

## ORIGINAL ARTICLE

## Extent of awareness and prevalence of adulteration in selected food items in rural Dehradun

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<a href="#">Abstract</a>	<a href="#">Introduction</a>	<a href="#">Methodology</a>	<a href="#">Results</a>	<a href="#">Conclusion</a>	<a href="#">References</a>	<a href="#">Citation</a>	<a href="#">Tables / Figures</a>
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### Abstract

**Background:** Adulteration of food items is common phenomenon in India. It includes both willful adulteration to improve texture and quality of food items and supply of substandard food items. The usual outcomes is outbreak of food borne illness. **Aims & Objectives:** i) To estimate the prevalence of food adulteration in selected food items ii) the awareness of subjects regarding food adulteration act and iii) their buying practices. **Material and Methods:** Sample size: 150 households was sampled, based on prevalence of adulteration to be around 50%, with 95% confidence interval and absolute allowable error of 10%. Sample household were drawn from the selected villages randomly. Pre-designed and pretested questionnaires was administered to fulfill the objectives and food items were tested using NICE food adulteration kit. Data were analyzed by numeral with percentage, Pearson's correlation test and F test. **Results:** In 59.3% households, housewives purchased the food items for the house. The prevalence of adulteration ranged from 17.3% to 66.2% in selected food items. Loose product was purchased by 54.3%. The food labels on packed items was not read by 86.3%. Mean percentage of purity was highest among literates (57.3 ± 12.3) than illiterates and those having primary education. Statistically significant F ratio was seen for mean percentage of purity and respondent's literacy status. **Conclusion:** Adulterant is rampant in poor strata of society due to consumer's illiteracy and lack of awareness towards food safety rules.

### Keywords

Adulteration; Awareness; Social class; Education; Food adulteration act

### Introduction

Food adulteration in India is usually done willfully by adding substandard quality of food which usually does not conform to food standard guidelines as recommended by FSSAI. Adulteration consists of a large number of practices, e.g., mixing, substitution, concealing the quality, putting up decomposed foods

for sale, misbranding or giving false labels and addition of toxicants. Food adulteration has always been considered a crime against humanity, because any mode of adulteration is harmful for humans and profit is only for those merchants and business men who are involved in such activities. Hardly any food material in today's world is spared from such spurious practice. Adulteration mainly results in two

disadvantages for the consumer: first he is paying more money for a foodstuff of lower quality; secondly, some form of adulteration are injurious to health, even resulting in paralysis and death (1). In the year 2002, Times of India, Hyderabad quoted the following news article in their daily: "There might be iron filings in the sugar you use, including what is distributed through fair price shops all over the state. (2) National health account 2004-05 shows that minimal 0.3% of International classification of Health Accounts function is spent on prevention of food adulteration (3). Another shocking and unbelievable revelation was made in 2007 when the Food and Drug administration (FDA) Mumbai, said that "nearly 25% of the milk produced in the state is found to be adulterated"(4). According to government data during 2013 -14 (5) all over across the country 20% of the food items that is served in restaurants and fast food outlets have been found to be substandard or adulterated. Multiple food laws has been replaced by FSSAI which came into effect on August 2011 and has become standard setting bodies and enforcement agencies with one integrated food legislation. It found to their astonishment that across the nation contamination was seen on an average in 13 % of both packaged and loose food items. The adulteration rate was seen to be as high as 40% in Chhattisgarh, followed by 34% in Uttarakhand, 29% in Uttar Pradesh, 23% in Rajasthan and 20% each in Himachal Pradesh and West Bengal (6). Another study conducted by Society of Pollution and Environment Conservation Scientists (SPECS), found 83 % food samples collected from markets to be adulterated along char dham yatra routes in Uttarakhand (7).

The main causes of food adulteration are due to lack of effective coordination, loopholes in food adulteration act (8), lack of government initiative, politicians not raising their voice and common people not being conscious of their responsibilities towards food adulteration (9).

Scarcity of reliable data more so in rural areas regarding the extent of adulteration reflects lack of attention and focus on this burning issue to the law makers. Present study was therefore carried out in the rural area and is an attempt to highlight the social issue and make recommendations to combat the problem.

