0.31	0.03*	0.177	0.84	0.442
7-9 years												
Boys	1970.7	41.2	80.9	271	681.7	421.5	10.5	0.8	0.6	9	95	3.8
(n=15)		(359)(10.8)	(17.1)	(60.9)	(120.4)	(142.3)	(4.3)	(0.2)	(0.1)	(3.8)	(64.4)	(0.9)
Girls	1857.4	36.5	78.3	259.5	561.3	291.1	9.1	0.4	0.5	6.9	65.8	4
(n=16)	(399.4)	(14.3)	(20.3)	-29.6	(104.1)	(86.6)	(4.1)	(0.1)	(0.1)	(4.3)	(25.0)	(2.6)
Significance (p)	0.232	0.151	0.188	0.056	0.012*	0.009**	0.495	0.000***	0.247	0.086	0.163	0.892
10-12 years												
Boys	2264.9	50.4	82	324.7	614.9	301.9	9.9	0.8	0.6	8.3	109	4.8
(n=38)	(325.5)	(12.4)	(22.7)	(109.2)	(200.8)	(151.6)	(4.6)	(0.3)	(0.2)	(6.0)	(66.0)	(1.9)
Girls	2313.2	51.4	88.9	334.1	585.9	343	10.9	0.7	0.5	7.4	105.5	4.1
(n=54)	(360.3)	(12.9)	(21.8)	(110.5)	(176.3)	(135.4)	(6.0)	(0.3)	(0.2)	(3.5)	(50.0)	(1.7)
Significance (p)	0.584	0.634	0.228	0.651	0.258	0.206	0.587	0.871	0.606	0.683	0.8	0.055

Table 3: Contd...

Generations	*Energy (Kcal)*	*Protein (g)*	*Fat (g)*	*Carbo-hydrate (g)*	*Calcium (g)*	*Vitamin A(mcg)*	*Iron (mg)*	*Thiamine (mg)*	*Ribo-flavin (mg)*	*Niacin (mg)*	*Folate-Total (mcg)*	*Zinc (mg)*
13-15 years												
Boys	2437.3	59.1	98.1	342.5	660	451.3	12.7	0.8	0.6	9.8	106.9	6.9
(n=49)	(431.7)	(17.6)	(22.9)	(98.5)	(217.1)	(174.4)	(4.3)	(0.3)	(0.2)	(4.2)	(47.6)	(3.0)
Girls	2546.2	60.6	95	330.3	603.9	419.3	12.2	0.8	0.7	10	102.9	6
(n=35)	(390.1)	(19.9)	(24.8)	(101.8)	(143.3)	(163.1)	(6.6)	(0.2)	(0.2)	(4.))	(45.3)	(2.5)
Significance (p)	0.931	0.747	0.207	0.13	0.153	0.523	0.129	0.212	0.013*	0.928	0.615	0.219
16-17 years												
Boys	2689.8	68.7	98.7	378.8	662.2	363.9	11.1	0.9	0.7	9.7	116.9	4.5
(n=55)	(325.7)	(20.2)	(25.8)	(105.3)	(279.6)	(168.2)	-4.9	(0.2)	(0.2)	(6.2)	(56.3)	(2.1)
Girls	2572.1	69.2	93.7	382.5	595.7	421.6	11.5	1	0.7	9.8	138	4.6
(n=32)	(268.5)	(18.5)	(23.3)	(90.5)	(155.3)	(189.3)	-4.4	(0.2)	(0.3)	(5.1)	(56.3)	(1.6)
Significance (p)	0.175	0.393	0.000***	0.476	0.107	0.194	0.504	0.215	0.523	0.47	0.081	0.549

Note: Statistics expressed as Mean (SD) for all variables; Significance (p) represents the significance between genders within each generation in their nutrient intakes; #*p<0.05, **p<0.01, ***p<0.001, Non-significant (p>0.05)

which was coming from fat, needs to be reduced. More than 35 percent of energy coming from fat has been linked to increased risk of cardiovascular diseases (WHO 2011). B- complex vitamins and certain minerals like iron, folate and zinc are generally deficient in the diets and deficiencies have been linked to increased morbidity and mortality especially in vulnerable age groups - children, elderly and women of child-bearing age (Kotecha and Lahariya 2010; Kotecha 2008).

Percent adequacy of intake of green leafy vegetables was <50 percent for the majority in all generations. This could also be attributed to the fact that the survey period was mostly the summer months when very few green leafy vegetables are available in the study region. Fruit consumption was also less in all generations. Nevertheless, their intake should be increased as they have a protective effect on health. A study by Wang et al. (2014) reported that an increase in the intake of fruits and vegetables can provide diversity and thereby improve the micronutrient profile of people accompanied with positive health effects.

On the other hand, intake of cereals, milk and milk products, fats, sugars, roots and tubers was adequate for a large percent of the study population. Studies have reported strong positive association between diets rich in fruits, vegetables, complex carbohydrates and health (Minocha et al. 2018; Peterson et al. 2017; Springmann et al. 2016).

The diets of grandparents had a poor nutritional profile as compared to their children and grandchildren. It may be due to the reason that their intake in terms of frequency and quantity was lesser and also, they had a lower intake of nutrient rich foods like fruits, green leafy vegetables, pulses etc. Other studies also support the finding that with ageing the calorie intake is reduced and there is sub-optimal intake of nutrients (Giezanaar et al. 2016; Pan et al. 2014). However, few studies also contradict the finding as they found an increase in calorie intake with increasing age (Johnston et al. 2014; Watanabe et al. 2004). Similarly, for other macro- and micronutrient intakes, a decline has been documented by some researchers (Hickson 2006; Volkert et al. 2004). Moreover, mostly the elderly group was dependent on the family for their basic

needs including food, hence most of them consumed what was served to them. Ultra-processed foods were being consumed by all three generations probably resulting in a high intake of calories and fat. Studies have reported a strong positive link of consumption of calorie dense foods with obesity (Costa et al. 2018; Monteiro et al. 2018; Poti et al. 2017).

CONCLUSION

Hence, it could be concluded that changes in the food consumption have been observed among grandparents and parents over the years which have been more towards ultra-processed food consumption due to convenience factor and variety in the types of food available in the market. Children were reportedly the decision makers in the types of foods selected and prepared at home although many families felt that mothers had a significant role to play. Grandparents on the other hand were dependent on their children and grandchildren for making decisions pertaining to food selection and cooking. More than half of parents and children exceeded the recommended allowances for energy. Majority (more than seventy percent) of the respondents consumed more than 30 percent of total calories as fat. These findings need to be correlated with their physical activity levels and BMI. For majority of the participants from all generations the micronutrient intake profile was poor for most of the micronutrients, as was the intake of fruits and green leafy vegetables.

RECOMMENDATIONS

The study throws a light on family dynamics related to food selection. It highlights a need for effective strategies to improve the nutritional quality of diets of urban Indian families as a whole rather than the present focus on specific age groups. Information on healthy eating, healthy food selection, should be communicated to all the members of the family. Strategies, implementing modifications in traditional recipes to make home cooked diets healthier, should be explored. The food industry urgently needs to rework their product formulations to decrease the fat, salt and sugar in the ready to eat packaged food products which have become an integral part of urban diets.

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