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Assessment of food consumption pattern in Uttar Pradesh: A dietary diversity study

V SANGEETHA[1], PREMLATA SINGH[2], G S MAHRA[3], SUJIT SARKAR[4], P VENKATESH[5], SATYAPRIYA[6], B S TOMAR[7] and MONIKA WASON [8]

ICAR-Indian Agricultural Research Institute, New Delhi 110 012

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ABSTRACT

Nutrition status of people is decided by the dietary habits of people of a region and it has substantial implications for the quality of life of its population. In this background, a study had been undertaken with the objective of understanding dietary habits with special reference to dietary diversity and nutritional status among rural population. The study is based on the primary data collected in Baghpat district of Uttar Pradesh during the year 2014-15. The body mass index, one of the indicator of nutrition status reveals about 10 per cent men, 20 per cent women, 30 per cent boys and 35 per cent girls were coming under underweight and remaining fell in overweight category. Nutrition awareness among the female groups was better than male groups and anganwadi workers were the key informants. The actual consumption of all the food groups were about 50 per cent less than the recommended dietary allowance (RDA) across all the categories. Home produced milk consumption was near to RDA and market depended pulses were more deficient in their consumption. The Individual Diet Diversity Score (IDDS) ranged from 7.6 to 8.0; womens' dietary diversity score was slightly less than men, similar was the case with children. Simpson Index of Dietary Diversity (SIDD) ranged from 0.69 to 0.77. As evidenced from this study, household production enhances food accessibility, hence, promotion of diversified cropping pattern could be a right strategy for enhancing nutritional security in rural areas. Further, this study suggests to target men as well women for sensitization and awareness programme about importance of food and nutrition to achieve nutritional security of all in particular women.

Key words: Consumption pattern, Dietary diversity, Individual Diet Diversity Score (IDDS), Simpson Index of Dietary diversity (SIDD), Nutritional status, Knowledge about nutrition

Despite economic advantages, India is home to the highest number of undernourished people (194.6 million) in the world (FAO 2015) and largest number of stunted children in the world, with a worse child stunting prevalence (Spears 2013). Evidence is accumulating that early childhood height deficits can lead to severe lifelong economic, health, and cognitive repercussions (Spears 2012). Ruel (2002) defines dietary diversity as "the number of different foods or food groups consumed over a given reference period". According to Hoddinott (2002), dietary diversity can be viewed as a proxy measure of food security. A diet, which is sufficiently diverse may reflect nutrient adequacy (Kennedy *et al*. 2009, Swindale and Bilinsky 2005). Dietary diversity has been estimated to have a greater potential of meeting nutrient requirements because no single food can have all nutrients (Labadarios *et al*. 2011). Food security can be reflected or positively correlated with dietary diversity (Styen *et al*. 2006, Ajani 2010, Bernal and Lorenzana 2003); dietary diversity as a food security indicator (Thorne-Lyman *et al*. 2010). Vakili *et al*. (2013) suggested that, dietary diversity at individual level can be used as a reflection of dietary quality. The dietary habits of people of a region have substantial implications for the quality of life of its population. Diets with greater variety of foods or food groups are associated with greater energy and nutrient intake (Kant 2004, Rose *et al*. 2002, Tarini *et al*. 1999). Dietary diversity has also been positively linked with the three pillars of food security, i.e. availability, access and utilization which is evidenced by empirical studies (Bernal and Lorenzana 2003, Styen *et al*. 2006, Hillbrunner and Egan 2008). Dietary diversity is directly correlated to quality of diets and inversely related to malnutrition (Azadbakht *et al*. 2005, Styen *et al*. 2006). Eating a variety of foods is an internationally accepted recommendation for a healthy diet, good nutrition and positive health outcomes such as reduced incidence of

