CONSUMER EDUCATION TOWARDS FOOD ADULTERATION AND ITS IDENTIFICATION AT HOUSEHOLD LEVEL BY USING LOW COST METHODS: AN INTERVENTIONAL STUDY

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LUCKNOW
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THESIS

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CERTIFICATE

Under rule 6.2 (ii) of Doctor of Philosophy (Ph.D.) Regulation 1999 as amended in 2010, this is to certify that the thesis entitled **"Consumer Education Towards Food Adulteration and its Identification at Household Level by Using Low Cost Methods: An Interventional Study"** submitted by **Mrs. Anita Gautam,** carried out by her is an original work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University (A Central University) Lucknow is fulfillment of the requirements fit for submission and evaluation for the award of the degree of Doctor of Philosophy in Department of Human Development and Family Studies, School for Home Sciences.

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Date :

Place : ***Anita Gautam***

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WHA	World Health Assembly
WHO	World Health Organization
FSSAI	Food Safety and Standard Authority of India
PFA	Preventionof Food Adulteration Act
FSS	Food Safety and Standards
BIS	Bureau of Indian Standard
ISI	Indian Standard Institute
DMI	Directorate of Marketing and Inspection
FPO	Fruit Product Order
OFT	Office of Fair Trading
NIN	National Institute of Nutrition
FGDs	Focus Group Discussion
AGMARK	Agriculture Marketing and Grading Act
KFC	Kentucky Fried Chicken
MSG	Monosodium Glutamate
DDT	Dichlorodiphenyletrichloroethane
DDE	Dichlorodiphenyledichloroethylene
HCE	Health Care Ethics
ISO	International Organization for Standardization
ICDDRB	International Centre for Diarrhoeal Disease Research, Bangladesh
NTFS	New Technology File System
DGHS	Directorate General of Health Services
ICMR	Indian Council of Medical Research

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INTRODUCTION

CHAPTER-I

INTRODUCTION

Food safety has emerged as an important global issue with international trade and public health implications. In response to the increasing number of food borne illnesses, governments all over the world are intensifying their efforts to improve food safety. The World Health Assembly adopted a resolution (WHA 53.15) in which, the World Health Organization (WHO) was asked "*to give greater emphasis on food safety…with the goal of developing suitable, integrated food safety systems for the reduction in health risk along the entire food chain, from primary producer to the consumers*. **(Sudershan *et al.* 2009)**

Consumer education is the process by which people learn the workings of the-marketplace so that they can improve their ability to act as purchasers or consumers of those products and services they deem most likely to enhance their wellbeing. **Paul N. Bloom, University of Maryland 1976**Consumer education is therefore treated as being rather different than consumer information -- something with which it is often confused. Consumer education is considered to be a learning process which people go through which, of course, cannot be readily observed or heard. Consumer information, on the other hand, is clearly something which can be observed or heard

Sudershan *et al.* 2009 In order to ensure that the food sectors match up to the best global standards, the Government of India enacted an integrated food law called the Food Safety and Standards Act in August 2006 and in addition a Food Safety Authority is being established shortly. This autonomous authority will set standards and license the manufacture of food products which are healthy and safe.

Food Safety Standards Authority of India (FSSAI) has found that around 13% of food stuff is contaminated across the country. The results of the study came a day after another survey found that milk, an important nutritional component, was found to be adulterated across almost all major cities. **(Zeenews Bureau 11 jan.2012)**

The testing showed adulteration rates as high as 40% in Chhattisgarh, 34% in Uttarakhand, 29% in Uttar Pradesh, 23% in Rajasthan and 20% in West Bengal and Himachal Pradesh. Besides, nearly 17% of the food samples tested in Bihar and Chandigarh, 16% in Nagaland, 15% in Punjab, Madhya Pradesh and Orissa, 14% in Haryana, 12% in Tamil Nadu and 10% in Maharashtra were found to be adulterated. Interestingly, adulteration rates in Delhi were low at 4%, while in Karnataka it was just 5%. **(Zeenews Bureau 11 jan.2012)**

The legal enforcement is only one measure for the prevention of food adulteration and it will not have any appreciable impact unless and until there is adequate supply of food at a reasonable price which the average consumer can afford, awareness of the small traders about the food standards which they are expected to maintain, awareness of the common consumer regarding the dangers of adulterations and how to take advantage of the legal machinery to force the traders to get the proper food and lastly, a sense of honesty among the food traders, big and small, in the maintenance of the safety and quality of food.

It is undoubtedly a social evil which can be regarded as the outcome of an interaction between a number of social, economic, technical and human behavioural factors. It is a manifestation of a sick society and can be regarded as a crime similar to other crimes like theft, burglary or murder. Like any other crime, food adulteration is expected to continue in our society as long as the existing factors which generate crime will continue. **(Bagchi 1984- prevention of food adulteration: Some thoughts)** The question of eradication of food adulteration, is an impossible task. What is really necessary for consideration is the implementation of measures which can control this crime to a level which will not pose health hazard among the consumers.

Uttar Pradesh reported the maximum number of food adulteration in the country, the union health minister Ghulam Nabi Azad said on Tuesday adding that the country's average adulteration stood at 11.14 per cent. **(http://www. indiamedicaltimes.com/24/09/2014).**

Food is the basic necessity of life. One works hard and earns to satisfy our hunger and relax (enjoy) later. But at the end of the day, many of us are not sure of what we eat. We may be eating a dangerous dye, sawdust, soapstone, industrial starch, and aluminum foil and so on! Contaminated foods and drinks are common sources of Infection. Often, we invite diseases rather than good health.

What is food adulteration? We have noticed the color of water excessively yellowish while washing the pulses than is expected of it. White stone powder is mixed in salt,chalk powder is also mixed in it. Fine pieces of soap bars are mixed in hing. Generally the pure ghee is adulterated with the vanaspati but its testing method is also very easy. Malachite green named chemical is used enormously in green vegetables like green chillies. Haldi powder is mixed up with metanil yellow. **(Kumar 2011)**Vegetables look excessively reddish than desirable after the chilli powder is dropped into it while cooking. It happens due to the mixing up of rhodamine named chemical and the brick powder is also mixed up into it.

The detection of allergenic ingredients in food products has received increased attention from the food industry and legislative and regulatory agencies over recent years. This has resulted in the improvement of measures aimed at the protection of food-allergic consumers. The controlled production of food products and control activities executed by food inspection agencies rely on the availability of methods capable of detecting traces of allergenic ingredients. The development of such methods faces a multitude of analytical challenges. Those challenges will be identified and discussed in review. But question of food adulteration is still kept in mind. Hink and sink about food safety, adulteration and consumer education. **(Hengel 2012)**

Every housewife loves to search on newer recipes, putting into hours together of labour in kitchen

to prepare the recipes and dish it out to her family members. It gives them immense pleasure. But it always haunts their mind whether there are any kinds of adulterations in the ingredients they have used.**(Kumar 2011)**

It is common in almost all developing countries. And it's ugly face is come out in the form of its harmful effects as stomach disorder giddiness and joint pain, diarrhea, liver disorder, dropsy, gastrointestinal problems, respiratory distress, oedema, cardiac arrest, glaucoma carcinogenic effects, paralysis etc. **(Bagchi 1984)**In a developing country which is at the lowest rung of the development ladder, food adulteration consists of relatively simple measures.

World Health Organization (WHO) has expressed its anxiety about the impact of food safety upon public health in Bangladesh in its website. It reveals that unsafe food can be a significant reason of many chronic and non-chronic diseases including but not limited to diarrhoea, cancer, heart diseases, various kidney diseases and birth defects.

In India under the law includes both willful adulteration of food and "substandard" foods which causes of adulteration could be identified: Inadequate availability of food to meet the demands of the consumer prompting the unscrupulous food traders to use any means to stretch the supply to earn more money, the more important reason is the basic dishonesty of the food traders and an urge to make quick and easy money, there are significant numbers of cases of food adulteration committed by small traders due to their ignorance about the standards they are expected to maintain.**(Bagchi 1984)**

Food safety programs have become increasingly necessary due to technological advances in food and agricultural sectors and also due to social changes introducing new food habits. In the past, food was consumed by those who produced it or by their immediate neighbors. Increased world production,

urbanization, industrialization and migration have however introduced new food safety problems into our food supply. (**Sudershan *et al.*2009)**

The domestic food processing industry in India which has been reeling under uncertainties for years, is now facing fierce competition from the developed and some of the developing countries. This could be due to the wide variations in the usage of food additives and consequent technologies. **(Sudershan *et al.* 2009)** With the government's economic policy and the influx of imported food items containing ingredients not permitted under the PFA Act in India, the regulatory authorities are flooded with requests to liberalize food laws and permit the use of a greater variety of food additives.

In order to ensure that the food sectors match up to the best global standards, the Government of India enacted an integrated food law called the Food Safety and Standards Act in August 2006 and in addition a Food Safety Authority is being established shortly. This autonomous authority will set standards and license the manufacture of food products which are healthy and safe.

The legal enforcement is only one measure for the prevention of food adulteration and it will not have any appreciable impact unless and until there is adequate supply of food at a reasonable price which the average consumer can afford, awareness of the small traders about the food standards which they are expected to maintain, awareness of the common consumer regarding the dangers of adulterations and how to take advantage of the legal machinery to force the traders to get the proper food and lastly, a sense of honesty among the food traders, big and small, in the maintenance of the safety and quality of food. **(Bagchi 1984)**

It is felt that there is an urgent need for an impartial scientific study to determine the prevalence of food adulteration at household level in the country. Such study should not be undertaken by an interested party, the consumers or the law enforcers, but should be undertaken by a research institution in a properly designed and controlled manner. The National Institute of Health and Family Welfare and the Indian Council of Medical Research are ideally suited to

undertake such a study in various parts of India in order to find out the extent of food adulteration, the types of foods which are commonly adulterated, the types of adulteration adopted, the common adulterants used, the health hazards of such type of adulteration and lastly, to explore as far as possible the motives for such adulteration. In other words, such a study will generate for the first time data on the basis of which one can develop an "anatomy of food adulteration" and possibly, get an idea of the "profiles of the food adulterators" and the reasons for such adulteration. The results of such a study will be an eye opener for the consumers, law enforcers and also for those who are brooding for decades as to the reasons of food adulteration and how to prevent this menace.**(Bagchi 1984)**

Justification of present study

Food is essential for sustenance of life. Adulteration of food cheats the consumer and can pose serious risk to health in some cases.

Adulteration in food is normally present in its most crude form; prohibited substances areeither added or partly or wholly substituted. In India normally the contamination/adulteration in food is done either for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing, transportation and marketing. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries. However, adequate precautions taken by the consumer at the time of purchase of such produce can make him alert to avoid procurement of such food. It is equally important for the consumer to know the common adulterants and their effect on health.[3]

Selection of wholesome and non-adulterated food is essential for daily life to make sure that such foods do not cause any health hazard. Although it is not possible to ensure

wholesome food only on visual examination when the toxic contaminants are present in ppm/ppb level. However, visual examination of the food before purchase makes sure to ensure absence of insects, visual fungus, foreign matters, etc. Therefore, due care taken by the consumer at the time of purchase of food after thoroughly examining can be of great help. Secondly, label declaration on packed food is very important for knowing the ingredients and nutritional value. It also helps in checking the freshness of the food and the period of best before use. The consumer should avoid taking food from an unhygienic place and food being prepared under unhygienic conditions. Such types of food may cause various diseases. Consumption of cut fruits being sold in unhygienic conditions should be avoided. It is always better to buy certified food from reputed shop.

This study will be conducted to make people aware about adulteration and its ill effects on health from their daily meal item, either, in cereals, pulses, fruits and vegetables or in milk and milk products and spices. Therefore, it is a need to make them aware with simple and easiest methods of detection of adulteration at household level with low cost value. Because most of the people are well aware with adulteration and its ill effects but due to their busy life, less time availability and costly methods of adulteration detection techniques was done by laboratories only. People ignore this one of the major health problem causing element at community level.

1.2 Objectives of the study:

1. To know the existing knowledge of consumer toward food laws, food safety, consumer behavior, health hazard at study area.
2. To elicit and classified adulteration in food stuffs used at household preparation in day to day life as per five food groups.

3. To give demonstration and detection of adulteration of selected food stuffs with using low cost method.

4. To examine food quality by using sensory evaluation techniques and detection kits.

5. To evaluate domestic methods for adulterated foods by using learning kits in the study area.

6. To study correlated factors with adulteration and its impact on health hazard as well as consumer behavior before and after intervention.

1.3Hypothesis:

H_1: A significant difference of knowledge towards consumer education and magnitude of food adulterant.

H_0: There is no significant difference on KAP score of pre and post intervention criteria of adulterant found in food stuffs.

H_0: The lower knowledge of adulterant having higher risk of health hazard.

1.4Brief outline of the study

This study was carried out in urban area of Lucknow City. For this study 300 women belonging to reproductive age groups (15 to 49 years) who carried their family were selected from three Mohall's of Lucknow city by adopting multistage random sampling procedure for preliminary study. For interventional study first 150 respondents were selected from 300 respondents who were self-interested for this intervention. No. of study subjects evaluated the same 150 respondents who were already intervene during intervention phase. The tools in the study were pre-designed and pre-tested questionnaire comprising of family and individual schedule, consumer education, type of adulteration, methods of detection of adulteration and harmful effects of adulteration for preliminary study. During interventional study a low cost adulteration detection kit was developed to give demonstration through sensory evaluation technique (Duo-trio-test) and through low cost detection kit at household level. A score card

has been developed for post study to evaluate the KAP score for consumer education, adulteration detection in food stuffs and harmful effects adulteration in food stuffs of study subjects after intervention.

The data was analyzed using Statistical Package for Social Sciences version 15.0. Data has been represented as frequency and percentages for categorical and as mean and standard deviation for continuous variables. For the purpose of analysis, chi-square test has been used for categorical and Independent samples 't'-test and Analysis of variance (ANOVA) for continuous data. The confidence level of the study was kept at 95%, hence a 'p' value less than 0.05 indicates a statistically significant association.

1.5Scope of the Study

Further these tools applicable for day to day life to evaluate adulterant in food stuffs and the present study will also enlighten with prevailed in the population as adulterant was only detect at laboratory level. It also further discuss when these kits are mobilize more and more population. Adulteration percentage in coming year must be checked and government may bound to some extent. Create policies and programs like pulse polio abhiyan like that for health and quality of life. They must be sensitize and specify during special occasion /festivals celebrated by us and used their consumer education behavior and use more and more low cost available adulteration kit to identified adulterant in food stuffs. So, that we extend livelihood on the parameter of human and development index and quality of life parameter.

1.6Limitation of the study

- Due to unawareness and lack of importance toward adulterant, the study subjects are limited in their subject size.
- Before and after intervention only compared those who were intervene.

REVIEW OF LITERATURE

CHAPTER-II

REVIEW OF LITERATURE

A comprehensive review of a literature is an integral part of any investigation, as it not only gives an idea, on the work done in the past and assists in delineation of problems but also provides basis for interpretation and discussion of findings.

The present study focuses on food adulteration, its hazardous effects, frequency and techniques used for detection of adulteration in food stuffs. However, an earnest effort has been made to review the available literature having direct or indirect bearing of this study. The available literature has been organized and presented under the following sub headings.

2.1 Consumer knowledge toward food safety.

2.2 Classification of adulteration

2.3 Detection methods

2.4 Sensory evaluation

2.5 Domestic method

2.6 Health Hazards

2.1 Consumer Knowledge toward food safety

Consumer

A consumer is defined as someone who acquires goods or services for direct use or ownership rather than for resale or use in production and manufacturing.

Consumer are people who buy goods and services to satisfy their needs. In the above definition, "goods" are the products that we buy to fulfill our needs. "Services" are the facilities offered to us by various agencies with or without payment. Thus, by above definition we are all consumer irrespective of our age, social and economic background and level of education.

Consumer education

Consumer education means to educate the consumers as to what, where, when, and how and how much to buy and how to use what they have bought.

Consumer education is the preparation of an individual through skills, concepts and understanding that are required for everyday living to achieve maximum satisfaction and utilization of his resources. It is defined as education given to the consumer about various consumer goods and services, covering price, what the consumer can expect, standard trade practice, etc.

Mishra(2010)A process of teaching and learning to improve knowledge and develop skills among consumers, is called as consumer education. The consumer education relates to imparting knowledge to developing skills in consumers regarding consumer rights,consumer laws, product quality-standards, health aspects of various products, availabilities of various public and private services, units and measurements, redressal of consumer problems and making correct choices while buying different commodities.

Consumer Education: (Home Science)

- ✓ What to buy?
- ✓ How much to buy?
- ✓ Where to buy?
- ✓ When to buy?
- ✓ How to buy?
- ✓ How to use?

Consumer Rights

1. Right to Safety against hazardous goods and services: This right protects consumers against hazardous products and services. The product offered for sale should not pose undue risk or physical harm to consumers or their family members. Impure food, defectively manufactured automobiles and

tyres, drugs having harmful side effects and unsafe appliances can cause harm, risk or injury to consumers. Consumers should observe marks of quality standards before buying products.

2. Right to be Informed: Consumers have rights to know about the quality, quantity, purity, potency, standard, price etc. about the product they go for buying. They have rights to know everything regarding the product regarding composition, preservatives used, colouring agents mixed in the product, date of manufacture & expiry date and also about nature of the product like vegetarian or non-vegetarian etc.

3. Right to Choose: Consumers have been given a right to buy things of their choice and likings. They can compare varieties and prices of products and can purchase items to the best of their satisfaction.

4. Right to be Heard: Consumers have been given the rights to file complaint in case of any cheating or defect in the purchased product. They have right to seek a refund, replacement or remedy or they can file a case in the consumer court or consumer forum.

5. Right to seek Redressal: Consumers have right to get protected from unfair trade practices by filing complaints in consumer forum or court. Many consumer organizations have been formed to protect consumers and get their problems properly redressed

6. Right to Consumer Education: Every consumer has the right of keeping knowledge and skills regarding purchase, use and effects of products. He has a right to get educated about various products, markets and related things so as to protect him against any possible exploitation.

The Consumer Education covers following areas-

- Health, Nutrition, food-borne diseases and food- adulteration,
- Product hazards like hazards due to storage and consumption of a particular product,
- Product labelling - pasting labels on the packaging of products regarding their composition status, weight, ecological impacts, purity standards, colour, preservatives

used, date of manufacture and expiry, address of producer/ manufacturer, matters pertaining to registration, trademarks, marks of standards etc.

- Protective Laws – Laws framed by the government to protect rights of consumers and seeking redressal, how and whom to approach for redressal etc.
- Information regarding weight, measure, packaging, price quality and availability of basic needs etc.
- Environment, different types of pollutions, sustainable consumption etc. **(Mishra, 2010)**

Consumer Protection:

Consumer protection consists of laws and organizations designed to ensure the rights of consumers as well as fair trade competition and the free flow of truthful information in the marketplace. The laws are designed to prevent business that engage in fraud or specified unfair practices from gaining an advantage over competitors and may provide additional protection for the weak and those unable to take care of themselves. Consumer protection laws are a form of government regulation which aim to protect the rights of consumers.

Consumer law:

Consumer protection law or consumer law is considered an area of law that regulates private law relationships between individual consumers and the business that sell those goods and services. Consumer protection covers a wide range of topics, including but not necessarily limited to Product liability, Privacy rights, Unfair business practices, Fraud mispresentation and other consumer/ business interactions.

Food safety:

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards.

Food can transmit disease from person to person as well as serve as a growth medium for bacteria that can cause food poisoning. Debates on genetic food safety include such issues as impact of genetically modified food on health of further generations and genetic pollution of environment, which can destroy natural biological diversity. In developed countries there are intricate standards for food preparation, whereas in lesser developed countries the main issue is simply the availability of adequate safe water, which is usually a critical item. In theory food poisoning is 100% preventable The five key principles of food hygiene, according to WHO, are:

1. Prevent contaminating food with pathogens spreading from people, pets, and pests.
2. Separate raw and cooked foods to prevent contaminating the cooked foods.
3. Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. Store food at the proper temperature.
5. Do use safe water and cooked materials.

The Food Safety and Standards Authority of India has been established under the Food Safety and Standards Act, 2006 as a statutory body for laying down science based standards for articles of food and regulating manufacturing, processing, distribution, sale and import of food so as to ensure safe and wholesome food for human consumption.

When food growers, manufacturers, or consumers don't pay adequate attention to the **safety of the food** supply the result can be foodborne illness resulting from the presence of foodborne pathogens. There are an estimated 76 million cases of foodborne illness every year in the United States. The majority of these cases resolve in a matter of days, though roughly 300,000 cases require hospitalization, and 5,000 people die.

The Food Safety and Standards Regulations, 2011

FSS (Licensing and Registration of Food businesses) regulation, 2011

FSS (Packaging and Labelling) regulation, 2011

FSS (Food product standards and Food Additives) regulation, 2011 (part I)

FSS (Food product standards and food additives) regulation, 2011 (part II)

FSS (Prohibition and Restriction on sales) regulation, 2011

FSS (contaminates, toxins and residues) regulation, 2011

FSS (Laboratory and sampling analysis) regulation, 2011

Food Safety and Standard Acts:

The Indian Parliament has recently passed the *Food Safety and Standards Act, 200*6 that overrides all other food related laws. It will specifically repeal eight laws:

- The Prevention of Food Adulteration Act, 1954
- The Fruit Products Order, 1955
- The Meat Food Products Order, 1973
- The Vegetable Oil Products (Control) Order, 1947
- The Edible Oils Packaging (Regulation) Order, 1998
- The Solvent Extracted Oil, De oiled Meal, and Edible Flour (Control) Order, 1967
- The Milk and Milk Products Order, 1992
- Essential Commodities Act, 1955 relating to food

Voluntary Standards and Certification System:

There are two organizations that deal with voluntary standardization and certification systems in the food sector. The Bureau of Indian Standards looks after standardization of processed foods and standardization of raw agricultural produce is under the purview of the Directorate of Marketing and Inspection.