## Aims & Objectives

1. To estimate the prevalence of food adulteration in selected food items.
2. To estimate the awareness of subjects regarding food adulteration act
3. To assess their buying practices.

## Material & Methods

The present study was descriptive cross sectional study conducted in the rural field practice area of Department of Community Medicine located in Doiwala block for a period of six months from January to June 2015. Since adulteration is rampant in society, we took the prevalence of adulteration to be around 50%. Taking confidence interval at 95% and absolute allowable error at 10%, the sample size calculated was 150. Multistage sampling was used to get the required number of households. One Nyaya panchayat (10%) was selected by random sampling out of 5 Nyaya panchayats located in block Doiwala by simple random sampling. Two villages Kudkawala and Niyamwala with total of 879 households was again selected by simple random sampling for the present study. All the household of the sampled villages formed the sampling unit. We visited every 6th house (879/150) in the selected village as it formed the sampling interval and after taking written informed consent, pre-designed and pre-tested questionnaire was administered to member of each household primarily responsible for buying the open and packed food items. Questionnaires included information on socio demographic data, per capita income, purchasing practices and awareness on symbols commonly imprinted on food packets. Socio economic status was assessed according to modified B.G. Prasad classification for the year 2014. Selected food items were tested using ISO certified NICE food adulteration kit (10) in the field itself as it was portable, easy to use and gave rapid results to 20 food items. Another advantage of the kit was that it did not require any stringent laboratory condition for testing.

Adulterants in rice, dal, wheat, oil, loose and packed spices and other selected items mostly used and available in almost every house were tested and also demonstrated to home makers/house wives to create awareness among them about food adulteration practices. Accordingly, in each selected household, purity percentage was also determined by using the formula:

Total no. of food without adulteration/total no. of food tested X 100.

Data was compiled and analyzed using SPSS version 20.0 software. Percentages and proportion were calculated for all the variables, while F test and was applied for testing significance of association between two variables.

The study was approved by Institute Ethical Committee.

## Results

[Table I](#) shows methods used for detection of adulteration in selected food items.

[Table II](#) shows the demographic profile of the buyers'. Housewife or homemakers purchased the grocery in 59.3% of the households. Maximum 2/3rd (66.0%) of the respondents belonged to social class III as per modified B. G. Prasad classification of socio – economic classification. Almost 3/5th (62.0%) of the respondents were matriculate or above while only 12% were illiterate.

[Table III](#) shows the awareness level of the consumers under PFA standards. Although 50% of the respondents were aware of the standards, less than one fourth recognized the symbols of food standards.

[Table IV](#) shows the buying practices of food items for the house by the respondents. Nutritional label, manufacturing and expiry date, and weight was rarely or never seen by 86.7%, 73.3%, and 41.3% of the buyers but MRP of product was seen by three fourths (78.0%) of the respondents. Nearly half of the respondents (53.4%) purchased loose edible items from the market.

[Table V](#) depicts the adulterants found in various food items. Maximum adulteration was observed in powdered items i.e. chilli, turmeric and black pepper (66.0%, 64.0% and 47.3% respectively). It was followed by oil (45.3%), atta (38.7%) and pulses (37.3%) respectively.

[Table VI](#) shows the relationship between education status of the buyers and mean household purity of food items in percentage. Mean percentage of household purity was observed to be highest among those who were educated high school and beyond followed by those who had education till primary while it was lowest among illiterates (F ratio = 16.4). These observed differences between literates and illiterates was found to be statistically significant.

## Discussion

Although the ill effects of adulteration on health of a person is known both to manufactures and sellers, still there is no moral responsibility and code of conduct among them. This could be due to the fact that rules and regulations are not strictly enforced upon or there is no fear of law i.e. one can easily bend the law. Moreover, the consumers are still not aware of their rights and responsibilities and further have no knowledge of whom to approach in such cases, particularly in rural areas.