[1]Scientist (e mail: sangeetha@iari.res.in), [2]Principal Scientist and Head (e mail: premlataashok@gmail.com), [3]Scientist (e mail: girijeshmahra22@gmail.com), [6]Senior Scientist (e mail: satyapriya@iari.res.in), [8]Principal Scientist (e mail: monikawason@yahoo.com), Division of Agricultural Extension, [5]Scientist, Division of Agricultural Economics (e mail:venkateshp@iari.res.in), [7]Principal Scientist and Head (e mail: bstomar@iari.res.in), Division of Vegetable Sciences, ICAR-Indian Agricultural Research Institute, New Delhi. [4]Scientist (e mail: sujitgovt@gmail.com), RRS-Kalimpong.

cancer or mortality. The level of diversity in individual's diets is an indirect measure of diet quality or the extent to which nutritional needs of the individuals are being met.

Therefore, understanding dietary diversity may be an alternative and easier pathway to assess household level food security (Taruvinga *et al*. 2013, Thorne-Lyman *et al*. 2010, Headey and Ecker 2013). The dietary diversity of people of a region is determined by a variety of factors including agricultural biodiversity in the region and diversity of its farming systems (Jones *et al*. 2014, Oyarzun *et al*. 2013, Herforth 2010). In this context it is of interest to know level of nutritional status; role of households' production; awareness about the nutrition and their sources; food consumption pattern and level of dietary diversity especially in the rural areas. In this background, a study had been conducted in Baghpat district of Uttar Pradesh with the objective of understanding food consumption habits with special reference to dietary diversity and nutritional status among rural population.

MATERIALS AND METHODS

The study is based on the primary data, which was collected from Baghpat district of Uttar Pradesh (UP) during 2014-15. UP state was purposively selected for this study as many studies indicated it is one of the worst affected states in India in terms of nutrition. Visaria and Visaria (2003) reported that Bihar, Madhya Pradesh and UP were the states in the bottom of the nutrition league in India and malnutrition situation in Uttar Pradesh is in general worse than for the country as a whole. The study conducted by IIPS and GoI (2006) indicated that 56 per cent of children in UP as whole are malnourished. The National Family Health Survey (NFHS-3) 2005 data show that stunting prevalence among under-fives ranges 57 per cent in UP. Hence, the survey was conducted in a cluster of villages namely Lechchoda, Sunnehra and Bassi from Khekada tehsil located in Baghpat district of UP. The respondent groups comprised 60 adults (30 men and 30 women) and 60 school children (30 girls and 30 boys); they were selected randomly and the total sample size was 120. Among the respondents, children were under twelve years of age and adults were over 20 years of age. The study was conducted in the year 2014-15. The paper specifically examines the food consumption pattern and dietary diversity. The 24 hour recall was administered to the individual respondents during the above period. As per FAO guidelines (FAO 2011) for dietary diversity, study reference period usually ranges from one to three days, but seven days is also used. In this study, 24-hour recall period was used to record quantity and number of food items consumed by respondents.

One of the commonly used indicators for assessment of healthy dietary habits is 'dietary diversity', which measures the number of different types of food items included in a food basket. Dietary diversity is usually measured by summing or counting the number of food groups consumed over a reference period (Ruel 2002, Vakili *et al*. 2013, Onyango *et al*. 1998). It may be defined as the variety of foods across and within food groups capable of ensuring adequate intake of essential nutrients that can promote good health (WHO/ FAO 1996).

Questionnaires were quite exhaustive with almost all types of food items generally consumed by rural inhabitants of Uttar Pradesh state represented. They not only included foods prepared and consumed within the household, but also those that were consumed outside (e.g. hotels, street vendors, social functions and children's mid-day meal programmes) including processed food items, beverages and other items. The aspects related to food intake such as the shares of various food items in total expenditure were also probed.