Bureau of Indian Standards (BIS)

The activities of BIS are two fold the formulation of Indian standards in the processed foods sector and the implementation of standards through promotion and through voluntary and third party certification systems. BIS has on record, standards for most of processed foods. In general, these standards cover raw materials permitted and their quality parameters; hygienic conditions under which products are manufactured and packaging and labelling requirements. Manufacturers complying with standards laid down by the BIS can obtain and "ISI" mark that can be exhibited on product packages. BIS has identified certain items like food colours/additives, vanaspati, and containers for packing, milk powder and condensed milk, for compulsory certification.

Safety, performance and reliability are assured when the product is ISI marked. ISI is now known as Bureau of Indian Standards. The Bureau of Indian Standard operates a Certification Mark Scheme under the BIS Act, 1986. Standards covering more than 450 different food products have been published. **(Srilakshmi, 2010)**

Directorate of Marketing and Inspection (DMI)

The DMI enforces the Agricultural Products (Grading and Marketing) Act, 1937. Under this Act, Grade Standards are prescribed for agricultural and allied commodities. These are known as "Agmark" Standards. Grading under the provisions of this Act is voluntary. Manufacturers who comply with standard laid down by DMI are allowed to use "Agmark" labels on their products.

The word ‘AGMARK’ is a derived from Agricultural Marketing. The AGMARK standard was set up by the Directorate of Marketing and Inspection of the Government of India by introducing an Agricultural Products Acts in 1937. The word ‘AGMARK’ seal ensures quality and purity. Before affixing the AGMARK label, there are four stages.**(Srilakshmi, 2010)**

- Preliminary testing
- From the product, inspecting officers take representative samples.
- Technically qualified and experienced officers test the samples and assign AGMARK quality grades.
- Afterwards the commodity is packed using AGMARK label or AGMARK replica on pouches/ containers.
- Even after sending the distributing markets, Agmark products are subjected to continuous inspection.

Kamthanai *et al.* (2014) said that consumer’s best defense is knowledge of his/her rights as a consumer and of the remedied which exist to resolve these problems when they occur. “knowledge and awareness about adulterated foods, laws and its rights related to adulterated food is crucial in a society where technology heightens opportunities for perpetrators of fraud deception and mispresentation”.

He also said that low income group respondents were least educated, had low awareness about their rights and responsibilities and food adulteration. So this group needs to be armed with lot of information and training on the issues of food adulteration and ways to raise their voice when felt cheated.

Chakrabarti (2013) found that 94 per cent of the respondents confirmed that they are totally unaware of any food symbols and were not able to recognize those shown to them. Correspondingly, a meager 2 per cent were able to recognize all three food symbols. He also found that majority of the

women were unable to recognize what is written on the packets and confirmed that they prefer to buy packed food only for confectionary items such as biscuits, local sweets and chocolates.

Barnett *et al*. (2011) reported that peanut and nut allergic individuals adopt a complex range of responses and strategies to interpret 'may contain' labelling. Many claimed such labelling was not credible or desirable; many ignored it whilst some found it helpful and avoided products with all such labelling. Interpretation and consequent decisions were not only based on the detail of the labelling but also on external factors such as the nature of the product, the perceived trustworthiness of the producer and on the previous experience of the nut allergic individual.

Takur *et al.* (2009) said that 23% of the subjects were aware of the various standard marks like ISI, FPO, Agmark. During pretest 3,8,18 subjects were able to identify FPO, Agmark and ISI respectively. Sixty eight responses of the subjects reported that they cannot protect themselves against food adulteration during pretest.

Sudershan*et al.* (2009) said that food safety in India was about 54.2% of the respondents did not know or associate diarrohea as a symptom of food-borne disease, while about 50 to 70% did not know or associate abdominal pain, nausea and vomiting as symptoms of food-borne disease. When asked on storage of food, 75% reported to leave the cooked food at room temperature and only 29.4% of them consume the stored food after thorough heating. Only 6% of the respondents were inclined to complain about food adulteration and others were either ignorant or did not bother about it; 72% in the same study did not take any action after an episode of food-borne disease outbreak in the village; about 50% of the respondents did not recognize food spoilage by smell. The findings of this study showed that there is a need to increase awareness pertaining to storage of food, recognition of food spoilage, symptoms of food-borne disease and action to be taken after detecting food adulteration/poisoning.

Brennan*et al.* (2004) concluded the results of interviews with an extensive range of key shakeholders and the results of a survey of service heads for trading standards throughout the UK. It will

consider implementation, partnership, resources, ideas and opportunities. The research found that the agenda for consumer in the UK is at an interesting stage of development. The enterprise Act 2002 gives the Office of Fair Trading (OFT) a statutory power to carry out educational activities. Consumer education is also moving up the agenda in the trading standard service. In addition, the teaching of citizenship in English Schools is already stimulating new developments in consumer education.

Sudershan*et al.*(2008) found that the respondents' knowledge on basic food microbiology was limited. They attributed their inability to monitor all cases of food poisoning/adulteration to delay in receiving information and lack of laboratory facilities. They had sound knowledge of conventional adulterations, but were not equipped to check newer adulterations. Their knowledge on health/nutrition claims on food labels is almost nil. Orientation towards food safety issues other than adulteration is the need of the hour.

Maheshwari& Hiremath (2014) revealed that Unsafe food, for example in case of adulteration can harm consumer health and hence it is a serious offence. A complaint can be lodged under the above Act for the goods which will be hazardous to life and safety when used. In some of the cases for example, the consumer forum awarded compensation for the injury caused by consumption of unsafe food by treating it a deficiency of service.

Maheshwari& Hiremath (2014) revealed that the advertisements of the Ministry of Consumer Affairs titled 'Jago Grahak Jago' themselves acknowledge the rampant adulteration that exists in house hold items and gives tips to consumers to detect them. The Ads warn that milk could be synthetic, sugar and salt can be contaminated with chalk powder, chilli powder could be mixed with brick powder grit or saw dust. The common adulterant in tea leaves is artificial colour, mustard seeds could be substituted with harmful argemone seeds, coriander

powder may have horse dung in it. All festivities are now discoloured by adulterated Khoya (dried milk) and false silver foil on sweets which is often Aluminium.

Subbarao*et al.* (2007) found that food safety awareness and practices are good among mothers perhaps due to the Indian food ethos passed on to them through generations. Home cooked foods are considered to be safe than prepared foods bought from outside. Many mothers were aware of the common food adulterants but do not bother to complain or take action. There is a need to create enabling environment with improved access to potable water, sanitation and cooking fuel. Spreading aware about checking food labels and reporting to the health authorities in case of food poisoning or adulteration is also the need of the hour. The Anganwadi Centres can be the focal points for imparting food safety education to the mothers.

Gupta & Panchal (2009) found that in 45 per cent families, the home maker took the major decisions for purchasing food for their families. Regarding buying practices includes the type of packaging used while purchasing, brand choice, shop choice and purchase frequency of the selected items undertaken for study. Regarding Consumer awareness the result depicted that majority, that is, two third of the respondents were moderately aware about the rights and responsibilities related to food quality and food adulteration.

Khapre*et al.* (2011) found that 68.5% Households, wife (home-maker) buys the grocery. Majority of them never read the food lables. All the selected food items were adulterated ranging from 76% to 11%. Mean percentage of purity was highest in literates (47.5± 22.48) than illiterates and just literates. Food borne illness was prevalent in households with low purity of food. Association was found between per capita income and percentage of purity (0.765).

Subba Rao *et al*. (2007) conducted a descriptive study on Knowledge of consumers regarding the nature and extent of adulteration of Indian food was conducted in Hisar city. A

total of 60 women consumers selected from three different localities to study their knowledge regarding adulteration and detecting adulterants in commonly used food items. The post exposure correct responses of the respondents increased remarkably as 100.0 percent of the respondents gave correct responses regarding statements on adulteration of spices and condiments, the most common adulterated food item and to when and whom they could approach for making complaints about adulterated foods. Similarly, the respondents gained considerable knowledge regarding adulterants generally present in milk, legumes and definition of food adulteration.

Gavaravarapu *et al*. (2009) reported that a focus group discussion on Food safety knowledge, attitudes and practices of mothers was conducted in National Institute of Nutrition (NIN). Jamai-Osmania PO, Hyderabad, AP, India. A total of 32 Focus Group Discussions were carried out with mothers of children <5 years in 16 districts from all the four South Indian states. The findings reveal that food safety awareness and practices are good among mothers perhaps due to the Indian food ethos passed on to them through generations. Home cooked foods are considered to be safer than prepared foods bought from outside. Many mothers were aware of the common food adulterants but do not bother to complain or take action. There is a need to create enabling environment with improved access to potable water, sanitation and cooking fuel. Spreading awareness about checking food labels and reporting to the health authorities in case of food poisoning or adulteration is also the need of the hour. The Anganwadi Centres can be the focal points for imparting food safety education to the mothers.[6]

Bagchi (2000) he conducted an experimental study on extent of awareness and food adulteration detection in selected food items purchased by home makers in Mahadev area.

A total of 60 families were selected from the sample population on the basis of stratified systematic sampling. Questionnaire cum interview schedule was adopted to collect data and standard lab testing procedures were carried out for selected spices and flours. The lab tested results were briefed on the absence/presence of adulterant in food products. Statistical test such as chi-square between awareness and occupation, t-test among age group, educational level and extent of awareness were carried out. Study revealed that respondent's awareness related to rights and responsibilities was good but poor related to food adulteration. Education, family income and occupation had an effect on extent of awareness. Age and awareness has no correlation while a positive correlation was found between family income and awareness. The results also revealed that almost all loose products were found adulterated.[2]

Knight *et al.* (2003)conducteda descriptive study on ascertaining buying practices of consumable goods among low income group by Department of home sciences in Vidyanagar. The study results reveals that homemakers were the actual buyers for the food in the family. Home makers took independent decision in all the areas of food buying except financial aspect. "Availability of money resource and availability of the product" in the market were the most important factors, whereas "food habit" and "nutritional requirements" were the least important factors while buying a product. On the other hand low income group home makers preferred rationing store, and independent store for the groceries and miscellaneous items. For the selection of stores low income group home maker gave more importance to credit facilities, lowest price and location of the store. Majority of the home makers from low income group collected all information from friends and neighbors. Among home makers retail shops

were more used than wholesale shops for purchasing grains, monthly purchasing was most common among the employed and unemployed homemakers for grains and grocery.

According to **Gavaravarapu *et al.* (2009)**a focus group discussion on food safety knowledge, perceptions, and practices of adolescent girls was conducted in four south Indian states. A total of 32 groups were selected using stratified random sampling. FGDs were audio recorded, transcribed, and manually coded by topic. At each stage of coding and analysis, reports were read independently by 3 researchers. Results were presented according to 4 food safety topics: concept of safe food; home-cooked food or outside food; packaged food products and food labels; and previous exposure to food safety education. Subjects confused the concept of nutrition with food safety. They were checking food labels, but they were not aware of quality symbols like ISI (Bureau of Indian Standards), FPO (Fruit Products Order), and AGMARK (Agriculture Marking and Grading Act); trusted more in brand names/expensive packaged food; were less careful about snack food safety. Receiving food safety information through school health education was preferred. Adolescent girls are not aware of food quality standards. Awareness needs to be raised on permitted food additives concerning which foods can use them.

Considering the need for comprehensive approach to food safety, a new law Food Safety and Standards Act, 2006 came into force on August 5, 2011 replacing the Prevention of Food Adulteration Act, 1954.

2.2 Classification of adulteration

Adulteration

According to **PFA Act, 1954 (Srilakshmi, 2010)** Food Adulteration includes

- Intentional addition, substitution or abstraction or substances which adversely affect the purity and quality of foods.
- Incidental contamination of foods with deleterious substances such as toxins and insecticides due to ignorance, negligence or lack of proper storage facilities.
- Contamination of the food with harmful insects, micro-organism like bacteria, fungus, moulds etc. during production, storage and handling.

Food adulteration is the act of intentionally debasing the quality of food offered for sale either by the admixture or substitution of inferior substances or by the removal of some valuable ingredient. Food is declared adulterated if:

- a substance is added which depreciates or injuriously affects it
- cheaper or inferior substances are substituted wholly or in part
- any valuable or necessary constituent has been wholly or in part abstracted
- it is an imitation
- it is coloured or otherwise treated, to improve its appearance or if it contains any added substance injurious to health

It is undoubtedly a social evil which can be regarded as the outcome of an interaction between a number of social, economic, technical and human behavioural factors. It is a manifestation of a sick society and can be regarded as a crime similar to other crimes like theft, burglary or murder. Like any other crime, food adulteration is expected to continue in our society as long as the existing factors which generate crime will continue. The question of eradication of food adulteration, is an impossible task. What is really necessary for consideration is the implementation of measures which can control this crime to a level which will not pose health hazard among the consumers. **(Bagchi 2000)**

According to **FSSAI, 2012** Adulteration of food commonly defined as "the addition or subtraction of any substance to or from, so, that the natural composition and quality of food substance is affected.

Adulteration of food cheats the consumer and can pose serious risk to health. Mere visual inspection does not serve the purpose especially when adulteration has assumed high degree of sophistication.

Food adulteration is an act of intentionally debasing the quality of food offered for sale either by the admixture or substitution of inferior substances or by the removal of some valuable ingredient. Food adulteration takes into account not only the intentional addition or substitution or abstraction of substances which adversely affect nature, substances and quality of foods, but also their incidental contamination during the period of growth, harvesting, storage, processing, transport and distribution

Food is adulterated if its quality is lowered or affected by the addition of substances which are injurious to health or by the removal of substances which are nutritious. It is defined as the act of intentionally debasing the quality of food offered for sale either by the admixture or substitution of inferior substances or by the removal of some valuable ingredient.

Types of adulterants

S.No.	Type	Substances Added
1.	Intentional Adulterants	Sand, marble chips, stones, mud, other filth, talc, chalk powder, water, mineral oil and harmful colour
2.	Incidental Adulterants	Pesticide residues, dropping of rodents, larvae in foods**.**
3.	Metallic Contaminants	Arsenic from pesticides, lead from water, effluent from chemical industries, tin from cans.

According to **Kumar(2011)**we have noticed the colour of water excessively yellowish while washing the pulses than is expected of it. The colour of green vegetables looks greener than it should and

by touching them with fingers, it has the trace of green colour over it. According to one survey conducted, adulteration were detected in milk to the tune of 705 with water, turmeric powder-43% with chalk powder, red chilli powder-100% with artificial colour, sugar 37% with chalk powder etc.

According to **Jaiswal(2012)**Adulteration in food is normally present in its most crude form, prohibited substances are either added or partly or wholly substituted. In India normally the contamination/adulteration in food is done either for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing, transportation and marketing. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries.

Adulterants in common food items (FSSAI, 2012)

S.No.	Food Article	Adulterant
1.	Wheat, rice, maize, jawar, bajra, chana, barley	Dust, pebble, stone, straw, weed seeds, damaged grain, weeviled grain, insects, rodent, hair and excreta
2.	Maida	Resultant atta
3.	Wheat bajra and other grains	Ergot (a fungus containing poisonous substance)
4.	Wheat bajra and other grains	Karnel bunt
5.	Sella rice (parboiled rice)	Metanil yellow (a non-permitted coal tar colour)
6.	Wheat flour	Excess bran
7.	Wheat flour	Chalk powder
8.	Atta, maidasuji (rawa)	Sand, soil, insects, webs, lumps, rodent hair and excrete
9.	Sago	Sand or talcum
10.	Dal whole and split	Khesari dal, clay stone, gravels, webs, insects, rodent hair and excreta
11.	Besan	Metanil yellow, khesari flour
12.	Pulses	Lead chromate
13.	Milk	Water, starch, urea, detergent. Vanaspati, formaline, synthetic milk
14.	Ghee, cottage, cheese, condensed milk, khoa, milk powder	Coal tar dyes

15.	Sweet curd	Vanaspati
16.	Rabdi	Blotting paper
17.	Khoa, chhana, paneer	Starch
18.	Fats and oils	Vanaspati or margarine, mashed potatoes, sweet potatoes and other starches
19.	Butter	Vanaspati or margarine, mashed potatoes other starches
20.	Edible oil	Prohibited colour
21.	Coconut oil	Any other oil
22.	Sugar	Chalk powder, urea and yellow colour (non permitted)
23.	Honey	Sugar solution
24.	Jiggery	Washing soda, chalk powder, metanil yellow coloursugar solution
25.	Bura sugar	Washing soda
26.	Sweetmeats, ice-cream and beverages	Metanil yellow (a non-permitted coal tar colour), saccharin
27.	Whole spices	Dirt, dust, straw, insect, damaged seeds, other seeds, rodent hair, and excrete
28.	Black pepper	Papaya seeds, light black pepper, coated with mineral oil
29.	Cloves	Volatile oil extracted (exhausted cloves), coated with mineral oil
30.	Mustard seed	Argemone seed
31.	Powdered spices	Added starch, common salt
32.	Turmeric powder	Coloured saw dust
33.	Turmeric whole	Lead chromate, chalik powder or yellow soap stone powder
34.	Chillies powder	Brick powder, salt powder, or talc, powder, artificial colours, water soluble coal tar colour
35.	Asofoetida (hing)	Soap stone, or other earthy material, starch, foreign resin
36.	Spices	Powdered bran and saw dust
37.	Cinnamon	Cassia bark
38.	Cumin seeds	Grass seeds coloured with charcoal dust
49.	Mango, banana	Calcium carbide
40.	Green chilli and green vegetables	Melachit green
41.	Green peas	Artificially coloured

Noman & Ali (2013) said that unauthorised food colours, especially textile dyes are used in food, manufacturing and processing in Bangladesh. Textile colours are especially applied in

the various types of sweets, which is locally called as ‘misti’ in Bangladesh. Mentionable that, people of Bangladesh love misti or any sweet based foods and some people are even addicted to this. Except misti some cultural foods named beguni, peaju are also adulterated by textile dyes. Generally, these harmful colours are used to make foods attractive, ‘appealing and appetizing’. Research suggests that the toxic colours in food can create indigestions, allergies, asthmas and even cancer. Artificial colours can also risk the human body for sleeping disorders, vomiting, diarrhoea, heart diseases, and several kinds of neurological diseases.

Except the aforesaid specific food safety issues, Bangladesh experiences many types of food adulterations every day. Few of the remarkable and relatively common adulterations are included below.

Thakur *et al.* (2009) found that majority (80%) of the subjects were aware of water and one third were aware of the starch as the adulterant of milk. Another 57% of the subjects were able to name stone and twigs as common adulterant of pulses, where as one third of them even reported Makkika Atta as adulterant in Basin during pretest.

Park (2005) said that food adulteration consists of large number of practices e.g.:- mixing, substitution, concealing the quality, putting of decomposed food for sale, misbranding or giving false labels and addition of toxicants1.

Gulati (2007) There was a news of seizing synthetic milk, synthetic paneer and synthetic khoya in the news paper. Synthetic khoya manufacturing unit was sealed in U.P (2007) and 15000 liters of synthetic milk was seized from a tanker at Rajpura based Dhaba in 2007 10,11,12.

Khan (2012) reported that the puffed rice (locally called known as ‘moodi’) is contaminated by using the urea fertilizer to make it whiter and bigger in size.

According to **Noman & Ali (2013)** Ghee, a popular food in Bangladesh made from the pure milk, is widely used in Bangladeshi cuisine. In the village culture children are encouraged to eat hot rice mixing with the ghee and palm sugar in the morning as breakfast. It is also used to manufacture various desserts in Bangladesh. Ghee is now adulterated in many ways. The impure ghee is made by rotten milk, palm oil, soybean, animal or vegetable fat, potato paste and with artificial colour, flavours instead of milk. Due to this tainting of ghee, people are deprived from the expected nutrition which ultimately may cause adverse effects on public health.

The National Survey on Milk Adulteration 2011, a snap shot survey, was conducted to check the contaminants in milk, especially liquid milk, throughout the country. The study found that due to lack of hygiene and sanitation in milk handling and packaging, detergents (used during cleaning operations) are not washed properly and find their way into the milk. Other contaminants like urea, starch, glucose, formalin along with detergent are used as adulterants. These adulterants are used to increase the thickness and viscosity of the milk as well as to preserve it for a longer period. The study notes that the consumption of milk with detergents in hazardous to health. About eight per cent samples were found to have detergents.

Food Safety Standards Authority of India (FSSAI) has found that around 13% of food stuff is contaminated across the country. The results of the study came a day after another survey found that milk, an important nutritional component, was found to be adulterated across almost all major cities.

As per the data released by the FSSAI, the high percentage of adulteration in food samples puts a question mark on the safety measures taken by the health ministry.

According to a survey the testing showed adulteration rates as high as 40% in Chhattisgarh, 34% in Uttarakhand, 29% in Uttar Pradesh, 23% in Rajasthan and 20% in West Bengal and Himachal Pradesh. Besides, nearly 17% of the food samples tested in Bihar and Chandigarh, 16% in Nagaland, 15% in Punjab, Madhya Pradesh and Orissa, 14% in Haryana, 12% in Tamil Nadu and 10% in Maharashtra were found to be adulterated. Interestingly, adulteration rates in Delhi were low at 4%, while in Karnataka it was just 5%.