In present study, out of 150 families, housewives purchased the grocery in 59.3% families. Mean age of respondents in the present study was 32±5.2 years. Maximum 66.0 % belonged to social class III as per modified B.G. Prasad classification. 62.0 % of them were matriculate and above while only 12.0 % were illiterate. Focus on consumer's movement or action should be directed towards housewife/homemaker since she is mainly responsible for buying grocery in families. More than 3/4th (78.0%) of consumers always checked for MRP while purchasing packed items since price of a commodity has always been considered as one of the major and most important factor while buying the grocery because of spiraling cost of living. Less than a quarter (24.0%) checked weight while 2.0% only checked the date of manufacture/best before buying. In a study conducted in South India, manufacturing label for expiry date was read by 68%, while only half (50%) of respondents checked the ingredient of food label (11). Although literacy rate is more in South India, they still purchased the item without being aware of its nutritional quality. In our present study, none of the respondent read the nutritional label mentioned on the pack. This could be due to the fact that local languages are usually not used on labels for printing the nutritive values. According to a report by NIN, Hyderabad use of local language was seen only in 21% of Indian food item making it difficult for consumers to understand the nutritive values on food labels (12).

In present study 36% of the respondents purchased packed seal edible items. This corroborates with the finding that in India at one time or other 38% buys the packed sealed edibles. NIN, Hyderabad Study in 2006 however revealed that 60% of households bought packed food (13). This is because the study was conducted in megacity where packed edibles are easily available. In present study not buying or

purchasing packed sealed edibles items was due to non-availability and wherever available because of its cost. More than 50% of respondents had heard about Agmark and ISI as markers of food standard quality but only 23.9% were able to recognize the symbol on food label. Study conducted in slum area of Hyderabad also observed similar results (14). Study conducted among south Indian women also showed that although women did see the label on packed food for manufacture and expiry date but still many of them were not aware of quality food symbols (11). Although 25.3% respondents knew whom to register for complain in case of adulteration was found but none had ever tried to file a complaint with the official due to tardy procedure.

At least 50 % of the ten items tested for adulteration in each household were found to be adulterated since mean percentage of purity obtained in the studied households was 57.3 ±12.3. Highest adulteration was observed in powdered food product as the adulterants mixed can be easily concealed. Local shopkeepers intentionally added the items with easily available adulterants so as to improve the taste and texture of the substance. Adulteration is usually high in small cities and villages as was shown by Roday (2002) in his study (15). This is because of low purchasing power of the consumers and their ignorance about their rights for food safety. F ratio computed for mean percentage of purity and respondent's literacy status was found to be highly significant in present study. Literacy status of the respondents play an important role in creating awareness about purchase of adulterated food item. Similar observation on education was also noted by Dhyani in his study on consumer's awareness on adulteration (16).

### Conclusion

World Health Day theme for the year 2015 has rightly been focused on "Food safety: From farm to plate" considering the common scenario of outbreak of food poisoning. Adulterant is rampant in poor strata of society due to consumer's illiteracy and ignorance of their rights on food safety rules and regulations and their becoming responsible citizens.

### Recommendation

The government should strictly enforce food safety laws and award stringent penalties to the offender. Effective monitoring system throughout the food production chain i.e. from farm to plate should be strictly followed. Quality fair price shop for

distribution of rations to the poorest section of society should be strictly enforced. Campaign like "Jago Grahak Jago" can help in creating mass awareness about consumers' rights towards demand of quality food. They and voluntary organizations have been empowered under the PFA act to take samples of food items and get them analyzed. Media can to certain extent help in revealing the names of unscrupulous manufacturers and traders. Filing of public interest litigation in court can to great extent abort such serious social evil and help in building healthy India through safe and nutritive food.

### Relevance of the study

The study highlights about the practice of adulteration in food items and methods of detection of common food adulterants. The study also empowers the common citizen to raise their voices and fight for their right.

### Authors Contribution

AKS: literature search, conception, design, collection, analysis and interpretation of data. JS: Revision and final drafting of manuscript. DS, SV and RJ: literature search, collection of data, drafting and review of manuscript.