Measurement of dietary diversity is challenging and methodologies are still being evolved such as the selection of food items to be counted, numbers, grouping and quantity of food items. Other aspects are selection of reference period and scoring systems to be considered. The studies on dietary diversity can be classified into two groups; one is number based Individual Diet Diversity Score (IDDS) (FAO 2013, FAO 2008, Swindle and Bilinsky 2005, Yuan-Ting Lo 2012) and other one is both number and quantity based Simpson Index of Dietary Diversity (SIDD) (Stewart and Harris 2005, Katanoda *et al*. 2006, Thiele and Weiss 2003, Van Trijp *et al*. 1992, Lee 1987, Patil and Taillie 1982, Shinoj *et al*. 2015). In this study, we adopted both IDDS and SIDD methods to analyse diversity in the consumption basket of respondents. IDDS was calculated by using Food and Agricultural Organization (FAO 2013) methodology which consisted of sixteen food groups namely, cereals, white tubers and roots, Vitamin A rich vegetables and tubers, dark green leafy vegetables, other vegetables, Vitamin A rich fruits, other fruits, organ meat, flesh meat, eggs, fish and sea food, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, spices, condiments and beverages. These sixteen groups were eventually combined into 12 food groups to arrive at IDDS indicator. Individual scoring method is more suited when there is more consumption of outside foods or snacks. Simpson Index of Dietary Diversity (SIDD) is a measure of diversity which tells as the richness and evenness of the food groups we consume. The SIDD was estimated using following formula:

$$SIDD = 1 - \sum_{i=1}^{n} Pi^2$$

where, Pi is the proportion of i^{th} food item in consumption of all food items by members of the household. The daily estimates were subsequently averaged to get the final SIDD estimate. SIDD index ranges between 0 and 1, whereas '0' indicates complete specialization and '1' indicates more diversity. Separate scores of SIDD were obtained for different individual groups (men, women, boys and girls) for comparison.

The Body Mass Index (BMI) was chosen to record the nutritionals status of the respondents. The necessary information of weight and height of the respondents were also recorded with electronic weighing scale and measuring tape. The BMI was calculated by using the following formula

BMI = Weight in kilograms/ Height in meters^2

RESULTS AND DISCUSSION

The socio-economic profile of the adult respondents is given in Table 1. As far as children concerned, the survey restricted only to the food intake information and nutrition awareness level. The adult respondents were on an average 40 years old and majority of them had higher secondary education (41.7 per cent). Average monthly income of the households was about ₹ 8000. On an average, 32 per cent of the income was spent on food by the respondents. About 62 per cent of their families were nuclear families and majority of them were vegetarian (98 per cent). About 2/3rd of the respondents had 2 meals per day and they mostly skipped breakfast. But good diet says that eat breakfast like a king. It was not at all followed. Many literatures stressed the severe consequences of missing breakfast on physical and mental growth (Adolphus *et al*. 2013, Juan *et al*. 2013, Morgan *et al*. 1981); in maintaining normal BMI (Szajewska and Ruszczynski 2010, de la Hunty *et al*. 2013); affects learning behavior (Hoyland *et al*. 2009); favourable nutrient intakes (Deshmukh-Taskar *et al*. 2010, Balvin Frantzen *et al*. 2013, Gibson 2003) etc.

Nutrition status and knowledge about nutrition

Nutrition status of men, women and children were calculated using Body Mass Index (BMI) is presented in Table 2. Based on BMI (WHO 2006), the respondents have been classified into underweight, normal and overweight with sub-class in each category. The results show that altogether 18 per cent men, 33 per cent women, 47 per cent boys and 58 per cent girls were falling under underweight, category. It clearly reveals that the children are undernourished than adults and in particular girls were more undernourished among the all categories. The UNICEF underscores that malnutrition lowers the body's ability to resist infection, leads to longer, more severe and more frequent episodes of illness, infections cause loss of appetite, mal-absorption and metabolic and behavioral changes. These, in turn, increase the body's requirement for nutrients, which further affects young children's eating pattern (UNICEF 1998). It is to be noted that girls are going to be the carrier of passing the genetical and physical vigour to next generation and their health needs some special care, however, they have not been given due care in the study area. Over weight was not the major problem among children as only less than 8 per cent of them coming under this category. However, in case of adults, it is the cause of concern as one fourth of men and one fifth of women fell under overweight category. It has been well documented in previous studies that overweight is associated with dietary patterns (Pourhassan and Najafabadi 2009, Stubbs and Lee 2004, Shetty 2002).