Uttar Pradesh reported the maximum number of food adulteration in the country, the union health minister Ghulam Nabi Azad said on Tuesday adding that the country's average adulteration stood at 11.14 per cent.

He also said that in 2010, about 3,789 cases were filed in Uttar Pradesh and 540 people were convicted. With 806 cases and 18 convictions, Rajasthan came in second followed by Gujarat with 683 registered cases and 99 convictions.

"The average adulteration in food items including milk products on the basis of samples collected in 2009 is 11.14 per cent," said Ghulam Nabi Azad.

According to **Maheshwari& Hiremath (2014)** while taking the food so supplied by the Airlines, a passenger suddenly experienced some pain in his mouth because of some hard substances piercing the gum. It was found that it was a piece of sharp metallic wire, which got into the mouth with rice and curry. In another case, where the complainant while traveling by Air was served with food containing broken glass articles which was noticed while chewing the food, it was held as deficiency in service. Thus it is said, supply of defective goods amounts to

gross deficiency of service. In case of food items, we don't need to look far for evidence of adulteration.

Bagchi(2000) According to lab test conducted by Food Technology and Quality Control Department, over 66 percent of the samples were found contaminated. Out of 149 mustard rapeseed samples, 98 of them were contaminated with Argemone Mexicana. Similarly, 44 percent of the black pulses were found adulterated with coal tar and inedible mix. The report has also said that 40% of ghee in the market was contaminated with vegetable fat and high concentration of **fatty acid**s, while 27% of vegetable ghee in the market was contaminated due to the use of low quality raw materials. Likewise 54.5% samples of papad were also found adulterated.

Bagchi (2000) A survey conducted reveals that the presence of pesticide residues in fruits and vegetables has been increasing steadily. The survey showed that about 18 per cent vegetables and 12 per cent fruits, both home grown and imported, contained pesticide residues, including banned pesticides. Residues of DDT, DDE and HCE pesticides were found in samples from Mumbai and Hyderabad, while samples from Anand, Surat and Baroda in Gujarat had chlorpyriphos and monocrotophos residues above the maximum levels.

According to **Subbarao*et al*(2007)** all the food samples except gene collected from the households of the respondents were found to be adulterated. The main adulterants in milk was water (70.0 percent); turmeric powder contained chalk powder (43.3 percent); chillies powder had artificial colour (100.0 percent); essential oils were removed from cardamom (36.6 percent); green gram and urd bean had water soluble colours; chick pea flour had artificial colours (70.0 percent) and chalk powder was present in sugar (36.6 percent).

Maheshwari & Hiremath (2014) said that Ads warn that milk could be synthetic, sugar and salt can be contaminated with chalk powder, chilli powder could be mixed with brick powder grit or saw dust. The common adulterant in tea leaves is artificial colour, mustard seeds could be substituted with harmful argemone seeds, coriander powder may have horse dung in it. All festivities are now discoloured by adulterated Khoya (dried milk) and false silver foil on sweets which is often Aluminium.

Jaiswal (2011) Found that the poor quality cardamoms (from which essential oils have been extracted) are mixed with good quality green cardamoms, and red pepper powder is adulterated with colored saw dust in the weekly markets. Admixture of oleomargarine (a product of beef fat) in butter and gelatin, and formaldehyde in milk are common adulterants.

Majumdar (2010) found that oils and fats containing butylatedhydroxyanisole or butylated hydroxyl toluene are mixed with edible oils. From the point of nutrition, the mixing of rancid oil in edible oils destroys vitamins A and E.

Jaiswal (2011) revealed that admixture of oleomargarine (a product of beef fat) in butter and gelatin, and formaldehyde in milk are common adulterants.

Siddqui (2010) found that unripe fruits are artificially ripened with ethylene to retain firmness and to give ripening appearance. Powder of calcium carbonate containing traces of arsenic and phosphorus is applied to fruits; fruits and vegetables are plumped up with injection of hormone ‘oxytocin’ to retain freshness, and colored water is injected into water melon to impart redness to pulp.

FSSAI (2011) the Food and Safety Standards Authority of India published the report of the national survey of adulterated foods in 33 states, viz. 8.79% incidence (n= 94,000) in 2008; 11.14% (n=113,000) in 2009; 12.65% (n=117,000) in 2010. When milk samples (n=1791)

collected in New Delhi were tested, 32% of them were found diluted with water, or mixed with glucose/skim milk powder (30.6%) or harmful detergent (5.7%) [12]. On an average, 13% of both packaged and loose food items sold across the country have been found contaminated; and the range varied considerably from one state to another, i.e., Chandigarh (40%), Uttarakhand (34%), Uttar Pradesh (29%), Rajasthan (23%), West Bengal & Himachal Pradesh (20%), Bihar (17%), Nagaland (16%), Madhya Pradesh, Odisha& Punjab (15%), Tamil Nadu (14%), Maharashtra (10%), Karnataka (5%) and Delhi (4%) [12]

According to **Mishra (2011)** in a survey, 70% of milk samples did not confirm to prescribed standards; i.e., 46% were with low solid not fat due to dilution with water, and 8% were with detergents [28]

2.3 Detection methods

According to **Kamthania *et al.* (2014)** Several test kit for detecting various adulterants viz urea, neutralizers, sucrose, glucose, pesticides antibiotics, aflatoxin have been developed in our country at National Dairy Research Institute, Karnal, Central food technological Research Institute, Mysore, PCDF, Lucknow and elsewhere. For detection of mastitis, simple strip test has been developed further M/s Gist Brocades, Netherlands, have developed test kits testing presence of antibiotics and sulphur drug residues in milk.

According to **Gahukar (2014)** Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar (Haryana) developed a kit for rapid spot testing to detect urea in milk.

Thakur *et al.* (2009) revealed that none of the subjects was aware of the physical and chemical test employed to detect to adulterant.

According to**Dzung & Dzuan (2004)** Adescriptive test: Evaluation were carried out by all panelists in sessions that contented of four samples, although the number of session per day and timing of the session varied from participant to participant. However, participants followed the same experimental design, ensuring that the same samples were grouped in sessions for all panels, and three replicate judgments were made on each sample by each judge. The assessors were asked to evaluate the coffee attributes on a non-structural linear scale and rinse out their mouth with water between coffee samples.

Dzung & Dzuan, (2004) Consumer test: reported that consumers assessed fifteen coffees in two sessions. In the first session, they evaluate eight coffees and in the second one was seven coffees. The consumers were asked to rate their preferences (overall degree of liking, and the degree of liking aroma, taste, appearance, mouthfeel, aftertaste) on a nine-point hedonic scale. Water and cereal crackers were supplied for refreshing palates between samples. Due to the difficulty in preparation of coffee samples, the planning of the sessions was evaluation of four coffee samples, break and evaluation of the remaining coffee sample. During the break after the first session, subjects were asked to fill out a questionnaire about their coffee consumption habits. Thus, the total duration of a session was about 45 minutes. The randomized presentation was affected to all consumers.

All the panels performed the tests in a sensory room, with a separate booth for each assessor.

Kumar (2011) reviewed that according to one survey conducted, adulteration were detected in milk to the tune of 70% with water, turmeric powder-43% with chalk powder, red chilli powder-100% with artificial colour, sugar 37% with chalk powder etc.

Singh *et al.* (2011) said that milk is staple food for both the group of children urban as well as rural area. From both the regions a wide variation of adulterants mixing was observed. The adulterants have been detected by doing the test and it was found that adulteration practice was higher in urban area compared to rural area.

2.4 Sensory evaluation

When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic. Sensory quality is a combination of different senses of perception coming into play in choosing and eating a food. Appearance, flavor and mouth feel decide the acceptance of the food. **(Srilakshmi 2010)**

Dzung & Dzuan(2004) Evaluation of sensory quality has been defined as *"a scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of foods and materials as they perceived by the senses of sight, taste, touch and hearing".*

As defined by **ISO Standard 5492** sensory analysis is the *"examination of organoleptic attributes of a product by the sense organs".*

Sensory Characteristics of Food

Appearance: Surface characteristics of food products contribute to the appearance. Sight plays a role in the assessment of lightness of foods like the bread, cakes and idli. Transparency, opaqueness, turbidity, dullness and gloss is mediated by the organs of sight.

Colour: In addition to giving pleasure, the colour of food is associated with other attributes. Ripeness of fruits can be assessed by the colour.

Flavour: The flavor has three components- odour, taste, and composite of sensation known as mouth feel.

Dzung &Dzuan (2004) Sensory evaluation has been defined as a scientific method used to evoke, measure, analyze and interpret those responses to products as perceived through the senses of sight, smell, touch, taste and hearing (Stone and Sidel, 1993). This definition has been accepted and endorsed by sensory evaluation committees within various professional organization such as the Institute of Food Technologists and the American Society for testing and Materials. The field of sensory evaluation has grown rapidly in the second half of the 20^{th} century, along with the expansion of the processed-end food and consumer product industries. Nowadays, sensory evaluation becomes a tool irreplaceable in food industry while interacting with the key sectors in food production. When a consumer buys a food product, they can buy nutrition, convenience, and image. Nevertheless, most importantly consumers are buying sensory properties/performance and sensory consistency. Therefore, sensory evaluation should be an integral part in defining and controlling product quality. Every company committed to quality should support, develop and operate QC/sensory program.

Costell & Duran (2012) According to ISO Standard 5492 (1992), sensory analysis is the "examination of organoleptic attributes of a product by the sense organs.

Srilakshmi(2010) When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic. Every time food is eaten a judgement is made. Sensory quality is a combination of different senses of perception coming into play in choosing and eating a food. Appearance, flavor and mouth feel decide the acceptance of the food.

Dzung &Dzuan (2004) Descriptive test: Evaluation were carried out by all penallists in sessions that contented of four samples, although the number of session per day and timing of the session varied from participant to participant. However, participants followed the same experimental design, ensuring that the same samples were grouped in sessions for all panels, and three replicate judgments were made on each sample by each judge. The assessors were asked to evaluate the coffee attributes on a non-structural linear scale and rinse out their mouth with water between coffee samples.

Dzung & Dzuan, (2004) Consumer test: reported thatconsumers assessed fifteen coffees in two sessions. In the first session, they evaluate eight coffees and in the second one was seven coffees. The consumers were asked to rate their preferences (overall degree of liking, and the degree of liking aroma, taste, appearance, mouthfeel, aftertaste) on a nine-point hedonic scale. Water and cereal crackers were supplied for refreshing palates between samples. Due to the difficulty in preparation of coffee samples, the planning of the sessions was evaluation of four coffee samples, break and evaluation of the remaining coffee sample. During the break after the first session, subjects were asked to fill out a questionnaire about their coffee consumption habits. Thus, the total duration of a session was about 45 minutes. The randomized presentation was affected to all consumers.

All the panels performed the tests in a sensory room, with a separate booth for each assessor.

According to **Dzung & Dzuan, (2004)** the results indicated that the characteristics contributed positively to the preference of consumer were smell attributes (roast, earth, sweet, butter, moist), colours attribute (dark), tastes attribute (bitterness). The attributes reduced the

consumer preference included smell attributes such as almond, sour, sweet smell and taste attributes like sour, sweet, and salty. The attribute sour taste was" the worst" for all seventeen attributes. Although there were small differences found between European and Vietnamese coffees, the Vietnamese consumer preferred to Vietnamese coffees than European coffees. However, their preferences were not unconditional. The most liking were the three coffees 13, 14, 15 over the fifteen coffees tasted and the most preferred attributes of coffee were butter, burnt and sweet smell, dark colour and bitter taste. The Vietnamese consumers disliked sour taste in coffee for all products. The results of this study will be completed by study in progress with French consumers to find out what attributes of Vietnamses coffee should be improved in accordance with their preference.

Singh *et al.* (2011) said that milk is staple food for both the group of children urban as well as rural area. From both the regions a wide variation of adulterants mixing was observed. The adulterants have been detected by doing the test and it was found that adulteration practice was higher in urban area compared to rural area. Through the household survey of health of children that consumed maximum milk it was found that, the preschool age group from 1-5 years most of the children are dependent on mother's milk, therefore less children have effect on their health related problems like diarrhea and eyesight problems. About 28% urban children of age group 6-18 have been affected by headache, while only 4% rural children were affected of same age group. This percentage increase with the increase in age and 38% urban children of age group 19-22 were affected by headache, while only 12% rural children were affected from same age group. Eye sight problem was also detected in survey, and 11% urban children of age group 1-5 years were affected by eye problems, while only 3% rural children were affected of same age group while 57% of urban children age group 19-22 was affected by eyesight problem, while

only 16% rural children were affected of same age group. In the age group 19-22 of total sample 52% of urban children were affected as compared to only 12.5% in rural areas. Diarrhoea most often in school going children was one of the major concerns. In age group 1-5 years, 45% of total sample in urban area was affected by diarrhoea as compared to only 22% in rural areas. In the age group 6-18 years, 57% of total sample in urban children were affected by diarrhoea as compared to only 16% in rural areas. While in age group 19-22 years, 52% of total sample in urban children were affected by diarrhoea as compared to only 12.5% in rural areas.

2.5 Domestic methods

According to **Kamthania *et al.* (2014)** Several test kit for detecting various adulterants viz urea, neutralizers, sucrose, glucose, pesticides antibiotics, aflatoxin have been developed in our country at National Dairy Research Institute, Karnal, Central food technological Research Institute, Mysore, PCDF, Lucknow and elsewhere. For detection of mastitis, simple strip test has been developed further M/s Gist Brocades, Netherlands, have developed Delvotest kits testing presence of antibiotics and sulphur drug residues in milk.

Subbarao*et al.*(2007) A kit was developed, tested and given to the housewives so that they could detect adulterants in commonly used food items at the household level.[5]

2.6 Health hazards

According to **Gahukar (2014)** Contamination of mycotoxins, metals and pesticides in daily foods and milk has been found highly toxic and carcinogenic, and about 70% of deaths are supposed to be of food-borne origin. Therefore, health hazards related to foods and food products are considered to be a major problem particularly in developing and less-developed countries.

Sudershan *et al.* (2009) reviewed the literature published during 1995 - 2005 on the situation of food safety in India and opined that incidence of food-borne diseases that are non-epidemic and not recognized either by the public or the health authorities, had not been reported due to lack of data. One of the reasons is that various diseases are not categorized separately in the health statistics, though about 70% of deaths are supposed to be of food-borne origin.

Around 44% samples of peanut oil were found adulterated with 5-20% of cotton seed oil, palm oil or castor oil consumption of which resulted in food-born diseases and 70% of children died with diarrhea.

FSSAI (2011) in 1988, 600 persons in Kolkata (West Bengal) suffered from paralysis in hands after having consumed the rapeseed oil adulterated with tricresyl phosphate which is generally used in varnishes and hydraulic fluid. Adulteration of mustard oil with Mexican prickly poppy/argemone (Argemonemexicana) oil caused dropsy in Delhi in 1998, Gwalior (Madhya Pradesh) in 2000, and Kannauj and Lucknow (Uttar Pradesh) in 2002 and 2005 respectively. Various clinical symptoms were obvious and in severe cases, death occurred due to cardiac and respiratory failure .

Al-Rmalli (2012) reviewed that urea is extremely hazardous for human body which can create cancer and various ulcers. In a recent doctoral research on Bangladeshi food conducted by Al-Rmalli, it is found that the level of cadmium in the puffed rice is nearly double than that of uncooked rice, which the writer suggests may be the result of using urea in the puffed rice. Al-Rmalli mentioned ‘exposure to cadmium is linked with kidney disease and over 20 million people in Bangladesh suffer from chronic kidney disease.’

Mukherjee (2014) he found report, according to which the Public Health Foundation of India attributed 80 percent of all premature deaths to contaminated food and water. Dr. Keya Ghosh is the head of CUTS, Kolkata, an NGO that fights for consumer rights. "Food adulteration in India starts from the field itself where fertilizers and pesticides are overused. Therefore one kind of contaminant that is present across all range of food is very high level of pesticide residues," she says.

But pesticide residues are not the only problem. Many products used in everyday cooking, such as cottage cheese and clarified butter, are adulterated. Coloring agents in spices are also posing problems. The use of carbide to make fruit ripen faster has created a number of health hazards.

Noman & Ali (2013) World Health Organisation (WHO) has expressed its anxiety about the impact of food safety upon public health in Bangladesh in its website. It reveals that unsafe food can be a significant reason of many chronic and non-chronic diseases including but not limited to diarrhoea, cancer, heart diseases, various kidney diseases and birth defects. Below find a discussion concerning the core food safety issues and their specific potential impact upon the public health.

Referring the data of International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDRB), WHO suggested that in Bangladesh at least 501 people visits hospital every day for diarrhoeal diseases that are related to food safety. The NTFS has also used by similar ICDDRB data which mentioned that a total of 1,657,381 cases of acute diarrhoea and resultant deaths of 2,064 lives occurred in 1998 alone in Bangladesh. Especially, the extent of attacks and deaths from diarrhoea has become alarming for the last couple of years in Bangladesh. The report of the Directorate General of Health Services (DGHS) mirrors the magnitude of the diarrhoeal diseases

and confirms that this health problem is caused by mainly unsafe foodstuffs. The DGHS report suggests, from 2003 to 2009 17,999,284 people were attacked by diarrhoea and among them 4,674 people died, which signifies that in average at least 3,850 people die for diarrhoea each year. NTFS report also mentioned that each year 5.7 million people become disable due to diarrhoeal diseases in Bangladesh.

Gupta &Panchal (2009)reviewed that regarding food adulteration problem faced the result depicted that little less than half of the respondents have sometimes or other faced problem of adulterated food, one-fifth of the respondents have never come across adulterated food or maybe they were not about adulterated food.

Singh *et al.* (2011) said that milk is staple food for both the group of children urban as well as rural area. From both the regions a wide variation of adulterants mixing was observed. The adulterants have been detected by doing the test and it was found that adulteration practice was higher in urban area compared to rural area. Through the household survey of health of children that consumed maximum milk it was found that, the preschool age group from 1-5 years most of the children are dependent on mother's milk, therefore less children have effect on their health related problems like diarrhea and eyesight problems. About 28% urban children of age group 6-18 have been affected by headache, while only 4% rural children were affected of same age group. This percentage increase with the increase in age and 38% urban children of age group 19-22 were affected by headache, while only 12% rural children were affected from same age group. Eye sight problem was also detected in survey, and 11% urban children of age group 1-5 years were affected by eye problems, while only 3% rural children were affected of same age group while 57% of urban children age group 19-22 was affected by eyesight problem, while

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According to **Lin (2011)** The food service industry contributes 60-80% of the food-borne diseases in India.

Chakrabati (2013) Madhya Pradesh shows a high prevalence of food-borne diseases. In 2008, Madhya Pradesh was ranked fifth (fourth) in terms of total number of cases (deaths) of diarrhea amongst all states and union territories in India.6 Nearly 20 per cent of the examined samples were adulterated in this state—considerably higher than the national average of around 10 per cent.

MATERIAL AND METHODS

CHAPTER-III

MATERIAL AND METHODS

Methodology refers to the method or methods used in the conduct of experiment. This chapter presents the procedure adopted for conducting the various investigations. Keeping in view the specific objectives, the present study has been carried out in two phases i.e. phase-I, phase-II and phase-III

Phase-I Preliminary Study

3.1 Background profile of respondents

3.2 Consumer's knowledge assessment toward food adulteration by using K.A.P. Study.

3.3 Classification of adulteration in food stuffs available at household level

Phase-II Interventional Study

3.4 Using sensory methods (Duo-Trio- Test) for detection of adulteration in common food items

3.5 Preparation of a learning kit for detection of classified adulterant at household level by using low cost methods.

Phase-III Post intervention Study

3.6 Association of Consumer's knowledge towards food adulteration before and after intervention

3.7 Evaluation of adulteration level and health hazards pre and post intervention period

3.1 THE STUDY AREA

3.1.1 DISTRICT PROFILE :

Situated on the banks of the river Gomti, it dates back to the time of the Suryavanshi dynasty. Lucknow, the capital of Uttar Pradesh, was founded by NawabAsaf-ud-Daula. In the

olden times, it served as the capital of the nawabs of Awadh and it is one of the reasons why it is also called as the city of the Nawabs.

The general profile of the district is given under different sub heading:-

S.No.	Variables	Values
1.	Geographic Location	
	Longitude Latitude	80^{o} 30-81^{o} 13’ 26^{o} 30’-27^{o} 10’
	Boundaries in East West North South	 Barabanki Unnao Sitapur&Hardoi Raebareli
2.	Climate	
	Average rainfall (mm) Temperature (^{0}C) Maximum (July) Minimum (Jan) Relative Humidity (%) Maximum (August) Minimum (April)	896.2 (35.28) 40^{o} C to 45^{o} C 3^{o} C to 7^{o} C - -
3.	Area and Administration Divisions	
	No. of Zone No. of Ward (on the basis of household number) No. of Blocks	6 110 8 BakshiKaTalab Chinhat Gosaiganj Kakori Mal Malihabad Mohanlalganj Sarojini Nagar

*Source: https://en.wikipedia.org/wiki/Lucknow

3.1.2 LUCKNOW CITY

Lucknow is the capital city of the state of Uttar Pradesh, India. A major metropolitan city of India, Lucknow is the administrative headquarters of the eponymous District and Division. It is the 2nd largest city in north, east and central India after Delhi. It is also the largest city in Uttar Pradesh. Lucknow has always been known as a multicultural city that flourished as a North Indian cultural and artistic hub and seat of Nawab power in the 18th and 19th centuries. It continues to be an important centre of government, education, commerce, aerospace, finance, pharmaceuticals, technology, design, culture, tourism, music and poetry.