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**Tables**

**TABLE 1 DETECTION OF ADULTERATION IN SELECTED FOOD ITEMS USING NICE KITS**

Substance	Adulterant	Test of adulteration
<b>Oils &amp; fats (edible oils)</b>	Castor oil	1 ml of oil sample is taken in a test tube to which 10 ml of castor oil reagent is added and shaken for 2 minutes. White turbidity if present indicates presence of castor oil.
<b>Sugar/ Jaggery</b>	Chalk powder	1 spoon of food sample was taken in a test tube and dissolved in sufficient quantity of water. Chalk powder will not dissolve and settle at the bottom of the test tube
<b>Rice</b>	Marble or other stones	One spoon of food sample is taken on the palm of the hand. The same is immersed in water, wherein the stone chips sinks.
<b>Wheat / Maize</b>	Ergot	1 spoon of food grains is taken in a test tube and 5 ml of ergot reagent added to it. While ergot floats over the surface, grains will settle at the bottom.
<b>Atta / Maida</b>	Sand / soil	The food sample is spread on a filter paper which is then examined with a magnifying glass.
<b>Dhal(pulse)</b>	Metanil Yellow	1 spoon of dhal sample is taken in attest tube to which 5 ml of water is added. After mixing well 3-4 drops of acid reagent is added and mixed. Pink colour presence indicates metanil yellow
<b>Black pepper</b>	Papaya seeds	One spoon of the sample is taken in a test tube and to it is added alcohol reagent. Papaya seeds being lighter floats on the top while pure black pepper seeds will settle down.
<b>Turmeric powder</b>	Chalk powder	Little quantity of turmeric powder is taken in a test tube. 3-4 drops of acid reagent is added and mixed. Presence of brisk effervescence indicates presence of chalk powder.
<b>Chilli powder</b>	Brick powder	One spoon of chilli powder is taken in a test tube. 10 ml of water is added to it and mixed well. Brick powder settles to the bottom.
<b>Tea leaves</b>	Husk of black gram dhal with colourants.	Few tea leaves are spread over a wet filter paper. Development of an immediate stain colour in the filter paper indicates the presence of coloured adulterants.

**TABLE 2 DEMOGRAPHIC PROFILE OF RESPONDENTS**

Profile	Frequency	Percentage
<b>Distribution of respondents</b>		
<b>Wife</b>	89	59.3
<b>Husband</b>	44	29.3
<b>Others</b>	17	11.4
<b>Socio economic class (updated B G Prasad classification 2014)</b>		

Profile	Frequency	Percentage
I	20	13.3
II	24	16.0
III	99	66.0
IV	07	4.7
<b>Educational Status</b>		
Illiterate	18	12.0
Primary	39	26.0
High School& beyond	93	62.0

**TABLE 3 AWARENESS ABOUT FOOD STANDARDS**

	Yes	(%)	No	(%)
Aware/Heard about Agmark and Bureau of Indian Standards (ISI)	75	(50)	75	(50)
Recognizes the symbol	36	(23.9)	114	(76.1)

**TABLE 4 BUYING PRACTICES OF THE CONSUMERS**

Buying Practices (n =150)	Always (%)	Occasionally (%)	Rarely/Never (%)
Purchased Packed seal items	16 (10.6)	54 (36.0)	80 (53.4)
Checked MRP on the items	117 (78.0)	20 (13.3)	13 (8.7)
Checked manufacturing labels/best before purchasing	03 (2.0)	37 (24.7)	110 (73.3)
Check weight of the items	36 (24.0)	52 (34.7)	62 (41.3)
Read Nutritional label	0 (0.0)	20 (13.3)	130 (86.7)

**TABLE 5 ADULTERANTS OBSERVED IN SELECTED FOOD ITEMS**

Food items	Adulterated	Percentages
Powdered chilly	99	66.0
Powdered turmeric	96	64.0
Powdered Black pepper	71	47.3
Oil	68	45.3
Atta/flour	58	38.7
Pulses	56	37.3
Rice	40	26.7
Sugar & Jaggery	44	29.3
Wheat	35	23.3
Tea leaves	26	17.3

**TABLE 6 EDUCATIONAL STATUS AND MEAN HOUSEHOLD PURITY**

Education	Frequency	Mean household purity (%)	Standard deviation
Illiterate	18	34.2	4.9
Primary	39	49.9	8.4
High School and beyond	93	57.3	12.3