Table 1 Socio-economic profile of the adult respondents (n=60)

Particulars		Particulars	
Average age (years)	39.9	Diet habit	
Education		Veg (%)	98
Illiterate (%)	18.3	Non-Veg (%)	2
Primary (%)	26.7	Meals frequency	
Up to higher secondary (%)	41.7	3/day (%)	34
Above higher secondary (%)	25	2/day (%)	66
Family type		Livestock	82
Joint (%)	38	Average income of the households (₹/month)	8000
Nuclear (%)	62	Percentage of income spent on foods (%)	32

Table Classification of underweight, overweight and obesity according to BMI N=120

Category	BMI (kg/m^2)	Men	Women	Boys	Girls
Underweight	<18.50	18.0	33.0	47.0	58.0
Normal (healthy weight)	18.5 to 24.99	46.0	43.0	43.0	39.0
Overweight	≥ 25-29.99	26.0	19.0	8.0	5.0
Obese Class I (Moderately obese)	30.00 – 34.99	10.0	5.0	0.0	0.0
Obese Class II (Severely obese)	35.00 – 39.99	0.0	0.0	0.0	0.0
Obese Class III (Very severely obese)	≥40.00	0.0	0.0	0.0	0.0

The knowledge level of the respondents were calculated and depicted in Fig 1. The knowledge test was estimated by using series of questions about nutrition such as food sources of nutrients; functions of nutrients; nutrients for pregnant women; importance of breast milk and about nutrient rich varieties and crops etc. and scores were assigned for each question. The range of the score was 0 to 120. Based on the score, they have been classified into three categories namely low (<40), medium (40-80) and high (>120). It is surprise to note that although men and boys scored well in case of BMI, they had low level of knowledge related to nutrition. As compared to women and girls. About 41 per cent of the boys and 56 per cent of men had low level of knowledge on nutrition. Whereas, the knowledge per centage was 28 and 54 for girls and women respectively. Discussions during the survey revealed that women (70%) were more exposed to *anganwadi* workers and as they were most important targets in ICDS programme, which enhanced their nutrition awareness. It is to be noted that knowledge level and nutritional status is not having much relation. As many factors such as genetic makeup, food habits, taste and preference, food access and other invisible factors determines the nutritional status, rather awareness about nutrition. Ramachandran (2013) also noted that height is determined by gene, environment and other factors; dietary intake and weight is past undernutrition and current nutritional status. Further, she also reported that low BMI and low dietary intake is highly correlated and it has consequences of low manual work capacity and

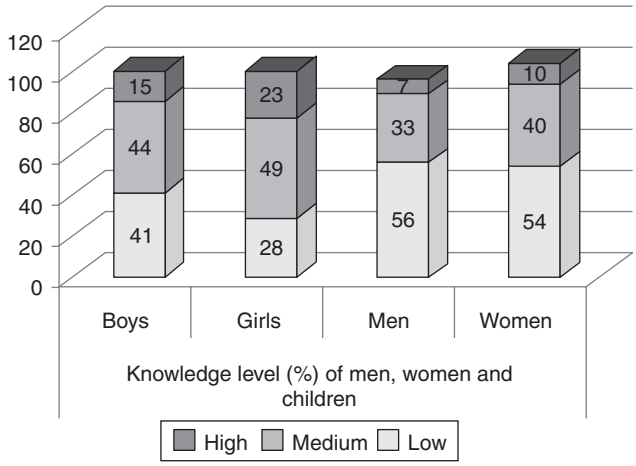

Fig 1 Knowledge level (%) of men, women and children

highly susceptible for infection. It indicates low BMI in rural areas could affect the agricultural productivity as it requires heavy manual work.