Historically the capital of Awadh was controlled by the Delhi Sultanate under Mughal rule, it was later transferred to the Nawabs of Awadh. In 1856 British East India company abolished local rule and took complete control of the city and the Awadh and later transferred to the British Raj in 1857. Along with the rest of India, Lucknow became independent from Britain on 15 August 1947. It is the world's 74th fastest growing city.

The demographic profile, socio economic characteristics, educational facilities, health Services and others information of city are given below:

1.	**Demographic profile**	
	Area of Lucknow city (Sq. Km) Urban population Urban population (%) Density of population (Per Sq. Km.) Male / Female ratio Hindu (%) Muslim (%) Christian Sikh Buddhist Jain Others (%) Schedule Caste (%)	2,528 km^2 (976 sq. mi) 3,038,996 66.21 1,816 1000 : 917 77.08 21.46 0.45 0.52 0.08 0.11 0.01 21.3
2.	**Socio-Economic characteristics**	
	Average Literacy rate (%) Male Female Industries Small Scale Industries	81.91 85.60 77.93 8836 (DIC, Lucknow) -
3.	**Educational Facilities**	
	University Medical College Engineering College PolytechniqueCollege Technical Training Colleges Primary School Middle Schools Senior and Senior Secondary School	7 Integral University Amity University University of Lucknow Uttar Pradesh Technical University Dr. Ram ManoharLohia National LkwUniversity BabuBanarsidas University 3 (SGPGIMS, KGMU, Sardarpatel Post Graduate Institute of Dental & Medical Sciences) 9 - (Govt. Girls PTC) 55 3050 1222 683

4.	**Health Facilities/Services**	
	GovernmentHospital Allopathic Hospitals Ayurvedic Hospitals Unani Hospitals Sub Health Centers Primary Health Centre Community Health Centre Dispensaries	04 38 39 06 328 26 09 17
5.	**Others**	
	Main river Police Stations Post Offices	1 (Gomti) 37 285

*Source: https://en.wikipedia.org/wiki/Lucknow (2016)

*Source: http://www.census2011.co.in/census/city/127-Lucknow.html

*Source: http://www.mapsof india.com/lucknow

3.2 PERIOD OF STUDY

The study was conducted for a period of four year. During initial period of study extensive literature search, pre-designing and pretesting of questionnaire were done. The field data collection for preliminary study was carried out for a period of six months extending from Dec. 2012 to May 2013. Interventional study was carried for three months from June 2013 to August 2013. Remaining three months were devoted for post intervention study from September 2013 to

November2013.

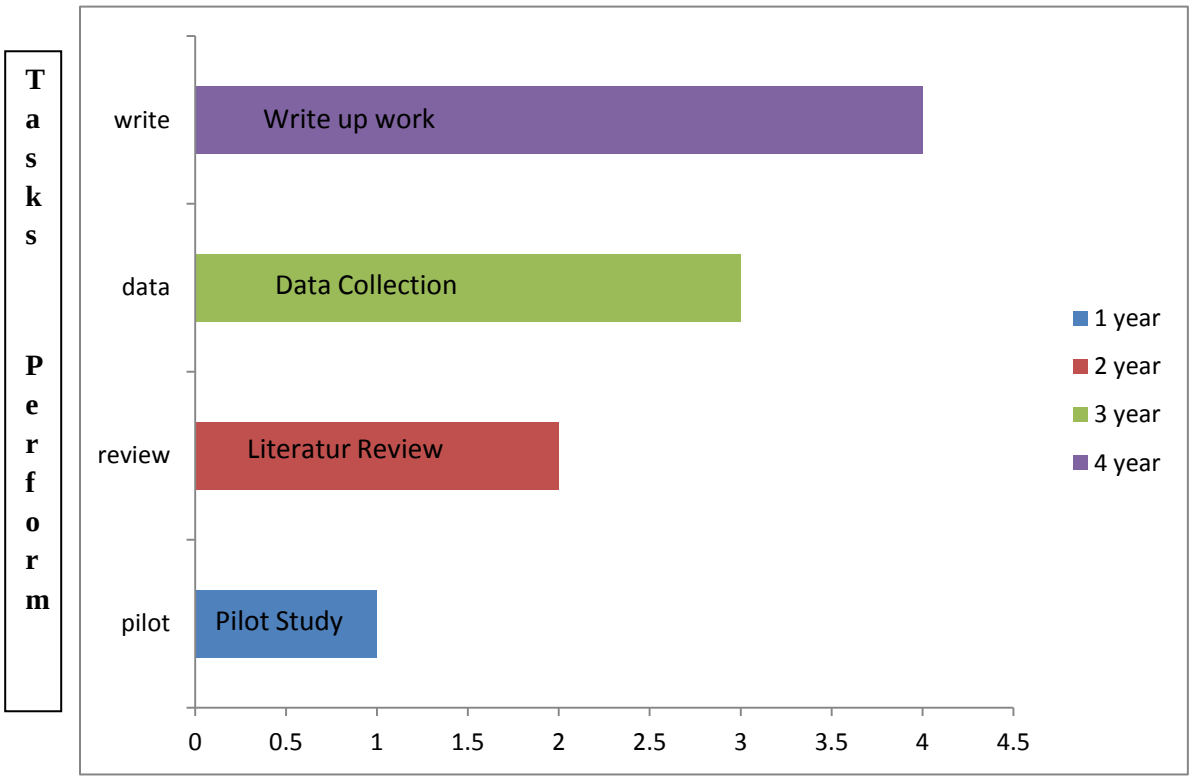


Fig. 3.2 Work plan of the study

3.3 STUDY DESIGN

The approach adopted for this study was interventional based study design i.e. Experimental Research Design. Thus, for the preliminary study 300 samples were selected from the study area through multistage random sampling technique. One hundred fifty samples were selected for interventional study out of 300.The 150 samples considered as exposer group and rest of the sample used as unexposed group. The random sampling techniques were used to collect and select the study sample in survey area. Whereas for post study 150 samples were evaluated those who were already intervene during interventional phase.

3.4 THE STUDY SAMPLE

3.4.1 Sample Size

The sample size is representative of ideal population. Its determination for any study is crucial because reliability of the estimates depends largely on the size of sample. However, the resources and time availability for the study also play an important role in fixing the sample size. As the study was conducted in three phases, the problem becomes even more complicated because each phase requires sample size for the same permissible level of error.

Since one of the main objective of the present study is to determine the knowledge of consumer education /behaviour towards the adulterant in food stuffs at the household level and its effect on health was taken as the parameter to decide the sample size. The pilot study was conducted among the women to estimate the approximate percentage of knowledge of consumer toward adulterant in the population and prevalence of health hazard due to adulterated foods . In the pilot study, 40 women were randomly selected other than study area. According to the study, the knowledge of consumer education toward adulterant was determined. The sample size was 300 for preliminary phase, 150 for intervention and post intervention by using purposively random sampling technique. According to the study, the prevalence of health hazards in study subject was found to be 57 percent. Further, the sample for the present study was calculated using the following formula:

$$n = \frac{4\,pq}{L^2}$$

Where,

n = sample size

p = Prevalence of health hazard in study subject

q = 100 - p i.e., proportion of women without health hazard

L = Permissible level of error in the estimated prevalence, taken as 10%

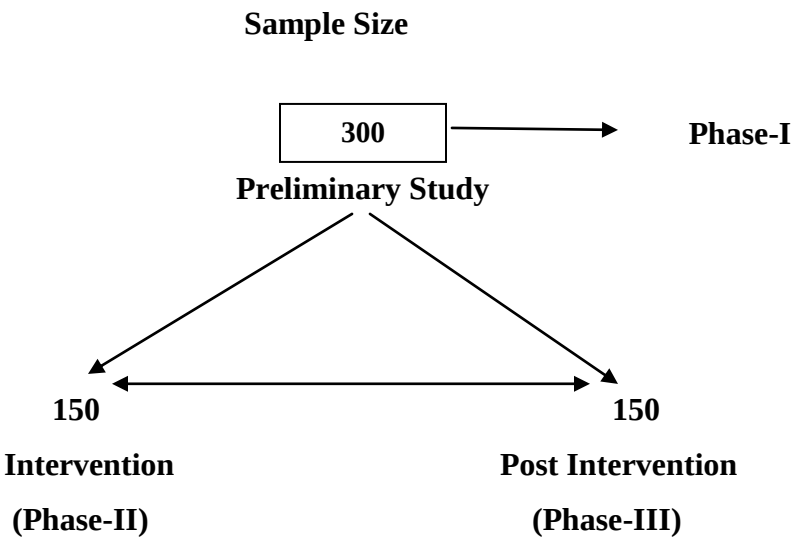
(10% of 57 = 5.7)

Putting the values on this formula, the required sample size was calculated as:

$$n = \frac{4 \times 57 \times 43}{(5.7)^2}$$

$$= 301$$

Thus, the total sample size was fixed to 300.



3.4.2 Study Subjects

For the present study married women of age groups (i.e. 15 to 49) were considered as study subjects who carried their families.

***Inclusive Criteria;**

1. Selected family were identified for study purpose only, one woman consider for data collection aged between 15 to 49 years.

2. Further, the interested study subject was included for the intervention study.

***Exclusive criteria;**

1. In case of migrated family, widow, separated, unmarried marital status was also excluded from the study to minimize the error and have homogenous group.

3.5 SAMPLING METHODOLOGY

As the present study was conducted in three phases, three sampling methods were used.Multistage random sampling was used in preliminary study. For interventional study and post interventional cohort study were used for data collection. .

3.5.1 Preliminary Study

TheMultistage randomsampling was used to collect the data in preliminary phase the stages are given below.

Stage 1: Lucknow city was divided into 110 wards as per Lucknow Nagar Nigam 2016. Out of which, to meet the requirement of sample size one ward selected randomly (Random table) for the study i.e. ward No. 21 (Sharda Nagar ward). This had total No. of Muhallas (17).

Ward No.	**Name of Ward**	**No. of Muhallas**
21.	**Sharda Nagar Ward**	1.Bhadrukh
		2. Usari
		3. Saleh Nagar
		4. FirangiKheda
		5. Devi Khera
		6. SarpotGanj
		7. Eldeco-I
		8. Ruche Khand
		9. RashmiKhand
		10. RajniKhand
		11. Sanik Nagar
		12. SenaniVihar
		13. South City
		14. Eldeco-II
		15. Piprowli
		16. SheetalKhera
		17. RatanKhand

Stage 2: Out of which, Three (3) muhalla selected on the basis of simple random sampling using by lottery methods. The selected muhalla are given below;

S.No.	Muhalla no.	Selected Muhalla
1.	**17**	RatanKhand
2.	**10**	RajniKhand
3.	**13**	South City

Stage 3: total three muhalla was selected and each of them had 100 sample identified by stratified sampling.Simple Random Technique was used to meet out 300 study samples. Study subject were selected only one senior female who carried their family at the time of present study.

3.5.2 Intervention Study

For interventional study first 150 study subjects were selected from 300 samples who were interested for intervention.In intervention phase cohort study technique was used. The basic design of a simple cohort study is with a group or cohort (a+b) exposed to a particular factor thought to be related to health hazard occurrence, and a group (c+d) not exposed to that particular factor. The former is known as "study cohort".

Cohort	Health hazard		Total
	yes	No	
Exposed to putative aetiological factor	a	b	a+b
Not Exposed to putative aetiolgical factor	c	d	c+d

In assembling cohorts, the following general considerations are taken into account:

a. The cohorts must be free from the health hazards under study. Thus, if the health hazard is prevalent, the cohort members are first examined and those who already have evidence of the health hazard under investigation are excluded.
b. Insofar as the knowledge of the health hazard permits, both the groups should be equally susceptible to the health hazard under study, or efficiently reflect any difference in health hazard occurrence.
c. Both the groups should be comparable in respect of all the possible variables, which may influence the frequency of the health hazard; and
d. The diagnostic and eligibility criteria of the health hazard must be defined beforehand; this will depend upon the availability of reliable methods for recognizing the health hazard when it develops.

3.5.2 Post-interventional study

The number of study subjects evaluated 150 those who were already intervene during intervention phase and also which was examine during preliminary phase. The study subjects 150 were same evaluated before and after intervention on the basis of health hazard prevalence and according to as per their score card.

3.6 TOOLS AND TECHNIQUES OF THE STUDY

The success of research investigation to a large extent depends upon the choice of appropriate tools. It is essential that the tools themselves be well standardized, reliable, valid and above all be suitable for the sample chosen for the study. The tools used in this study have been divided into three parts. As the study was conducted in three phases, each phase has different tools as required by the study.

3.6.1 Tools for the Phase-I Preliminary Study

In the preliminary phasepre-designed and pre tested questionnaire used for this study. (Annexure-I)

3.6.1.1Background profile of respondents:-This part related to variables age, educational status, working status, nature of job, sector, marital status, religion, caste, ownership of house, socioeconomic status, dietary preferences, consumption pattern and leisure time activity.

3.6.1.2 Consumer education assessment toward food adulteration:-this part cover the variables consumer rights, consumer protection, consumer laws, food safety and standard acts, food marks and symbols, food adulteration and harmful effects of adulteration.

Plate: 3.6.1: Data Collection from Respondents during Preliminary Study

3.6.1.3 Identification of food adulteration as per five food groups:-This part covers the five food groups given by ICMR (1989) and reviewed ICMR 2011 for the identification of adulteration in food items which included cereal, grains and products, pulses and legumes, milk and meat products, fruits and vegetables and fats and sugar. It also covers the frequency of adulteration in food items on the basis of daily, twice a week, weekly, fortnightly and never.

S.No.	Food Items	Adulterant
•	**Cereals, grains and products**	
	Wheat, bajara, other grains	Ergot
	Wheat flour	Excess bran
	Wheat flour & other grains	Karnel bunt
	Maida	Resultant atta or cheap flour
	Wheat flour	Chalk flour
•	**Pulses and legumes**	
	Arhar and Chana	Khesari dal
	Arhar and chana	Lead chromate
	Besan	Khesari flour
	Milk and meat products	
	Milk	Water
	Milk	Urea
	Milk	Starch
	Milk	Soda
	Milk	Detergent
•	**Fruits and vegetables**	
	Mangoes and bananas	Calcium carbide
	Pumpkin, watermelon, brinjal gourd, cucumber	Oxytocin
	Apples and pears	Wax
	Bitter gourd, leafy vegetables & other vegetables	Cheap colours
•	**Fats and sugars**	
	Mustard oil	Argemone oil
	Coconut oil	Argemone oil
	Ghee	Vanasati or margarine
	Bura Sugar	Washing powder
	Jaggery	Washing powder

3.6.2 Technique of the Study preliminary phase

The author herself acted as the investigator for collecting the data. For this purpose, the head of the household / senior member of the family was contacted. She was briefly explained about the purpose of the study and a short description was given about to study subject. Care was taken to avoid prompting, but in few cases cross questioning become necessary to elicit the desired information. The techniques employed in this study are given below

Phase-I Preliminary study

3.6.2.1 Background profile of the respondents:-

The independent variable is the factor that is measured manipulated or selected by the researcher to determine its relationship with observed phenomenon. For the present investigation demographic variables were married women's age, literacy status, working status, occupation, marital status, nature of diet, religion caste, type of family, family income, housing type, nature of house, consumption pattern and leisure time activities.

Age: Age was operationalized as the number of full years completed by the respondent at the time of interview. Actual age was recorded and categorized on the basis of maximum-minimum responses obtained, the age groups were categorized as: 15-24, 25-34, 35-44 and more than 44.

Education: Education was operationalized as the number of years of formal education acquired by the respondent and grouped as illiterate, primary, middle, high school, intermediate, graduate, post graduate and professional.

Working status: It is the status of women whether, she is working, non-working.

Nature of job: To set the occupational status, respondents were classified in the following groups; Business, labour, service (Govt. & private), housewife, student and unemployed.

Marital status: Standard classification were used for marital status i.e. married, unmarried, separated, divorce, widow or *gauna*not performed. But present study only included married women who so ever indulge in family activity.

Religion: The Hindu, Muslim, Sikh and Christian were included in the sample and studied as per reporting.

Caste:caste was subjects were grouped into SC/ST, OBC, general and others and included as per their reporting.

Type of house: Pakka, kachcha and semi pakka were included in this category and assess on amenities available at the time of data survey work.

Ownership of house:the study subject itself provide statement about their belongings and then divided into own or rented house.

Socioeconomic status: Subjects were divided into 5 socio-economic classes on the basis of per capita monthly income. B.G. Prasad Socio Economic classification (1961) has been used in the present study. It was calculated as follows:

B.G. Prasad Socio Economic classification (1961)

Class	1961 (Base year)	1991 (March)	2013 (June)
Upper	100 & above	1000 & above	2500 & above
Upper middle	50 - 99	500 - 999	1250 - 2499
Middle	30 - 49	300 - 499	750 - 1249
Lower middle	15 - 29	150 - 290	375 - 749
Lower	Below 15	Below 150	Below 375

Multiplication factor for June 2016 = $\frac{269^{*} \times 4.93}{100}$

$= 13.26 \approx 13.00$

* All India Consumer Price Index (AICPI) for year 2016 in 269, in 1991, it was 203 in respect to 1981-82 base, and this base is itself 4.93 times (Link factor) of 1961 base.

*Source: www.igecorner.com/category/aicpin/

Dietary preferences: this includes vegetarian, eggetarian, non vegetarian and occasional non-vegetarian and data collected after their statement about food habits.

Consumption pattern: The frequency of food items taken from five food groups on the basis of daily, 3-4 days, weekly, occasionally and neverby using food frequency method.

Leisure time activity: thehabit of watching television and reading newspaper on regular/own, occasional and never basis. This was included only last month activities.

3.6.2.2 Consumer education assessment toward food adulteration

To assess the consumer education of the respondents following parameters were taken i.e. consumer rights (right to safety, right to information, right to choice, right to be heard, right to redress, right to consumer education), consumer protection (product liability, privacy rights, unfair business practices, fraud mispresentation), consumer laws (credit repair, debt repair, product safety, service, sales contact, bill collector regulation, pricing, utility turnoffs, consolidation. Personal loans that may lead to bankcrupty), food safety and standard acts (the prevention of food adulteration act, the fruit product order, the meat food product order, the vegetable oil products order, the edible oils packaging order, the solvent extracted oil, de oiled meal, and edible, the milk and milk products order, essential commodities act relating to food),

food marks and symbols (AGMARK, green mark, red mark), adulteration and harmful effects of adulteration. These parameters were assessed by pre tested and pre designed questionnaire.

3.6.2.3 Identification of food adulteration as per five food groups:-

List of adulterant found during data collection was recorded by using pre-designed pre-tested questionnaire firstly. After that classified into available five food groups for Indian as per ICMR (1989) recommendation: these are cereal, grains and products, pulses and legumes, fruits and vegetables and fats and sugars. Lastly, selected items from each food group category wise listed for further data collection in the intervention phase.

Basic Five Food Groups: ICMR

S.No.	Food group	Products
1.	Cereals, grains and products	Rice, wheat, ragi, maize, bajra, jowar, rice flakes, puffed rice.
2.	Pulse and legumes	Bengal gram, black gram, cow pea, peas (dry) rajma, soyabeans.
3.	Milk and meat products	*Milk, curd, skimmed milk, cheese *Chicken, liver, fish, egg and meat.
4.	Fruits and vegetables	*Mango, guava, tomato, papya, orange, sweet lime, watermelon *Green leafy vegetables: Amaranth spinach, gogu, drumstick leaves, fenugreek. *Other vegetables: carrots, onion, brinjal, ladies finger, beans, capsicum, cauliflower
5.	Fats and sugars	*Fats: Butter, ghee, hydrogenated fat, cooking oils *Sugar and jaggery

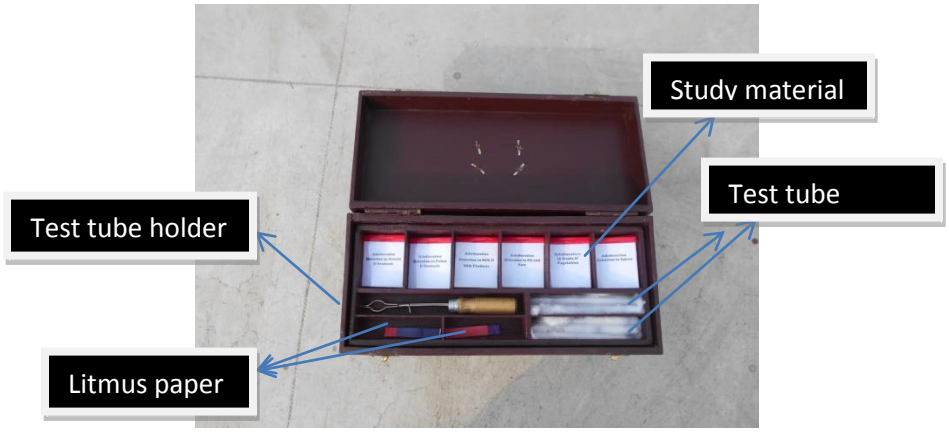
3.6.3Phase-II :Interventional Study

3.6.3.1 Preparation of a learning kit for detection of adulteration at household level by using low cost methods:-On the basis data available, literature and adulteration found in common food items, a learning kit had been prepared. This kit contains four reagents i.e. starch, urea, soda and detergent for adulteration detection in milk. Besides this iodine solution, HCL, iodine solution, magnifying glass, blotting paper, litmus paper and adulteration detection diaries.

Plate:3.6.3.1Developed Detection Kit by Using Low Cost Method at Household Level

A

B



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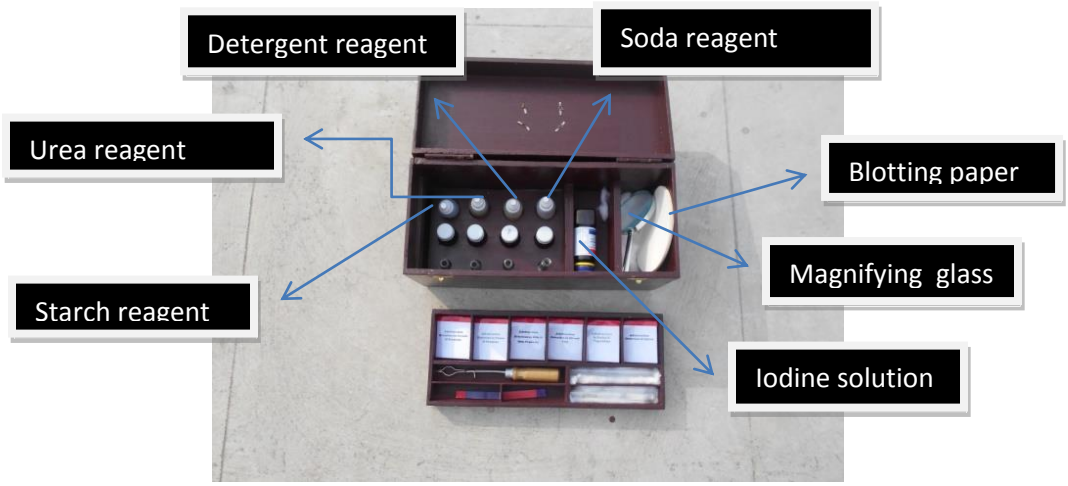

3.6.3.2Demonstration of low cost methods for detection of adulteration in common food items:-Based on the selected food items from each five food groups, demonstration of low cost methods for detection of adulteration in common food items were given by sensory evaluation (Duo-Trio-Test)and through learning kit.

Plate: 3.6.3.2 <u>Demonstration of Adulteration Detection to the Respondents</u>

3.6.3.2.1 Sensory Evaluation: When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or objective or organoleptic. Every time food is eaten a judgment is made.

Sensory is a combination of different senses of perception coming into play in choosing and eating a food. Appearance, flavor and mouth feel decide the acceptance of the food.

Note:- All the detection techniques in Annexure- II (Learning Mannul)

Plate: 3.6.3.2.1 Sensory Evaluation of Adulterated Food Sample by Respondent

Tool for Sensory Evaluation(Duo-trio-test)

This test employs three samples, two identical and one different. The panel is first given one of the pair of identical samples as known reference sample R and then the other two successively in random order, asked to match one of these with the first. A positive answer is required even if it is a guess. The chance probability of placing the samples in a certain order is one-half.

Score card for the sensory evaluation of the products

Name: …… **Date:** ……

Product: …….

The first sample 'R' given is the reference sample

Taste it carefully

From the pair of coded sample next given, judge which sample is the same as **'R'**

Set. No.	**Code no. of pairs**	**Same as 'R'**
1.	……	……..
2.	……	……..
3.	……	……..
4.	……	……..
5.	……	……..Signature

3.6.4 Technique of the Study

3.6.4.1 Preparation of a learning kit for detection of adulteration at household level by using low cost methods:- Detection kit was develop by using low cost methods involved for detecting the adulterant in food stuffs at the household level. The kit was developed after reviewing various adulteration kit or learning material, which was already available for the detection. Such as; instruction manual, instruction manual (common methods for detection at households) research papers, news papers, review papers etc. The concept behind developing low cost method kit was first; adulterant already found in the study area, Secondly ; selected items were detected by using low cost, Third, it was based or divided onto considering of five food groups for Indian given by ICMR 1989. Fourthly; Every day problem faced by common people/consumer and lastly focused on easily availability, handling and useful by consumer in their day to day life. The kit was developed into 3 parts:

Part-1; Small booklet was prepared for the consumers to understand the detection methods easily which are applicable for adulteration detection.

Part-2; All tools are used such as test-tube, test-tube holder, litmus paper, blotting paper, magnifying glass, glass ware and so on.

Part-3; Chemicals are used for detection of adulteration such as, HCL, iodine solution, detergent reagent, starch reagent, soda reagent, urea reagent.

3.6.4.2 Demonstration of low cost methods for detection of adulteration in common food items:-as the awareness of respondents about adulterants found in common food items were very limited therefore for demonstration, food items were selectedfor adulteration detection were chosen as per five food groups given by ICMR (1989). Demonstration was given by sensory

evaluation technique and by adulteration detection kit by using low cost methods at household level.

*Note: all the techniques in Annexure-II (Learning manual)

1. **Cereal, grains and products**

Cereals, grains and products	**Tools**
Ergot in wheat	Sensory evaluation technique
Ergot in wheat, bajra	Detection kit
Excess bran in wheat flour	Sensory evaluation technique
Karnel bunt in wheat flour	Sensory evaluation technique
Chalk powder in wheat flour	Detection kit
Resultant atta or cheap flour in maida	Sensory evaluation technique

2. **Pulses and legumes**

Pulses and legumes	**Tools**
Khesari dal in arhar and chana	Detection kit
Lead chromate in arhar and chana	Detection kit
Khesari flour and besan	Detection kit

3. **Milk and meat products**

Milk and meat products	**Tools**
Water in milk	Sensory evaluation technique
Urea in milk	Detection kit
Starch in milk	Detection kit
Soda in milk	Detection kit
Detergent in milk	Detection kit

Plate: 3.6.4.2 Technique of Adulteration Detection in Milk

Sample: Milk
Quantity: 3 ml

3 ml Milk + 2 drops
Detergent Reagent

Purple colour showed Adulteration in milk

4. **Fruits and vegetables**

Fruits and vegetables	**Tools**
Calcium carbide in mangoes and bananas	Sensory evaluation technique
Oxytocin in pumpkins, watermelon, brinjal, gourd	Sensory evaluation technique
Wax in apples and pears	Sensory evaluation technique
Cheap colous in bittergourd, green leafy vegetables	Sensory evaluation technique

5. **Fats and sugars**

Fats and sugars	**Tools**
Argemone oil in mustard oil	Detection kit
Argemone oil in coconut oil	Detection kit
Vanaspati in ghee	Detection kit
Washing powder in jiggery	Detection kit
Washing powder in bura sugar	Detection kit

3.6.5 Phase-III Post Study

Tool of the Study

3.6.5.1 Evaluation sheets for adulterated foods:-Score card has been preparedto evaluate the KAP score of consumers in post intervention regarding knowledge about adulteration, its hazardous effects and its detection techniques at household level by using low cost methods.

Plate: 3.6.5.1 Evaluation of Respondents during Post-Study

3.6.6 Technique of the Study

3.6.6.1 Evaluation sheets for adulterated foods (Annexure-III)

Score card has been prepared to evaluate the consumer's knowledge about adulteration, its hazardous effects and its detection techniques at household level by using low cost methods in the form of Yes/No.

3.7 ANALYSIS OF DATA

The data was coded, tabulated and analysed using appropriate statistical techniques i.e. mean, SD, t-test, ANOVA, paired t-test, χ^2 test, correlation was administered to analyse the data accordingly.

STATISTICAL TOOLS EMPLOYED

The data was analyzed using Statistical Package for Social Sciences version 15.0. Data has been represented as frequency and percentages for categorical and as mean and standard deviation for continuous variables. For the purpose of analysis, chi-square test has been used for categorical and Independent samples 't'-test and Analysis of variance (ANOVA) for continuous data. The confidence level of the study was kept at 95%, hence a 'p' value less than 0.05 indicates a statistically significant association. The statistical formulae used for the study are as follows:

1. Mean: To obtain the mean, the individual observations were first added together and then divided by the number of observation. The operation of adding together or summation is denoted by the sign Σ.

The individual observation is denoted by the sign X, number of observation denoted by n, and the mean by $\overline{X}$.

$$\overline{X} = \frac{\Sigma X}{\text{No. of observations (n)}}$$

2. Standard Deviation: It is denoted by the Greek letter σ.

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n}}$$

3. **Chi square test:**

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Where O = Observed frequency

E = Expected frequency

4. **Student 't' test**: To test the significance of two means the student 't' test was used

$$t = \frac{\overline{X}_1 - \overline{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where $S^2 = \frac{(N_1 - 1)SD_1^2 + (N_2 - 1)SD_2^2}{N_1 + N_2 - 2}$

where $\overline{X}_1$, $\overline{X}_2$ are means of group 1 and group 2

N_1, N_2 are number of observation group1 and group 2

SD_I, SD_2 are standard deviation in group1 and group 2

5. **Analysis of Variance:Analysis of Variance** (ANOVA): The ANOVA test was used to compare the within group and between group variances amongst the study groups. Analysis of variance of different study groups at a particular time interval revealed the differences amongst them. ANOVA provided “F" ratio, where a higher "F" value depicted a higher inter-group difference.

$$: F = \frac{\text{Mean of Sum of Between Group Differences}}{\text{Mean of Sum of within Group Differences}}$$

Differences	**Sum of Squares**	**df**	**Mean Square**	**F**
Between Groups	A	N_1	$X=A/N_1$	X/Y
Within Groups	B	N_2	$Y=B/N_2$	

6. Level of significance: "p" is level of significance

p> 0.05	Not significant
p <0.05	Significant
p <0.01	Highly significant
p <0.001	Very highly significant

RESULT AND DISCUSSION

CHAPTER-IV

RESULT & DISCUSSION

This chapter reveals the findings of the research work. The present research has three parts viz. preliminary study, interventional study and post study. For comprehensive presentation, this chapter has been presented under the following headings:

Phase-I Preliminary Study

4.1 Background profile of respondents

4.2 Consumer's knowledge assessment toward food adulteration by using K.A.P. Study.

4.3 Classification of adulteration in food stuffs available at household level

Phase-II Interventional Study

4.4 Using sensory methods (Duo-Trio- Test) for detection of adulteration in common food items

4.5 Preparation of a learning kit for detection of classified adulterant at household level by using low cost methods.

Phase-III Post Intervention Study

4.6 Association of Consumer's knowledge towards food adulteration before and after intervention

4.7 Evaluation of adulteration level and health hazards pre and post intervention period.

Phase-I Preliminary Study

4.1 Background Characteristics

This section discussed with back ground characteristics of the respondent under various parameters viz; age, educational status, working status, occupational status, nature of jobs, marital status and so on. Other components were evaluated in the form of environmental behaviors at the household level.

Table 4.1.1Background Characteristics of the Study Subjects

(N=300)

S.No.	Variable	Number of consumers	Percentage
•	**Age(in year)**		
	15-24	04	01.30
	25-34	59	19.70
	35-44	179	59.70
	>44	58	19.30
	Total	**300**	**100.00**
•	**Educational status**		
	Illiterate	02	00.70
	High School	33	11.00
	Intermediate	55	18.30
	Graduate	189	63.00
	Postgraduate	14	04.70
	Professional	07	02.30
	Total	**300**	**100.00**
•	**Working Status**		
	Working	60	20.00
	Non-working	240	80.00
	Total	**300**	**100.00**
•	**Nature of job**		
	Service	48	16.00
	Business	16	05.30
	Housewife	227	75.70
	Student	09	03.00
	Total	**300**	**100.00**
•	**Sector**		
	Semiprivate	251	83.70
	Govt.	21	07.00
	Private	28	09.30

S.No.	Variable	Number of consumers	Percentage
	Total	**300**	**100**
•	**Marital Status**		
	Married	300	100
	Unmarried	0	00.00
	Separated	0	00.00
	Divorce	0	00.00
	Widow	0	00.00
	Gauna not performed	0	00.00
	Total	**300**	**100**
•	**Religion**		
	Hindu	222	74.00
	Muslim	72	24.00
	Sikh	06	02.00
	Total	**300**	**100.00**
•	**Caste**		
	SC/ST	54	18.00
	OBC	92	30.70
	Gen	154	51.30
	Total	**300**	**100.00**

Consumer age was founded between 35 to44 years in 179(59.70%) as heighted percentage whereas, only 04(01.30%) belonged to age group of 15-24 years. Age group between 25-34 and > 44 years were similar i.e.59 and 58 in number, correspondally value are in percentage 19.70 and 19.30. Majority of consumers were aged 35-44 years (N=179; 59.7%) followed by those aged 25-34 years (19.7%) and those aged >44 years (n=58; 19.3%). There were 4 (1.3%) consumers who were aged between 15 and 24 years.

Except for 2 (0.7%) consumers, all the consumers were literate. Majority of consumers were graduate or above (n=210; 70%). There were 33 (11%) consumers who were educated upto High

School and 55 (18.3%) educated up to Intermediate. A total of 14 (4.7%) were postgraduate and 7 (2.3%) had a professional qualification.

Majority of consumers were non-working (n=240; 80%). Only 60 (20%) were working. Maximum number (n=227; 75.7%) were housewives, a total of 9 (3%) were students. There were 48 (16%) who were in service while 16 (5.3%) were in business.

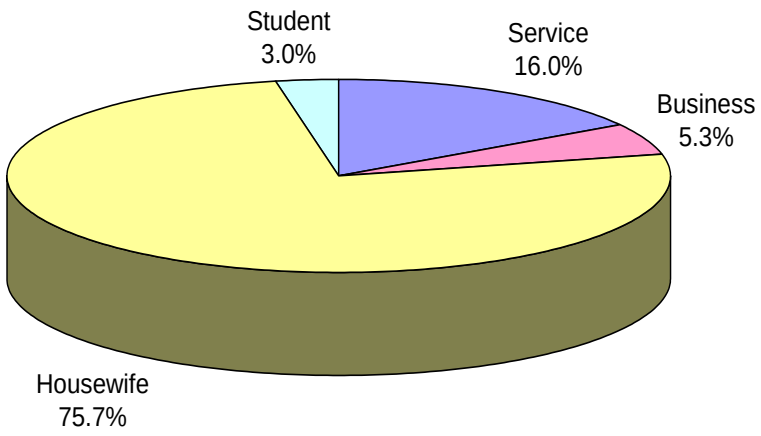

Figure 4.1.1. Distribution of Job as per their Nature among the Study Subjects

Majority were dependent on semiprivate sector (n=251; 83.7%) followed by private sector (9.3%). Only 11 (7%) were dependent on government sector.Majority of consumers were Hindus (n=222; 74%). There were 72 (24%) Muslims and 6 (2%) Sikhs. Majority were from general category (n=154; 51.3%). A total of 54 (18%) were SC/ST and 92 (30.7%) were OBC.

Table 4.1.2 Percentage wise Distribution of Environmental Profile at Household Level

(N=300)

•	**Type of house**		
	Pakka	279	93.00

	Semi-Pakka	21	07.00
	Total	**300**	**100.00**
•	**Ownership of house**		
	Own	169	56.30
	Rental	131	43.70
	Total	**300**	**100.00**
•	**Socioeconomic status**		
	Lower middle	33	11.00
	Middle	128	42.70
	Upper middle	135	45.00
	Upper	04	01.30
	Total	**300**	**100.00**
•	**Dietary preferences**		
	Vegetarian	153	51.00
	Eggetarian	27	09.00
	Non-vegetarian	111	37.00
	Occasional vegetarian	09	03.00
	Total	**300**	**100.00**

Maximum number of consumers (n=135; 45%) were from upper middle income group followed by those from middle income group (n=128; 42.7%). There were 33 (11%) from lower middle and 4 (1.3%) from upper income group**.**

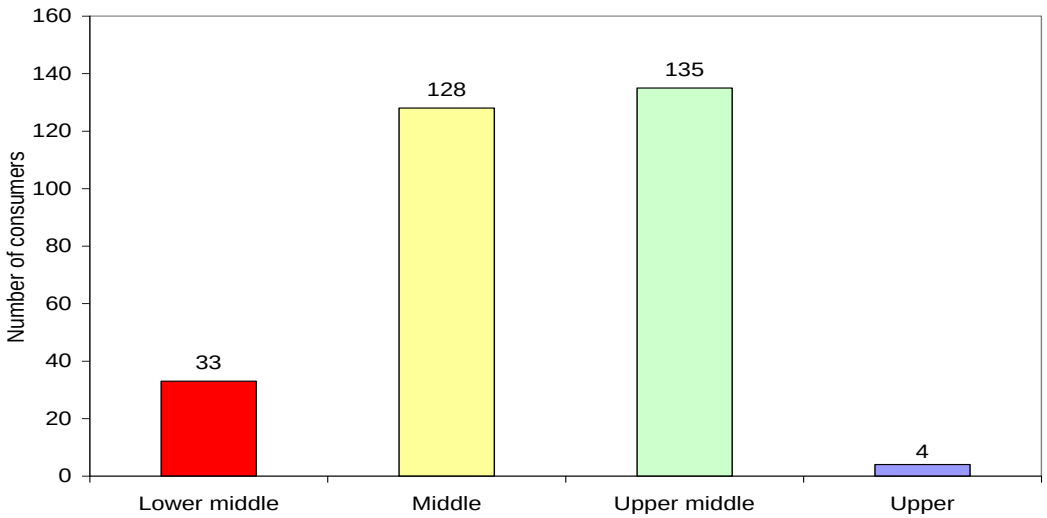

Figure 4.1.2Distribution of Socioeconomic Status among the Respondent

Majority of consumers were vegetarian (n=153; 51%). There were 111 (37.0%) non-vegetarian. A total of 27 (9%) were eggaetarian and 9 (3%) were occasional vegetarian.

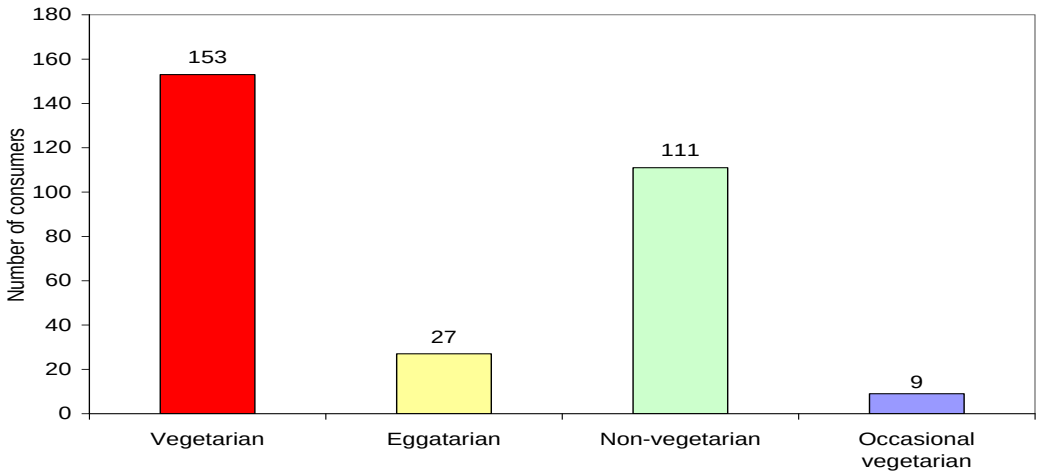

Figure 4.1.3Frequency Distribution of Dietary Habits as per their Nature of Diet.

Most of the consumers dwelled in pakka houses (n=279; 93%). There were 21 (7%) who were dwelling in semi-pakka houses. None of the consumers dwelled in kutcha houses.

Majority (n=169; 56.3%) had their own house. A total of 131 (43.7%) were living in a rented house.

Consumption Pattern of Food Items: Vegetables and pulses were the food items that were reported to be daily consumed by all the consumers. Green vegetables, Salad, coffee and fruit use were the most common food items consumed on daily basis while animal products and fish were the food items that were reported to be never consumed by majority of consumers.

Table 4.1.3Percentage wiseDistribution as per Consumption Pattern ofFood Stuffs among Respondents

(N=300)

SN	Variable	Daily	3-4 days	Weekly	Occasionally	Never	Total
1.	Milk	61 (20.30)	58 (19.00)	72 (24.00)	20 (06.60)	89 (29.60)	300 (100)
2.	Vegetables	300 (100)	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)	300 (100)
3.	Green vegetables	277 (92.30)	23 (07.60)	0 (00.00)	0 (00.00)	0 (00.00)	300 (100)
4.	Dal pulses	300 (100)	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)	300 (100)
5.	Animal products	0 (00.00)	102 (34.00)	36 (12.00)	09 (03.00)	153 (51.00)	300 (100)
6.	Fast food	0 (00.00)	19 (06.30)	100 (33.30)	181 (60.33)	0 (00.00)	300 (100)
8.	Dry fruit	69 (23.00)	147 (49.00)	80 (26.60)	04 (01.30)	0 (00.00)	300 (100)
9.	Coffee	212 (70.60)	79 (26.00)	09 (03.00)	0 (00.00)	0 (00.00)	300 (100)
10.	Fish	0 (00.00)	31 (10.30)	104 (34.60)	12 (04.00)	153 (51.00)	300 (100)
11.	Fermented	0 (00.00)	88 (29.30)	202 (67.30)	10 (03.30)	0 (00.00)	300 (100)
12.	Fruit	172 (57.30)	98 (32.60)	30 (10.00)	0 (00.00)	0 (00.00)	300 (100)

Fast food was the item which was reported to be consumed occasionally by majority of consumers while fermented food was the item reportedly consumed weekly by majority of consumers.

Leisure time activity of respondents:A total of 201 (67%) consumers used to watch television regularly and 78 (26%) used to watch it occasionally, however, 21 (7%) did not watch television at all.

Table 4.1.4 Distribution as per Leisure Activity of the Respondents

(N=300)

SN	Variable	Regular / Own		Occasional		Never		Total	
		No.	%	No.	%	No.	%	No.	%
1.	Habit of watching television	201	67.0	78	26.0	21	7.0	300	100.00
2.	Habit of reading newspaper	209	69.7	91	30.3	00	00	300	100.00

A total of 209 (67.7%) consumers used to read newspaper regularly and 91 (30.3%) used to read it occasionally.