The source of information about nutrition is one of the major factor for policy makers to conduct the successful nutrition intervention programmes. It will help to develop suitable strategies to target different categories such as men, women, and children. Therefore, a detailed analysis was carried out about the respondents' source of information. In general, television emerged as the major information source for the respondents as more than one third of the respondents in each category received information from this source. And none of the other sources like mobile, relatives and neighbors sources were relevant to the respondents, except women. As far as women concerned, *angawadi* workers emerged as the key information source as 70 per cent of the respondents depended on it. Apart from this, ICDS, SHGs, *mahila mandals* were also played a key role in catering nutrition information to the rural women.

Food consumption pattern and dietary diversity

This section discusses about actual consumption of food items and the level of diversity in diet. Based on the response of 24 hour recall period, the respondents' actual consumption was collected and presented in Table 3. The respondents were asked to list out the food items consumed in household measurements and it was later converted by using standard conversion factors as suggested as raw ingredients and cooked portions of some commonly consumed Indian foods (Chadha and Mathur 2015) to arrive at the exact quantity of food items consumed.

Perusal of Table 3 clearly indicates that per-capita consumption of all the food items were less than the recommended dietary allowance (RDA). Cereals were the major contributor of food security of the people and the respondents' average consumption of cereals ranged from 150-200 g/day, whereas the RDA was about 400g, indicating only 50% of the required amount of cereals being consumed by the respondents. Similarly, pulses, vegetables and edible oils, all have witnessed lesser consumption of the required

Table 3 Average per-capita consumption of food items (g/day)

Category		Cereals	Pulses	Vegetables	Edible oils	Milk and milk products
Children	Girls	150	40	118	8	252
		(-63)	(-50)	(-61)	(-73)	(-16)
	Boys	204	26	148	10	233
		(-49)	(-68)	(-51)	(-67)	(-22)
	Average	177	33	133	9	242
		(-56)	(-59)	(-56)	(-70)	(-19)
Adults	Women	167	18	99	5	246
		(-58)	(-78)	(-67)	(-83)	(-18)
	Men	200	32	135	17	268
		(-50)	(-60)	(-55)	(-43)	(-11)
	Average	183	25	117	11	257
		(-54)	(-69)	(-61)	(-63)	(-14)
Average share of home produce in total consumption (%)		57	0	55	70	100
RDA*		400	80	300	30	300

Note: *Recommended dietary allowance (RDA) for moderately active person was collected from NIN (2011) and figures in parentheses indicates percentage difference in accrual consumption and RDA

diet. The deficiency percentage of these food items was in tune of more than 50% and highest being recorded for females (about 80%) in case of pulses and edibles oils. However, milk consumption was appreciably near to RDA and deficiency percentage was about 20%. The reasons for the large differences among the food items were probed. It was emerged that the home production is the key factor, which determines household food consumption pattern. The share of home produce in total cereals consumed was about 50%, 55% in vegetables, 100% in milk, 0% in pulses, and 70% in case of edible oils. It clearly explains that cropping pattern and availability enhance their food accessibility and in turn consumption. In study area, almost all the households were having milch animals and no pulses crops were found in their cropping pattern, which clearly reflected in their consumption pattern. It can be noted that the respondents were self-reliant for about half their cereals, milk and oil, but relied on outside sources such as local market or the public distribution system for most of their fresh fruits and vegetables, particularly for pulses.

Dietary diversity is an important indicator which is used for measuring nutrient adequacy. The IDDS scores of the respondents' is presented in Fig 2. In general, it was found that IDDS was medium ranging from 7.6 to 8 with minor differences in gender. Ruel (2002) also reported that one of the most important challenges in developing countries is lack of dietary diversity in rural areas. Overall, male groups were having marginally higher scores than their counterparts, both in adults and children groups. This may be due to the fact