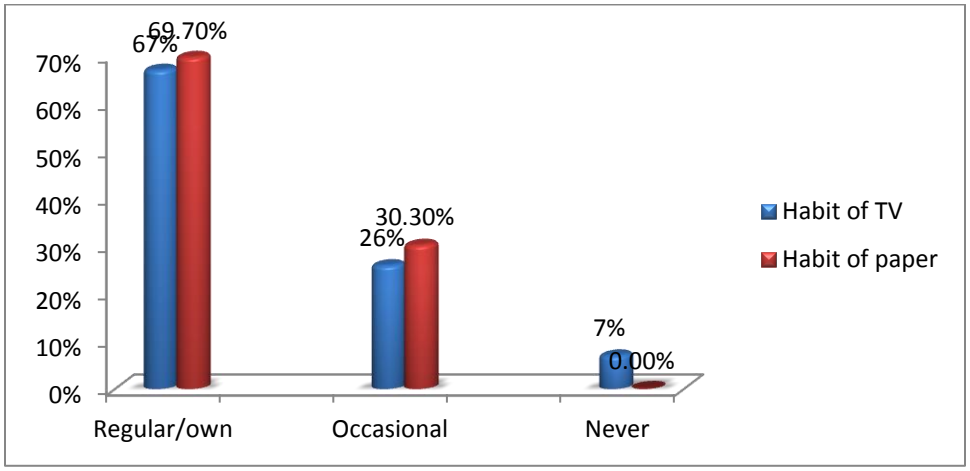

Figure 4.1.4 Diagram of Habits of Watching TV & Newspaper Reading among the Study Subjects

4.2 Consumer's Knowledge Assessment towards Food Adulteration by Using K.A.P. Study.

As we knew about consumer's knowledge is prime emphasis by researcher to elicit food adulterations in day to day life, but before intervene the present study a thorough knowledge

about adulteration among consumer was key point for present study. Keeping this facts the consumers knowledge were assessed by using K.A.P. Study in respect towards food laws, food safety, consumer behavior and health hazards. The present study subdivided above heads and discussed one by one. Assessments by K.A.P. Methods scoring were developed by the researcher to furnish the investigation. These scoring had percentile <25 showed low score, 25-75showed average and >75showed High score and analyzed by mean and standard deviation.

Knowledge Wise Distribution of Consumer Rights among Study Subject

It is evident from **Table 4.2.1** that 9.33% respondents (28) were aware about 'right to redress'. Nine per cent respondents (27) were aware about 'right to choice', where as 8.66% (26) were know about right to safety', 8.33% (25) were know about right to heard' and 7.00% (21) aware were about 'right to heard'.

Table 4.2.1 Percentage Wise Distribution of Knowledge related to Consumer Rights among Study Subjects (N=300)

S.No.	Particulars	Percentage Distribution (N=300)				Total	
		Yes		No		No.	%
		No.	%	No	%		
1.	Right to safety	26	8.66	274	91.30	300	100
2.	Right to information	21	7.00	279	93.00	300	100
3.	Right to choice	27	9.00	273	91.00	300	100
4.	Right to heard	25	8.33	275	91.60	300	100
5.	Right to redress	28	9.33	272	90.60	300	100
6.	Right to consumer education	19	6.33	281	93.60	300	100

Only 6.33% per cent of respondents (19) were aware about 'right to consumer education'

from 300 respondents.**Gupta & Panchal (2009)**also reported that in 45 per cent families, the home maker took the major decisions for purchasing food for their families. Regarding buying practices includes the type of packaging used while purchasing, brand choice, shop choice and purchase frequency of the selected items undertaken for study. Regarding Consumer awareness the result depicted that majority, that is, two third of the respondents were moderately aware about the rights and responsibilities related to food quality and food adulteration.

Sudershan *et al.*(2009)also said that food safety in India was about 54.2% of the respondents did not know or associate diarrohea as a symptom of food-borne disease, while about 50 to 70% did not know or associate abdominal pain, nausea and vomiting as symptoms of food-borne disease. Only 6% of the respondents were inclined to complain about food adulteration and others were either ignorant or did not bother about it; 72% in the same study did not take any action after an episode of food-borne disease outbreak in the village; about 50% of the respondents did not recognize food spoilage by smell. The findings of this study showed that there is a need to increase awareness pertaining to storage of food, recognition of food spoilage, symptoms of food-borne disease and action to be taken after detecting food adulteration/poisoning. **Maheshwari & Hiremath (2014)**also revealed that unsafe food, for example in case of adulteration can harm consumer health and hence it is a serious offence. A complaint can be lodged under the above Act for the goods which will be hazardous to life and safety when used. In some of the cases for example, the consumer forum awarded compensation for the injury caused by consumption of unsafe food by treating it a deficiency of service. **Gupta &Panchal (2009)** found that in 45 per cent families, the home maker took the major decisions for purchasing food for their families. Regarding buying practices includes the type of packaging used while purchasing, brand choice, shop choice and purchase frequency of the

selected items undertaken for study. Regarding Consumer awareness the result depicted that majority, that is, two third of the respondents were moderately aware about the rights and responsibilities related to food quality and food adulteration.

Distribution of Consumer Protection as per their Knowledge

Consumer protection as per their knowledge in **Table 4.2.2** shows that respondents (9.00) i.e. 3.00% were aware about 'product liability', and 'fraud mispresentation'.

Table 4.2.2 Percentage wise Distribution of Knowledge Regarding Consumer Protection

(N=300)

S.No.	Particulars	Percentage distribution(N=300)				Total	
		YES		NO		NO.	%
		NO.	%	NO.	%		
1.	Product liability	9	3.00	291	97.00	300	100
2.	Privacy rights	7	2.33	293	97.60	300	100
3.	Unfair business practices	8	2.66	292	97.30	300	100
4.	Fraud mispresentation	9	3.00	291	97.00	300	100

Eight respondents (2.66%) were aware about unfair business practices and 7 respondents i.e. 2.33% were aware about privacy rights from 300 respondents.

According to**Maheshwari& Hiremath (2014)** the advertisements of the Ministry of Consumer Affairs titled 'Jago Grahak Jago' themselves acknowledge the rampant adulteration that exists in house hold items and gives tips to consumers to detect them. **Khapre *et al.* (2011)**also found that 68.5% Households, wife (home-maker) buys the grocery. Majority of them never read the food lables. According to a survey **(Anon 1996**) there was a report of police

having registered criminal cases against four milk traders of Muzzaffarnagar district where a trader was arrested for allegedly manufacturing synthetic milk**).**

Existing Knowledge about Consumer Laws among Study Subjects

The existing knowledge about consumer laws deals with wide range of issues. **Table 4.2.3** shows that 26.00 respondents (8.66%) were familiar with 'product safety, followed by 'pricing' (23.00) i.e. 7.66%. and only 20 respondents (6.66%) were familiar with 'service'.

Table 4.2.3 Percentage wise Distribution of Knowledge Towards Consumer Laws Among Study Subjects (N=300)

S.No.	Particulars	Percentage distribution (N=300)				Total	
		Yes		No		No.	%
		No.	%	No.	%		
1.	Credit repair	0	0.00%	100	100	300	100
2.	Debt repair	0	0.00%	100	100	300	100
3.	Product safety	26	8.66%	274	91.30	300	100
4.	Service	20	6.66%	280	93.30	300	100
5.	Sales contract	0	0.00%	100	100	300	100
6.	Bill collector regulation	0	0.00%	100	100	300	100
7.	Pricing	23	7.66	277	92.30	300	100
8.	Utility turnoffs	0	0.00%	100	100	300	100

Almost all the respondents were not even heard about 'credit repair', 'debt repair', 'sales contract', 'bill collector regulation', 'consolidation' and 'personal loans that may lead to bancrupty'. According to **Anon1996** it was further alleged that clause 14 of the Prevention of Food Adulteration Act which makes it mandatory for the wholesalers to issue warranty bills

bluntly violated. "*Gur*" (animal feed) was openly sold in the market for human consumption. The inspectors and higher authorities were hand-in-glove with mill owners and wholesalers and no action was being initiated against those indulging in adulteration. The association demanded that food commodities should be thoroughly checked at the time of packing to prevent adulteration.

Distribution of Knowledge on Food Safety and Standard Act

Table-4.2.4 shows that respondents (31) i.e. 10.33% were know about 'prevention of food adulteration act' and 'milk & milk products order' followed by 'fruit products order, and 'vegetable oil products (control) order' (9.66%).

Table 4.2.4Percentage wise Distribution of Knowledge regarding Food Safety and Standard Act among Study Subjects (N=300)

S.No.	Particulars	Percentage Distribution (N=300)				Total	
		Yes		No			
		No.	%	No.	%		
1.	Prevention of food adulteration act	31	10.33	269	89.60	300	100
2.	Fruits products order	29	9.66	271	90.30	300	100
3.	Meat food products order	23	7.66	277	92.30	300	100
4.	Vegetable oil products (control) order	29	9.66	271	90.30	300	100
5.	Edible oils packaging (regulation) order	18	6.00	282	94.00	300	100
6.	Solvent extracted oil, de oiled meal & edible	0	0.00	100	100	300	100
7.	Milk and milk products order	31	10.33	269	89.60	300	100
8.	Essential commodities acts, relating to food	0	0.00	100	100	300	100

Twenty three respondent i.e. 7.66% were aware about ‘meat food products order’.

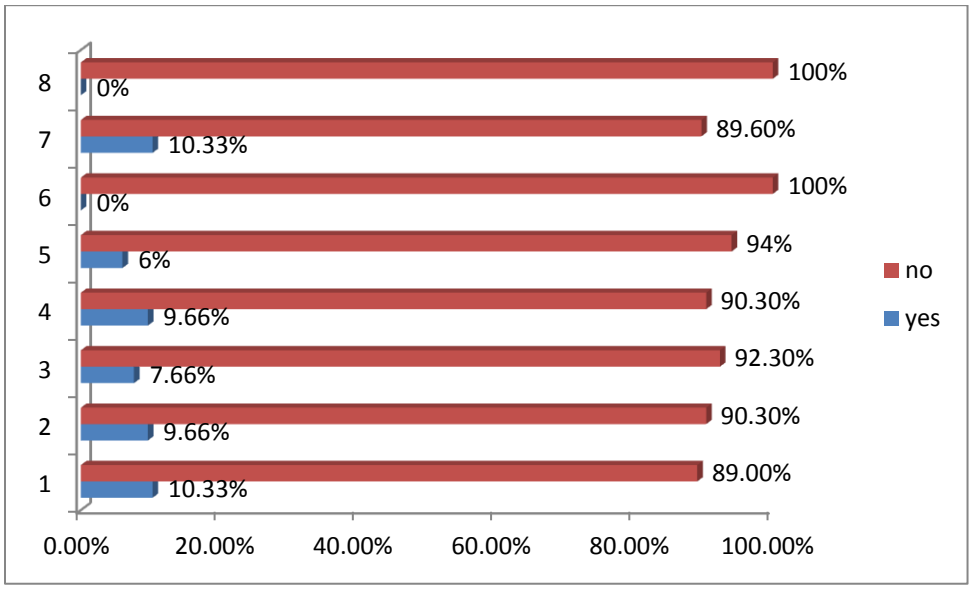

Figure 4.2.4 Diagram Showed the Distribution of Knowledge Regarding Food Safety and Standard Acts

Whereas only six per cent respondents were aware about edible oils packaging (regulation) order and no one know about ‘solvent extracted oil, de oiled meal & edible’ and ‘essential commodities acts, relating to food. **SubbaRao*etal.* (2007)**also found that food safety awareness and practices are good among mothers perhaps due to the Indian food ethos passed on to them through generations. Home cooked foods are considered to be safe than prepared foods bought from outside. Many mothers were aware of the common food adulterants but do not bother to complain or take action. There is a need to create enabling environment with improved access to potable water, sanitation and cooking fuel. Spreading aware about checking food labels and reporting to the health authorities in case of food poisoning or adulteration is also the need of the hour. The Anganwadi Centres can be the focal points for imparting food safety education to the mothers.

Similarly it was further alleged that clause 14 of the Prevention of Food Adulteration Act which makes it mandatory for the wholesalers to issue warranty bills bluntly violated. “*Gur*”

(animal feed) was openly sold in the market for human consumption. The inspectors and higher authorities were hand-in-glove with mill owners and wholesalers and no action was being initiated against those indulging in adulteration. The association demanded that food commodities should be thoroughly checked at the time of packing to prevent adulteration.**(Anon1996).**

Knowledge related Food Marks and Symbols

Data in **Table 4.2.5** indicates that 56.33% respondents (169.00) were know about AGMARK.

Table 4.2.5 Percentage wise Distribution of Food Marks and Symbols as per their Knowledge (N=300)

S.No.	Particulars	Percentage Distribution (N=300)				Total	
		Yes		No		No.	%
		No.	%	No.	%		
1.	AGMARK	169	56.33%	131	43.60	300	100
2.	Green mark	157	52.33%	143	47.60	300	100
3.	Red mark	154	51.33%	146	48.60	300	100

Respondents (157) i.e. 52.33% were know about green mark whereas 51.33% respondents (154) were know about red mark. **Khapre*et al.* (2011)**also reported that 68.5% Households, wife (home-maker) buys the grocery. Majority of them never read the food lables.

Level of Awareness about Consumer EducationBefore Intervention

Table 4.2.6 Before intervention majority of consumers had low scores on consumer rights, consumer protection, consumer laws, food safety and food marks. All the consumers (N=300) had low scores for consumer protection and consumer laws. High scores were reported only for 2 items – consumer rights and food marks by 3 (1%) and 9 (3%) consumers respectively.

Table 4.2.6 KAP wise Distribution of Awareness Related to Consumer Education among Study Subjects Before Intervention (N=300)

SN	Variable	KAP Levels			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Consumer rights	281	16	3	1.07±0.30
2.	Consumer protection	300	0	0	1.00±0.00
3.	Consumer laws	300	0	0	1.00±0.00
4.	Food safety	285	15	0	1.05±0.22
5.	Food marks	164	127	9	1.48±0.56

Mean scores were maximum for the item food marks (1.48±0.56) whereas for the items consumer protection and consumer laws the mean scores were minimum (1.00±0.00).Similarly**Khapre *et al.* (2011)** also found that 68.5% Households, wife (home-maker) buys the grocery. Majority of them never read the food lables. All the selected food items were adulterated ranging from 76% to 11%. **Bagchi (2000)**also revealed that respondent's awareness related to rights and responsibilities was good but poor related to food adulteration.**Gupta &Panchal (2009)**also found that in 45 per cent families, the home maker took the major decisions for purchasing food for their families. Regarding buying practices includes the type of packaging used while purchasing, brand choice, shop choice and purchase frequency of the selected items undertaken for study. Regarding Consumer awareness the result depicted that majority, that is, two third of the respondents were moderately aware about the rights and responsibilities related to food quality and food adulteration.

Consumer's Level of Awareness about Adulteration in Food Stuffs

Majority of consumers had low awareness scores for adulteration in different food stuffs. There were only two food items *i.e.* cereals and milk for which high scores were reported by 7 (2.33%) and 1 (0.33%) consumers respectively**(Table 4.2.7).**

Table 4.2.7 Level of Awareness about Adulteration in Food Stuffs as per Score of KAP Before Intervention Among Study Subjects

(N=300)

SN	Item	Level			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Cereals	166	127	7	1.47±0.55
2.	Pulses	254	46	0	1.15±0.36
3.	Fruits	279	21	0	1.07±0.26
4.	Milk	280	19	1	1.07±0.27
5.	Fat	293	7	0	1.02±0.15
6.	Spices	291	9	0	1.03±0.17
7.	Other food items	287	13	0	1.04±0.20

Mean awareness scores were maximum for cereals (1.47±0.55) and minimum for fat (1.02±0.15). According to **Gupta & Panchal (2009)** regarding Consumer awareness the result depicted that majority, that is, two third of the respondents were moderately aware about the rights and responsibilities related to food quality and food adulteration. **Bagchi (2000)**also revealed that respondent's awareness related to food adulteration were poor.

Consumer Awareness Regarding Harmful Effects of Adulteration

On evaluating the level of awareness regarding harmful effects **(Table 4.2.8)**of adulteration, majority of consumers were seen to be having low awareness about these.

Table 4.2.8As per KAP Score Mean ± SD on the basis of Harmful Effects of Food Adulteration on Health of Study Subjects

(N=300)

S.No.	Item	Level			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Cereals	274	26	0	1.09±0.28
2.	Pulses	281	19	0	1.06±0.24
3.	Fruits	279	21	0	1.07±0.25
4.	Milk	276	24	0	1.08±0.27

S.No.	Item	Level			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
5.	Fat	261	39	0	1.13±0.33
6.	Spices	279	21	0	1.07±0.25
7.	Other food items	279	21	0	1.07±0.25

None of the consumers had high awareness scores for any of the food stuffs. Only maximum of thirty nine consumers had average knowledge score for adulteration of fat. Mean scores of consumers ranged from 1.06±0.24 to 1.13±0.33.

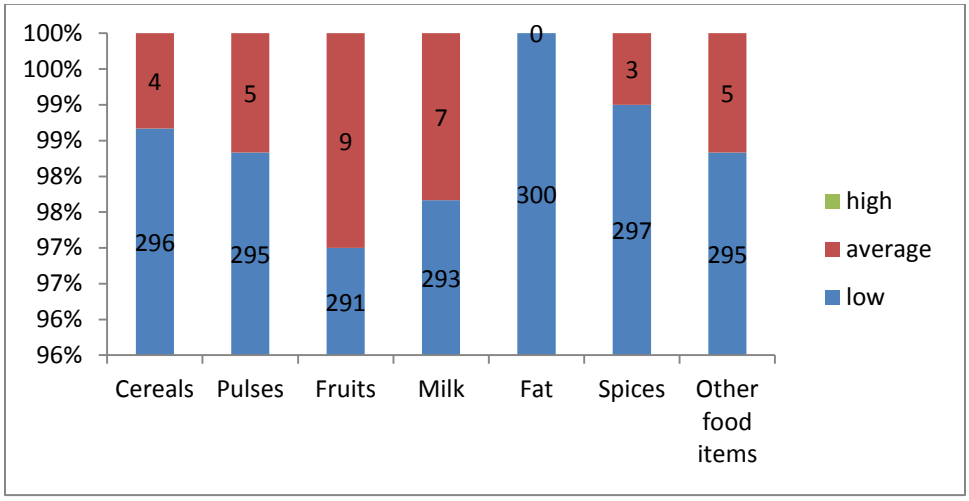

Figure 4.2.8 Percentage Showed the Harmful Effects of Food Adulteration on the basis of their Knowledge

Gupta & Panchal (2009)also depicted regarding food adulteration problem faced the result that little less than half of the respondents have sometimes or other faced problem of adulterated food, one-fifth of the respondents have never come across adulterated food or may be they were not about adulterated food. According to **Noman &Ali (2013)** World Health Organisation (WHO) has expressed its anxiety about the impact of food safety upon public health in Bangladesh in its website. It reveals that unsafe food can be a significant reason of many chronic and non-chronic diseases including but not limited to diarrhoea, cancer, heart diseases, various kidney diseases and birth defects.

4.3 Classification of Adulteration in Food Stuffs Available at Household Level.

Adulterant is found everywhere in foods and its made preparation at household level rather than commercial level i.e. well known by everyone. Because of its test constraint it is supposed to be evaluated in commercial product. Household food stuffs is negligible area in terms of unintentional and intentional adulterant were not identified by housewife or any other person in the family. These are the fact founded during reviewing literature in the resent studies. Thus, simplified the hub of food stuffs at household level ,five food group classification(according to ICMR,1989) were used to classified and identified for further intervention phase of the study. These are as follows:

1) **Cereals, grains and products**
2) **Pulses and legumes**
3) **Fruits and vegetable**
4) **Milk and meat products**
5) **Fats and sugar**

As above food group classification itself have wide variety of food stuffs. The present study selected common food items from each group on the basis of maximum number of frequent founded during data analysis. This is further analyses in intervention phase.

Cereals, grains and products

Table 4.3.1 shows that out of 300 consumers less than fifty percent consumers had knowledge only about stone in rice(141), dirt in flour (36), sand in flour (35) and chalk in flour (09) were found as adulterant in cereal and its products.

4.3.1 Frequency Distribution of Cereals, Grains and Products Adulteration in Food Stuffs at Household Level (N=300)

S.No.	Cereals and products	No.	%	Total	
1.	Rice-Stone	141	47.00	300	100
2.	Flour-Sand	35	11.60	300	100
3.	Flour-Dirt	36	12.00	300	100
4.	Flour-Chalk	09	03.00	300	100

Khan (2012)also found that puffed rice (locally called known as 'moodi') is contaminated by using the urea fertilizer to make it whiter and bigger in size.

Pulses and legumes

Table 4.3.2 Frequency Distribution of Pulses and Legumes Adulteration in Food Stuffs at Household Level (N=300)

S.No.	Pulses and products	No.	%	Total	
1.	Dal-Stone	138	46.00	300	100
2.	Dal Color	42	14.00	300	100

Table 4.3.2 depicted that forty six per cent (138) consumers had knowledge about stone found in dal only fourteen per cent (42) consumers out of three hundred had knowledge about colour was found as adulterant in dal. According to**Bhat *et al.* (1996)**a spokesman for the All Rajasthan Retailers Association, about 80 per cent of the food substances in Rajasthan were adulterated. The grains and pulses were packed in discarded bags used for packing insecticides and urea. While rubber polish containing carcinogenic substances was used by mill owners and wholesalers to give shine to pulses.

Fruits and vegetables

Table 4.3.3 Frequency Distribution of Fruits and Vegetables Adulteration in Food Stuffs at Household Level (N=300)

S.No.	Fruits & Vegetables	No.	%	Total	
1.	Vegetable-Urea	70	23.30	300	100
2.	Mango-Cal.carbide	117	39.00	300	100
3.	Banana-Cal.carbide	75	25.00	300	100
4.	Fruit-Wax	16	05.00	300	100
5.	Vegetable-Color	122	40.00	300	100

Table 4.3.3 this table shows that less than fifty per cent consumers had knowledge about colour in vegetables (122, 40.00%), calcium carbide in mango (117, 39.00), calcium carbide in banana (75, 25.00%) urea in vegetables (70, 23.30%) and wax in fruits (16, 05.00%) adulterant were found in fruits and vegetables out of 300 consumers. **Bagchi(2000)**conducted a survey and revealed that the presence of pesticide residues in fruits and vegetables has been increasing steadily. The survey showed that about 18 per cent vegetables and 12 per cent fruits, both home grown and imported, contained pesticide residues, including banned pesticides. Residues of DDT, DDE and HCE pesticides were found in samples from Mumbai and Hyderabad, while samples from Anand, Surat and Baroda in Gujarat had chlorpyriphos and monocrotophos residues above the maximum levels.

Milk and meat products

Table 4.3.4 Frequency distribution of Milk and Meat Products Adulteration in Food Stuffs at Household Level (N=300)

S.No.	Milk and its products	No.	%	Total

1.	Milk-Water	119	39.00	300	100
2.	Khoa-Potato	13	4.30	300	100

Table 4.3.4 shows that consumers (119, 39.00%) had knowledge only about water in milk and only consumers (13, 04.30%) had knowledge about potato in khoa was used as adulterant in milk and its products.According to **Noman & Ali (2013)**Ghee, a popular food in Bangladesh made from the pure milk is now adulterated in many ways. The impure ghee is made by rotten milk, palm oil, soybean, animal or vegetable fat, potato paste and with artificial colour flavours instead of milk. Due to this tainting of ghee, people are deprived from the expected nutrition which ultimately may cause adverse effects on public health. The study found that due to lack of hygiene and sanitation in milk handling and packaging, detergents (used during cleaning operations) are not washed properly and find their way into the milk. Other contaminants like urea, starch, glucose, formalin along with detergent are used as adulterants. These adulterants are used to increase the thickness and viscosity of the milk as well as to preserve it for a longer period. The study notes that the consumption of milk with detergents in hazardous to health. About eight per cent samples were found to have detergents.

Food Safety Standards Authority of India (FSSAI) has found that around 13% of food stuff is contaminated across the country. The results of the study came a day after another survey found that milk, an important nutritional component, was found to be adulterated across almost all major cities.

Spices and Condiments

Table 4.3.5 Frequency Distribution of Spices and Condiments Adulteration in Food Stuffs at Household Level (N=300)

S.No.	Spices and condiments	No.	%	Total	
1.	Black pepper-Papaya seed	37	12.30	300	100
2.	Chilli powder-Brick powder	25	08.30	300	100
3.	Chilli powder-Dirt	35	11.60	300	100
4.	Cumin seed-Grass	21	07.00	300	100
5.	Salt-Chalk	17	05.60	300	100

Table 4.3.5 depicted that less than twenty per cent consumers had knowledge only about papaya seed in black pepper (37, 12.30%), dirt in chilli powder (35, 11.60%), brick powder in chilli powder (25, 08.30%), grass in cumin seeds and chalk was found in salt as adulterant in spices out of 300 consumers. **Beniwal & Khetarpaul (1999)**also found that all the food samples except gene collected from the households of the respondents were found to be adulterated. The main adulterants in milk was water (70.0 percent); turmeric powder contained chalk powder (43.3 percent); chillies powder had artificial colour (100.0 percent); essential oils were removed from cardamom (36.6 percent); green gram and urd bean had water soluble colours; chick pea flour had artificial colours (70.0 percent) and chalk powder was present in sugar (36.6 percent). **Maheshwari & Hiremath (2014)** The Ads warn that milk could be synthetic, sugar and salt can be contaminated with chalk powder, chilli powder could be mixed with brick powder grit or saw dust. The common adulterant in tea leaves is artificial colour, mustard seeds could be substituted with harmful argemone seeds, coriander powder may have horse dung in it.

Frequency of Adulteration on Consumption pattern

Majority of food items never had adulteration. The most common adulteration was stones in rice and dal. None of the food items, except salt-chalk had frequency of adulteration more than weekly. The most frequent adulteration was that of dal-stone.

Table 4.3.6 Percentage wise Distribution of Adulterant Present in Selected Food Items for the Study at the Household Level (N=300)

S.No.	Variable	Weekly	Fortnightly	Never
1.	Rice-stone	65 (21.66)	76 (25.33)	159 (53.00)
2.	Flour-sand	14 (4.66)	21 (7.00)	265 (88.33)
3.	Flour-dirt	15 (5.00)	21 (7.00)	264 (88.00)
4.	Flour-chalk	0 (0.00)	9 (3.00)	291 (97.00)
5.	Dal-stone	108 (36.00)	30 (10.00)	162 (54.00)
6.	Dal-color	0 (0.00)	42 (14.00)	258 (86.00)
7.	Vegetable-urea	18 (6.00)	52 (17.33)	230 (76.66)
8.	Mango-carbide	0 (0.00)	117 (39.00)	183 (61.00)
9.	Banana-carbide	0 (0.00)	75 (25.00)	225 (75.00)
10.	Fruit-wax	0 (0.00)	16 (5.33)	284 (94.66)
11.	Vegetable-color	0 (0.00)	122 (40.66)	178 (59.33)
12.	Milk-water	0 (0.00)	119 (39.66)	181 (60.33)
13.	Khoa-potato	0 (0.00)	13 (4.33)	287 (5.66)
14.	Pepper-papaya seed	0 (0.00)	37 (12.33)	263 (87.66)
15.	Chilli-brick powder	0 (0.00)	25 (8.33)	275 (91.66)
16.	Chilli-dirt	0 (0.00)	35 (11.66)	265 (88.33)
17.	Cumin seed-grass	0 (0.00)	21 (7.00)	279 (93.00)
18.	Salt-chalk	0 (0.00)	0 (0.00)	283 (94.33)

*None of the consumers observed frequency of adulteration in daily and twice a week. Only salt-chalk in the category of daily was founded 17 in number.

Flour-chalk (n=291), khoa-potato (n=287) and fruit-wax (n=284) were the least adulterated food products. Uttar Pradesh reported the maximum number of food adulteration in the country, the union health minister Ghulam Nabi Azad said on Tuesday adding that the country's average adulteration stood at 11.14 per cent.

He said that in 2010, about 3,789 cases were filed in Uttar Pradesh and 540 people were convicted. With 806 cases and 18 convictions, Rajasthan came in second followed by Gujarat with 683 registered cases and 99 convictions. “The average adulteration in food items including milk products on the basis of samples collected in 2009 is 11.14 per cent,” said Ghulam Nabi Azad.

Considering the need for comprehensive approach to food safety, a new law Food Safety and Standards Act, 2006 came into force on August 5, 2011 replacing the Prevention of Food Adulteration Act, 1954.

Percentage of Awareness of Methods of Adulteration Detection

Although, all the consumers had awareness of only sensory techniques,**(Figure 4.3.7)** however, majority (n=196; 65.3%) had a high level of awareness. Mean awareness score was 2.64±0.52.

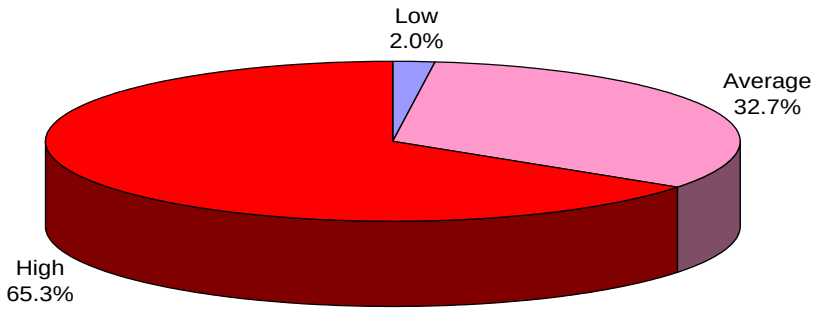

Figure 4.3.1Diagram Showed Awareness Regarding Adulteration Detection Methods

Phase-II Interventional Study

Subjects were randomly selected from a population of 300 women out of which 150 randomly selected women were subjected to an Intervention, Education and Counselling (IEC) session following which KAP scores related habits.

4.4 Using Sensory methods (Duo-trio-test) for detection of adulteration in common food items

Colour and appearance of cereals, grains and products sample during intervention

Table 4.4.1 shows that majority of consumers had poor knowledge of sensory technique for T_3 (127), T_2 (83), T_4 (64), and T_1 (51) respectively. For the items T_4 (78), T_2(53), and T_1 (46) consumers had off knowledge respectively. Consumers (51, 18, 12, and 8) had fair knowledge for T_1, T_3, T_2 and T_4 respectively whereas only for two items T_3 (05), and T_2 (02) consumers had good knowledge.

Table 4.4.1Colour and Appearance wise Detection of Cereals, Grains and Products Adulterants at Intervention Phase by using Duo-Trio-Test

Sample	Good	Fair	Poor	Off	Total
T_1	02 (01.30)	51 (34.00)	51 (34.00)	46 (30.60)	**150**
T_2	0 (00.00)	12 (08.00)	83 (55.30)	53 (35.30)	**150**
T_3	05 (03.30)	18 (12.00)	12 (84.60)	0 (00.00)	**150**
T_4	0 (00.00)	08 (05.30)	64 (42.60)	78 (52.00)	**150**

T_1= Ergot in wheat
T_2= Excess bran in wheat flour
T_3= Karnel bunt in wheat flour
T_4= Resultant atta or cheap flour in maida

Colour and Appearance of Cereals, grains and products Sample during Post- intervention

Table 4.4.2 depicted that after intervention more than fifty per cent consumers had good knowledge of sensory technique for T_3 (131), T_2 (90), T_1 (89) and T_4 (89) respectively. Consumers (61, 47, 44 and 25) had fair knowledge for T_4, T_1, T_2 and T_3 respectively whereas less than ten per cent consumers had poor knowledge for T_1, T_2, T_3 and T_4 items.

4.4.2Colour and Appearance wise Detection of Cereals, Grains and Products Adulterants at Post-intervention Phase by using Duo-Trio-Test

Parameters	Phase	T_1	T_2	T_3	T_4
Good	**I**	02 (01.30)	0 (00.00)	05 (3.30)	0 (00.00)
	PI	89 (59.30)	90 (60.00)	131 (87.30)	89 (59.30)
Fair	**I**	51 (34.00)	12 (08.00)	18 (12.00)	08 (5.30)
	PI	47 (31.30)	44(29.30)	25 (16.60)	61 (40.60)
Poor	**I**	51 (34.00)	83 (55.30)	127 (84.60)	64 (42.60)
	PI	11(07.30)	12 (08.00)	04 (02.60)	0 (00.00)
Off	**I**	46 (30.60)	53 (35.30)	0 (00.00)	78 (52.00)
	PI	03 (02.00)	04 (02.60)	0 (00.00)	0 (00.00)
Total	**I**	**150 (100)**	**150 (100)**	**150 (100)**	**150 (100)**
	PI	**150 (100)**	**150 (100)**	**150 (100)**	**150 (100)**

I= Intervention
PI= Post-intervention

T_1= Ergot in wheat
T_2= Excess bran in wheat flour
T_3= Karnel bunt in wheat flour
T_4= Resultant atta or cheap flour in maida

Only for two items T_2 (04), and T_1 (03) consumers had off knowledge of sensory technique for adulteration detection in cereals and its products.

Thakur *et al.* (2009) majority(80%) of the subjects were aware of water and one third were aware of the starch as the adulterant of milk. Another 57% of the subjects were able to name stone and twigs as common adulterant of pulses, where as one third of them even reported Makki ka Atta as adulterant in Basin during pretest But, after the intervention knowledge of the subjects increased significantly, except gain in knowledge for asbestos powder as adulterant.

Colour and Appearance of Milk and meat products sample during Intervention

Table 4.4.3.Colour and Appearance wise Detection of Milk and Meat product's Adulterants at Intervention Phase by using Duo-Trio-Test

Sample	Good	Fair	Poor	Off	Total
T_1	79 (52.60)	70 (46.60)	01 (00.60)	0 (00.00)	**150**

$T_{1=}$ water in milk

Table 4.4.3 this table shows that before intervention only seventy nine consumers had good knowledge for item T_1 whereas consumers (70, and 01) had fair and poor knowledge for T_1 respectively and no one had found off knowledge of sensory technique for adulteration detection in milk.

Colour and Appearance of Milk and meat products sample during Intervention and Post-intervention

Table 4.4.4 shows that after intervention more than ninety five per cent (146) consumers had good knowledge of sensory technique for adulteration detection in T_1 whereas only four (02.60%) consumers had fair knowledge.

Table 4.4.4 Colour and Appearance wise Detection of Milk and Meat product's Adulterants at Post-intervention Phase by using Duo-Trio-Test

Parameters	Phase	T_1
Good	**I**	79 (52.60)
	PI	146 (97.30)
Fair	**I**	70 (46.60)
	PI	04 (2.60)
Poor	**I**	00 (00.60)
	PI	0 (00.00)
Off	**I**	0 (00.00)
	PI	0 (00.00)

Total	**I**	**150 (100)**
	PI	**150 (100)**

I= Intervention T_1= Water in milk

PI=Post-intervention

No one had to be found poor and off knowledge of sensory technique for T_1 item after intervention.

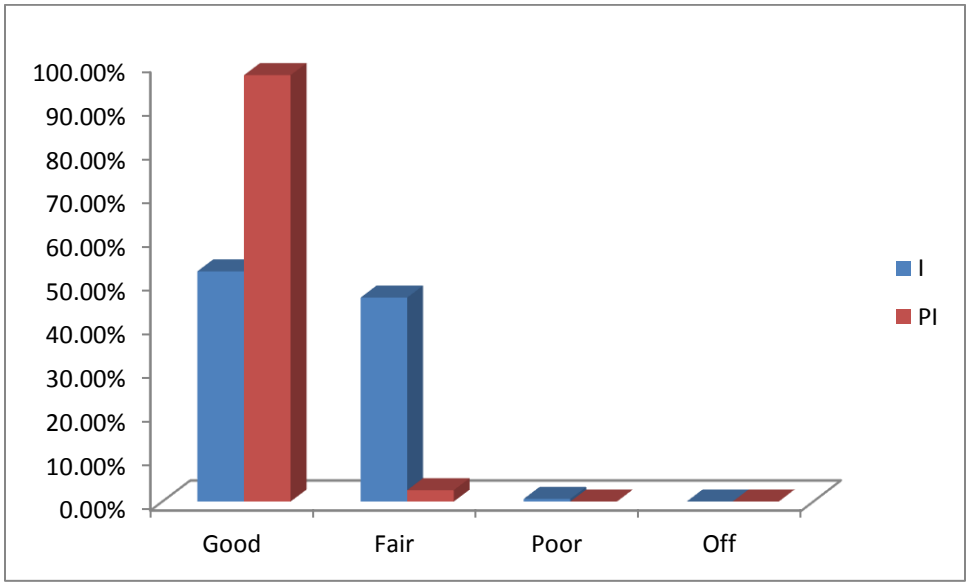

Figure 4.4.4 Graphical Presentation of Intervention and Post-intervention Phase Knowledge Regarding Sensory Evaluation

Thakur *et al.* (2009)majority(80%) of the subjects were aware of water and one third were aware of the starch as the adulterant of milk. Another 57% of the subjects were able to name stone and twigs as common adulterant of pulses, where as one third of them even reported Makki ka Atta as adulterant in Basin during pre-test But, after the intervention knowledge of the subjects increased significantly, except gain in knowledge for asbestos powder as adulterant.

Colour and Appearance of Fruits and vegetables sample during Intervention

Table 4.4.5 Before intervention majority of consumers had poor knowledge of sensory technique for T_2 (83), T_4 (64), T_1 (51) and T_3 (12) respectively. Consumers (78, 53, 46 and 01) had off knowledge for T_4, T_2, T_1 and T_3 respectively.

Table 4.4.5 Colour and Appearance wise Detection of Fruits and Vegetables Adulterants at Intervention Phase by using Duo-Trio-Test

Sample	Good	Fair	Poor	Off	Total
T_1	02 (01.30)	51 (34.00)	51 (34.00)	46 (30.60)	**150**
T_2	0 (00.00)	12 (08.00)	83 (55.30)	53 (35.30)	**150**
T_3	05 (03.30)	18 (12.00)	12 (84.60)	0 (00.00)	**150**
T_4	0 (00.00)	08 (05.30)	64 (42.60)	78 (52.00)	**150**

T_1= Cal.carbide in mangoes &bananas

T_2= Oxytocin in pumpkins, watermelon, brinjal, gourd

T_3= Wax in apples & pears

T_4= Cheap colours in bittergourd, green leafy vegetables

Fair knowledge for T_1, T_3, T_2 and T_4 were found as 51, 18, 12, and 8 respectively whereas only for two items (T_3 and T_1) consumers (05, and 02) had good knowledge of sensory technique of adulteration detection in fruits and vegetables.

Colour and Appearance of Fruits and vegetables sample during Post intervention

Table 4.4.6 shows that after intervention majority of consumers had good knowledge of sensory technique for T_4 (144), T_3 (136), T_1 (88) and T_2 (78) of adulteration detection respectively.

Table 4.4.6 Colour and Appearance wise Detection of Fruits and Vegetables Adulterants at Post-intervention Phase by using Duo-Trio-Test

Parameters	Phase	T_1	T_2	T_3	T_4

Good	**I**	0 (00.00)	05 (3.30)	82 (54.60)	127 (84.60)
	PI	88 (58.60)	78 (52.00)	136 (90.60)	144 (96.00)
Fair	**I**	01 (00.60)	16 (10.60)	53 (35.30)	18 (12.00)
	PI	59 (39.30)	43 (28.60)	14 (9.30)	06 (4.00)
Poor	**I**	23 (15.30)	42 (28.00)	10 (6.60)	05 (3.30)
	PI	03 (2.00)	25 (16.60)	0 (00.00)	0 (00.00)
Off	**I**	126 (84.00)	87 (58.00)	05 (3.30)	0 (00.00)
	PI	0 (00.00)	04 (2.60)	0 (100)	0 (00.00)
Total	**I**	**150 (100)**	**150 (100)**	**150 (100)**	**150 (100)**
	PI	**150 (100)**	**150 (100)**	**150 (100)**	**150 (100)**

I= Intervention
PI= Post-intervention

T_1= Cal.carbide in mangoes &bananas
T_2= Oxytocin in pumpkins, watermelon, brinjal, gourd
T_3= Wax in apples & pears
T_4= Cheap colours in bittergourd, green leafy vegetables

Consumers (59, 47, 14 and 06) had fair knowledge for T_1, T_2, T_3 and T_4, respectively whereas T_2 and T_1 were found to be (25, 03) had poor knowledge. And only four consumers had off knowledge of sensory technique of adulteration detection in fruits and vegetables.

Bhat *et al*. (1996) reported a foodborne disease outbreak mostly involving children and characterized by vomiting, abdominal pain and diarrhoea. Epidemiological, hospital and laboratory investigations indicated that the disease outbreak was associated with consumption of rancid biscuits abandoned in the street corner in a crowded locality of old Hyderabad, Andhra Pradesh, India. The offensive flavour of rancidity was marked by the strong pineapple flavour in the biscuits. Rancidity of biscuits was confirmed by high peroxide value and acidity of extracted fat. Bacteriological contamination was excluded by the total aerobic plate counts and test for *Staphylococcus* and *Salmonella*.

Singh*et al.* (2011) said that milk is staple food for both the group of children urban as well as rural area. From both the regions a wide variation of adulterants mixing was observed. The adulterants have been detected by doing the test and it was found that adulteration practice was higher in urban area compared to rural area.

4.5 Preparation of Learning Kit for Detection of Classified Adulterant at Household Level by using Low Cost Methods

Cereals, grains and products adulterant detectedby using developed detection kit

Table 4.5.1 Before intervention not any single consumer had knowledge about adulteration detection at household level through detection kit.

Table 4.5.1 Distribution as per using Developed Detection Kit on Cereals, Grains and Products Adulterant at Intervention and Post-intervention Phase

Cereal & products	Phase	+ve sample (not know)	-ve sample (know)	Total
T_1	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	6 (04.00)	144 (96.00)	**150 (100)**
T_2	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	5 (03.30)	145 (96.60)	**150 (100)**

$T_{1=}$ Ergot in wheat, bajra

$T_{2=}$ Chalk powder in wheat flour

But after intervention more than ninety five per cent consumers had knowledge about adulteration detection through detection kit in cereal and its products for T_2 (145)and T_1 (144) items respectively. Below five per cent consumers still had no knowledge of adulteration detection for T_1 (06) and T_2 (05) respectively.

Pulses and legumes Adulterant Detected by Using Developed Detection Kit

Table 4.5.2 depicted that before intervention no consumers had any knowledge about adulteration detection through detection kit in pulses and its products. After intervention more

than eighty per cent consumers (130, 129 and 126) had knowledge of adulteration detection in pulses and its products through detection kit at household level for all the three items $T_{1,}$ T_3 and T_2 respectively.