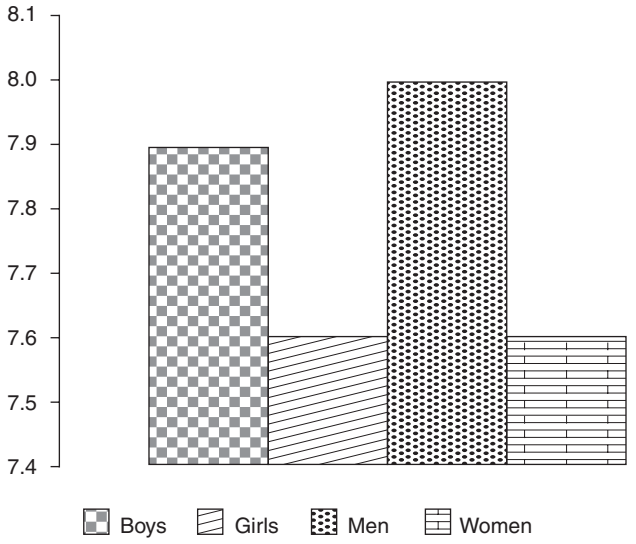

Fig 3 Individual dietary diversity scores based on food groups

that male groups were having more access to foods within households and outside than females, which increased their diversity. And some of the female respondents reported that food preparation itself make them aversion of some foods, which could influence their diversity score. In particular, women of the family mostly eat only after completion of eating by all family members. It might reduce their access to variety of food items as sometimes some food items might have finished. It is to be mentioned that order of food intake at the household level directly could not be collected, however, during the discussion some of the respondents revealed that women were taking food after men which conforms FAO report, where they mentioned that women were the last to eat in many developing countries due to their social customs (FAO 2006).

Although IDDS measures diversity, the quantity is not being taken into account in this method. Therefore, Simpson Index of Dietary Diversity (SIDD) was calculated to know the richness and variety of food items consumed. The SIDD scores were displayed in Fig 3. It was ranged from 0.69 to 0.77. There was minimal variation in diet diversity scores among the different categories of respondents. Similar to IDDS, slightly higher SIDD scores were found in the male groups than their counterparts. This may be due to the fact that the intake of food quantity was relatively high in male groups as compared to female groups.

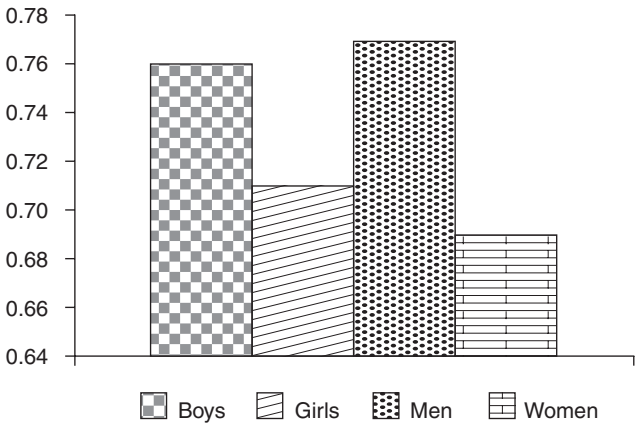

Fig 4 Simpson Index of Dietary Diversity (SIDD)

The nutritional status of the rural households as indicated by body mass index revealed that more than half of the respondents were either underweight or obese. More awareness by women about food and nutrition than their counterparts directly not translated into their nutritional status, which is evident by the high incidence of underweight in female groups. But this better awareness of women significantly contributed for improvement of nutritional status of their family members. Actual consumption of food by different groups were also not meeting the RDA. Household production directly related with accessibility of food items, for example, home produced milk consumption was near to RDA, whereas more deficient consumption in pulses as it was mostly purchased from markets. Hence, this study suggests promotion of diversified cropping pattern, biofortified food crops and nutrient rich varieties as a right strategy for enhancing nutritional security in rural areas. Food consumption pattern evidenced by dietary diversity score also clearly indicates that female groups were not as good as male in food intake. Hence, this study concludes that, although many nutritional programmes targeted women, yet the desired results were not achieved, which seeks more attention from policy makers to make this vulnerable group more nutritious and healthy. Therefore, this study suggests to target men equally as women for sensitization and awareness programme about importance of food and nutrition to achieve nutritional security of all in particular women.

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