Table 4.5.2 Distribution as per using Developed Detection Kit on Pulses and Legumes Adulterant at Intervention and Post-intervention Phase

Pulses & products	Phase	+ve sample (not know)	-ve sample (know)	Total
T_1	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	11 (7.30)	139 (92.60)	**150 (100)**
T_2	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	24 (16.00)	126 (84.00)	**150 (100)**
T_3	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	21 (14.00)	129 (86.00)	**150 (100)**

$T_{1=}$ Khesari dal in arhar and chana

$T_{2=}$ Lead chromate in arhar and chana

$T_{3=}$ Khesari flour in besan

Below fifteen per cent consumers still had no knowledge for T_2 (24), T_3 (21) and T_1 (11) respectively. **Thakur *et al.* (2009)**majority(80%) of the subjects were aware of water and one third were aware of the starch as the adulterant of milk. Another 57% of the subjects were able to name stone and twigs as common adulterant of pulses, where as one third of them even reported Makki ka Atta as adulterant in Basin during pre-test But, after the intervention knowledge of the subjects increased significantly, except gain in knowledge for asbestos powder as adulterant.

Thakur *et al.* (2009) also revealed that none of the subject was aware of the physical and chemical test employed to detect to adulterant But after the intervention significant gain in the knowledge of the subject was observed, except for two adulterant (color and kesari dal) partial gain in knowledge was observed.

Milk and meat products Adulterant Detected during Intervention and Post intervention by Using Developed Detection Kit

Table 4.5.3 shows that before intervention no consumers had knowledge about adulteration detection through detection kit at household level in milk and its products.

Table 4.5.3 Distribution as per using Developed Detection Kit on Milk and Meat Products Adulterant at Intervention and Post-intervention Phase

Milk& products	Phase	+ve sample (not know)	-ve sample (know)	Total
T_1	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	09 (06.00)	141 (94.00)	**150 (100)**
T_2	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	12 (08.00)	138 (92.00)	**150 (100)**
T_3	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	13(08.60)	137 (91.30)	**150 (100)**
T_4	**Intervention**	150 (100)	0 (00.00)	**150 (100)**
	Post-intervention	07 (04.60)	143 (95.30)	**150 (100)**

$T_{1=}$ Urea in milk

$T_{2=}$ Starch in Milk

$T_{3=}$ Soda in milk

$T_{4=}$ Detergent in milk

But in post intervention phase it was found that more than 90% consumers had knowledge of adulteration detection for T_4 (143), T_1 (141), T_2 (138) and T_3 (137) respectively. But less than 10.00% consumers still had no knowledge for T_3 (13), T_2 (12), T_1 (9) and T_4 (7) respectively.

Fats and sugars Adulterant Detected During Intervention and Post intervention by Using Developed Detection Kit

Table 4.5.4 depicted that before intervention consumers had no knowledge about adulteration detection in fats, oils, sugar and jiggery through detection kit. But in post intervention phase

more than 85.00% consumers had found to be had knowledge of adulteration detection through detection kit for T_1 (147), T_2 (147), T_5 (134), T_4 (133) and T_3 (130) respectively.

Table 4.5.4 Distribution as per using Developed Detection Kit on Fats and Sugars Adulterant at Intervention and Post-intervention Phase

Fats, oil, sugar & jiggery	Phase	+ve sample (not know)	-ve sample (know)	Total
T_1	**Intervention**	0 (00.00)	150 (100)	**150 (100)**
	Post-intervention	147 (98.00)	03 (02.00)	**150 (100)**
T_2	**Intervention**	0 (00.00)	150 (100)	**150 (100)**
	Post-intervention	147 (98.00)	03 (02.00)	**150 (100)**
T_3	**Intervention**	0 (00.00)	150 (100)	**150 (100)**
	Post-intervention	130 (86.60)	20 (13.30)	**150 (100)**
T_4	**Intervention**	0 (00.00)	150 (100)	**150 (100)**
	Post-intervention	133 (88.60)	17 (11.33)	**150 (100)**
T_5	**Intervention**	0 (00.00)	150 (100)	**150 (100)**
	Post-intervention	134 (89.30)	16 (10.60)	**150 (100)**

$T_{1=}$ Argemone oil in mustard oil

$T_{2=}$ Argemone oil in coconut oil

T3= Vanaspati in ghee

$T_{4=}$ Washing powder in jiggery

$T_{5=}$ Washing powder in bura sugar

Only less than 15% consumers still had no knowledge. **SubbaRao *et al.*** A kit was developed, tested and given to the housewives so that they could detect adulterants in commonly used food items at the household level.[5]

Beniwal & Khetarpaul (1999) A kit was developed, tested and given to the housewives so that they could detect adulterants in commonly used food items at the household level.

Thakur *et al.* (2009) also revealed that none of the subject was aware of the physical and chemical test employed to detect to adulterant But after the intervention significant gain in the

knowledge of the subject was observed, except for two adulterant (color and kesari dal) partial gain in knowledge was observed.

Phase-III Post-study

Post-intervention Level of Knowledge, Attitude and Practices

Level of knowledge, Attitude and Practices Regarding Consumer Education After Intervention

Table 4.6.1 Shows that after the intervention, majority of consumers had high scores for all the items. Maximum number of consumers with high score were observed for the item food marks (n=136; 90.7%). **Subbarao*et al.* (2007)**also found that food safety awareness and practices are good among mothers perhaps due to the Indian food ethos passed on to them through generations. Home cooked foods are considered to be safe than prepared foods bought from outside. Many mothers were aware of the common food adulterants but do not bother to complain or take action. There is a need to create enabling environment with improved access to potable water, sanitation and cooking fuel. Spreading aware about checking food labels and reporting to the health authorities in case of food poisoning or adulteration is also the need of the hour. The Anganwadi Centres can be the focal points for imparting food safety education to the mothers.

Table 4.6.1 KAP Score after Intervention as per Consumer Education in the Study Subjects (n=150)

SN	Variable	KAP Levels			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Consumer rights	16	20	114	2.65±0.67
2.	Consumer protection	19	22	109	2.60±0.70
3.	Consumer laws	15	26	109	2.63±0.66
4.	Food safety	10	17	123	2.75±0.57
5.	Food marks	0	14	136	2.91±0.29

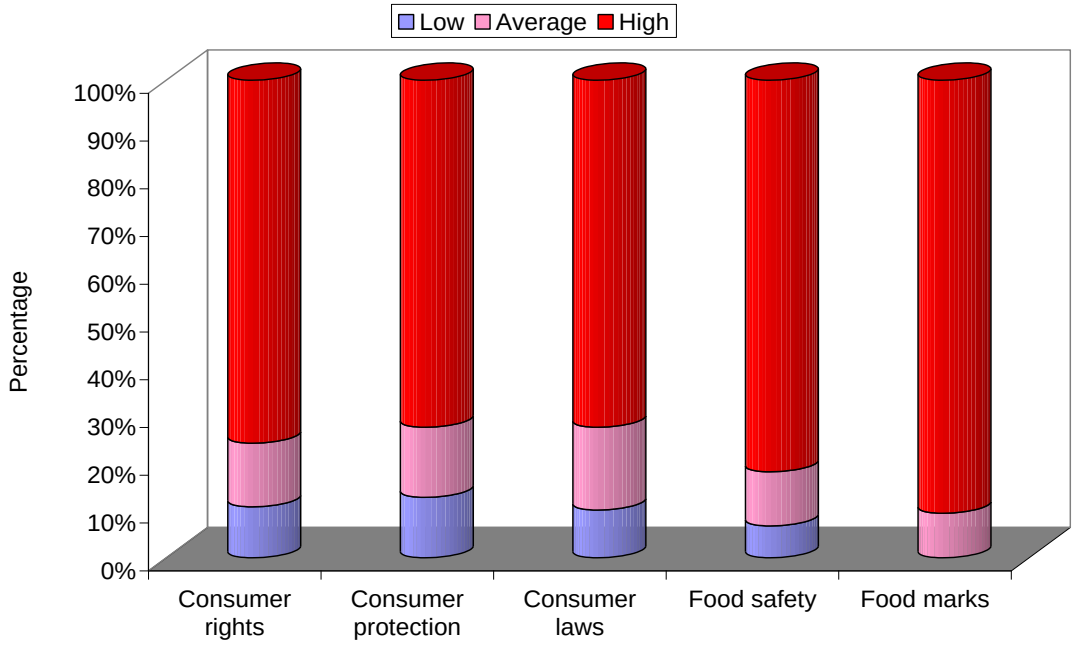

Figure 4.6.1 Percentage of Awareness about Consumer Education in Post-intervention

Minimum number of consumers with high scores were observed for the items consumer protection and consumer laws respectively (n=109; 72.7%). Mean scores were minimum for the item consumer protection (2.60±0.70) and maximum for the item food marks (2.91±0.29). **Beniwal & Khetarpaul(1999)** also reported that the post exposure correct responses of the respondents increased remarkably as 100.0 percent of the respondents gave correct responses regarding statements on adulteration of spices and condiments, the most common adulterated food item and to when and whom they could approach for making complaints about adulterated foods.

Level of Awareness about Adulteration in Food Stuffs After Intervention

Following intervention for all the items **(Table 4.6.2)**majority of consumers had high level of awareness regarding adulteration. Maximum number of consumers with high level of awareness

were observed for the item pulses (n=146; 97.3%) and minimum for the item fruits (n=124; 82.67%).

Table 4.6.2 KAP Score after Intervention as per Adulteration in Food Stuffs Among the Study Subjects (n=150)

SN	Item	Level			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Cereals	3	12	135	2.88±0.38
2.	Pulses	0	4	146	2.97±0.16
3.	Fruits	2	24	124	2.81±0.42
4.	Milk	2	21	127	2.83±0.41
5.	Fat	7	11	132	2.83±0.48
6.	Spices	4	4	142	2.92±0.36
7.	Other food items	1	21	128	2.85±0.38

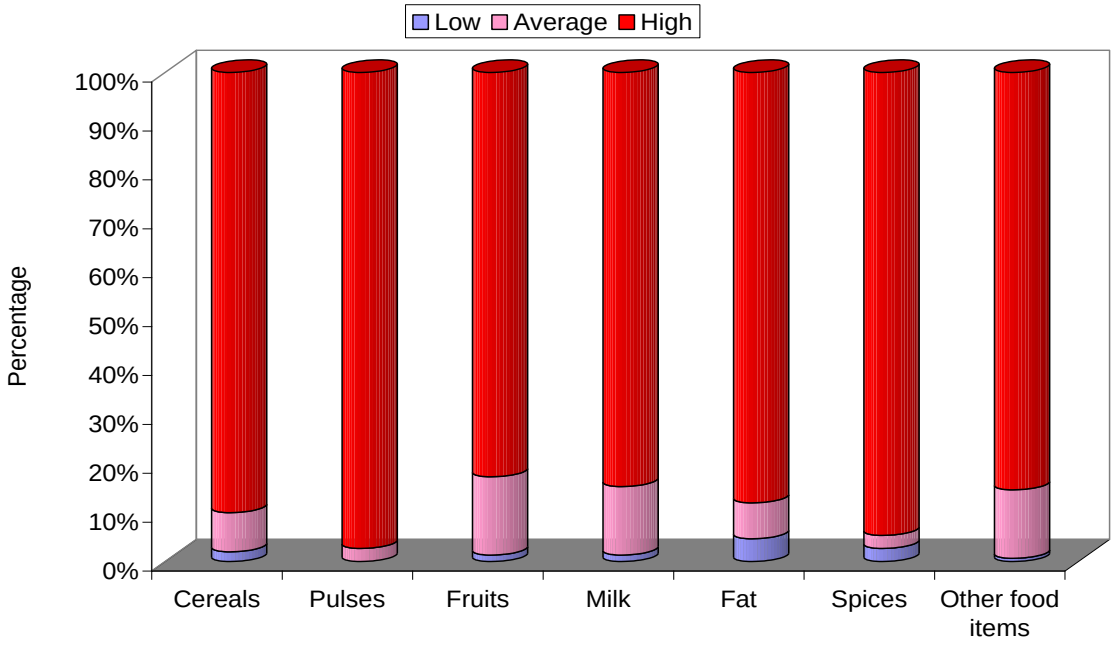

Figure 4.6.2 Percentage of Awareness about Adulteration in Food Items in Post-intervention

Mean scores for awareness regarding adulteration was also observed to be maximum for pulses (2.97±0.16) and minimum for fruits (2.81±0.42). **Subbarao *et al*, (2007)**also reported that a descriptive study onKnowledge of consumers regarding the nature and extent of adulteration of Indian food was conducted in Hisar city. A total of 60 women consumers selected from three

different localities to study their knowledge regarding adulteration and detecting adulterants in commonly used food items. The post exposure correct responses of the respondents increased remarkably as 100.0 percent of the respondents gave correct responses regarding statements on adulteration of spices and condiments, the most common adulterated food item and to when and whom they could approach for making complaints about adulterated foods. Similarly, the respondents gained considerable knowledge regarding adulterantsgenerally present in milk, legumes and definition of food adulteration.

Level of Awareness about Harmful Effects of Adulteration After Intervention

Following intervention majority of consumers had good awareness of harmful effects of adulteration**(Table 4.6.3)** of food stuffs. Maximum number of consumers with high scores were observed for cereals and spices (n=131; 87.3%) while minimum number of consumers with high scores were observed for the item pulses (n=123; 82.0%).

Table 4.6.3KAP Score after Intervention on the Basis of Harmful Effects of Adulteration among the Study Subjects (n=150)

SN	Item	Level			Mean Score±SD
		Low (Score 1)	Average (Score 2)	High (Score 3)	
1.	Cereals	3	16	131	2.85±0.41
2.	Pulses	6	21	123	2.78±0.50
3.	Fruits	3	18	129	2.84±0.42
4.	Milk	8	15	127	2.79±0.52
5.	Fat	4	21	125	2.81±0.46
6.	Spices	3	16	131	2.85±0.41
7.	Other food items	2	19	129	2.85±0.40

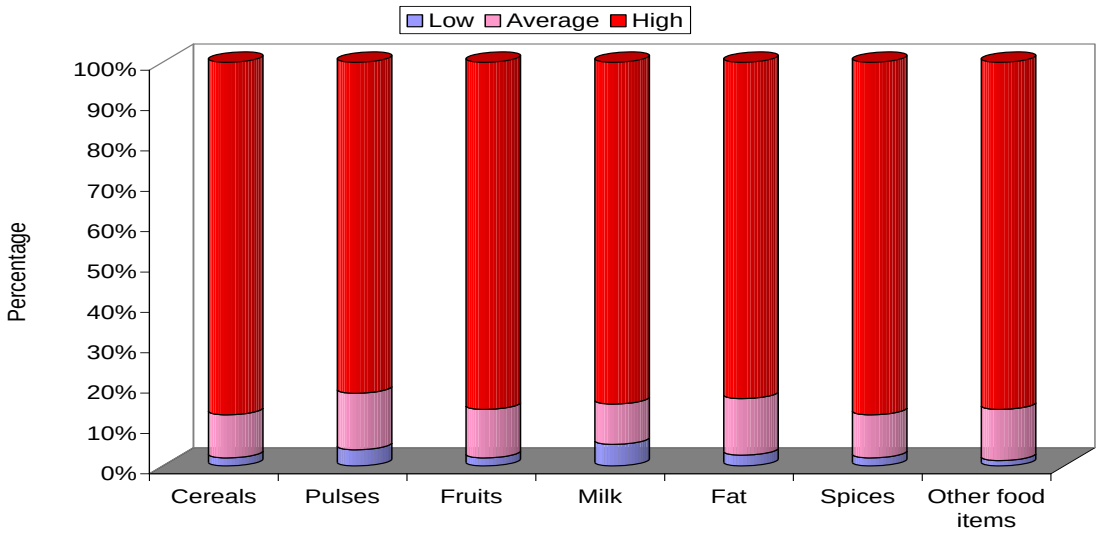

Figure 4.6.3 Graphical Presentation of Awareness among Study Subjects on the Basis of Harmful Effect of Food Adulterants

Mean scores were maximum for three items –cereals, spices and other food items (2.85±0.41, 2.85±0.41 and 2.85±0.40 respectively) and minimum for the item pulses (2.78±0.50).

4.7 Comparison of Pre- and Post-intervention Knowledge, Attitude and Practices

Comparison of Pre- and Post-intervention Knowledge, Attitude and Practices Scores

H_1: A significant difference of knowledge towards consumer education and magnitude of food adulterants.

Table 4.7.1depicted that for all the variables, pre-intervention KAP scores ranged from 1.00±0.00 to 1.50±0.53. However, after intervention this range reached to 2.60±0.70 to 2.91±0.29.

Table 4.7.1KAP Score of Pre and Post-intervention on the basis of their Consumer Education (n=150)

SN	Variable	Pre-intervention		Post-intervention		Change		Significance of change	
		Mean	SD	Mean	SD	Mean	SD	't'	'p'

SN	Variable	Pre-intervention		Post-intervention		Change		Significance of change	
1.	Consumer rights	1.07	0.29	2.65	0.67	1.58	0.76	-25.391	<0.001
2.	Consumer protection	1.00	0.00	2.60	0.70	1.60	0.70	-27.806	<0.001
3.	Consumer laws	1.00	0.00	2.63	0.66	1.63	0.66	-30.142	<0.001
4.	Food safety	1.05	0.21	2.75	0.57	1.71	0.60	-35.016	<0.001
5.	Food marks	1.50	0.53	2.91	0.29	1.41	0.60	-28.566	<0.001

For all the variables, pre-intervention KAP scores ranged from 1.00±0.00 to 1.50±0.53. However, after intervention this range reached to 2.60±0.70 to 2.91±0.29. Mean increase was minimum for variable food marks (1.41±0.60) whereas it was maximum for the variable food safety (1.71±0.60). For all the variables, mean change in KAP scores was significant statistically ($p<0.001$). The above table (4.7.1) was accepted on hypothesis. **Thakur *et al.* (2009)**also reported that only 23% of the subjects were aware of the various standard marks like ISI, FPO, Agmark. During pretest 3,8,18 subjects were able to identify FPO, Agmark and ISI respectively, whereas significant gain in knowledge of the subjects was observed during posttest. Sixty eight responses of the subjects reported that they cannot protect themselves against food adulteration during pretest but during posttest, except one all favored that they can now protect themselves against food adulteration.

4.7.2 Comparison of Pre- and Post-intervention Awareness Scores for Type of Adulteration in Food Stuffs

H_0: There is no significant difference on KAP score of Pre and post-intervention criteria of adulterant found in food stuffs.

Table 4.7.2KAP Score of Pre and Post-intervention on the Basis of Adulterants in Food Stuffs (n=150)

S.No.	Variable	Pre-intervention		Post-intervention		Change		Significance of change	
		Mean	SD	Mean	SD	Mean	SD	't'	'p'

S.No.	Variable	Pre-intervention		Post-intervention		Change		Significance of change	
1.	Cereals	1.50	0.53	2.88	0.38	1.38	0.63	-26.782	<0.001
2.	Pulses	1.15	0.35	2.97	0.16	1.83	0.38	-58.904	<0.001
3.	Fruits	1.07	0.25	2.81	0.42	1.75	0.52	-41.096	<0.001
4.	Milk	1.07	0.25	2.83	0.41	1.77	0.51	-42.383	<0.001
5.	Fat	1.02	0.14	2.83	0.48	1.81	0.51	-43.536	<0.001
6.	Spices	1.01	0.08	2.92	0.36	1.91	0.37	-64.164	<0.001
7.	Other food items	1.04	0.20	2.85	0.38	1.81	0.43	-51.605	<0.001

Prior to intervention mean awareness scores about type of adulteration in food stuffs ranged from 1.01±0.08 (spices) to 1.50±0.53 (cereals) which changed to reach at a range from 2.81±0.42 (fruits) to 2.97±0.16 (pulses). The mean difference of pre and post intervention in respect to cereals, pulses, fruits, milk, fat, spices and other food items were found significantly at the level of 0.001 percent. Thus, the null hypothesis of above table was accepted.

Comparison of Pre- and Post-intervention Awareness Scores for Harmful Effects of Adulteration in Food Stuffs

H_0: The lower knowledge of adulterant having higher risk of health hazard.

Pre-intervention awareness scores **(Table 4.7.3)**regarding harmful effects of adulteration in food stuff ranged from 1.00±0.00 (fat) to 1.02±0.14 (fruits and milk respectively).

Table 4.7.3KAP Score of Pre and Post-intervention on the basis of Harmful Effects of Adulterant of Food Stuffs (n=150)

S.No.	Variable	Pre-intervention		Post-intervention		Change		Significance of change	
		Mean	SD	Mean	SD	Mean	SD	't'	'p'
1.	Cereals	1.01	0.08	2.85	0.41	1.85	0.41	-54.700	<0.001
2.	Pulses	1.01	0.08	2.78	0.50	1.77	0.52	-41.765	<0.001
3.	Fruits	1.02	0.14	2.84	0.42	1.82	0.45	-49.561	<0.001
4.	Milk	1.02	0.14	2.79	0.52	1.77	0.55	-39.835	<0.001
5.	Fat	1.00	0.00	2.81	0.46	1.81	0.46	-48.206	<0.001
6.	Spices	1.01	0.08	2.85	0.41	1.85	0.43	-52.671	<0.001
7.	Other food items	1.01	0.12	2.85	0.40	1.83	0.41	-55.000	<0.001

After intervention, these scores ranged from 2.78±0.50 (pulses) to 2.85±0.40 (other food items). Thus following intervention a mean increase ranging from 1.77±0.52 (pulses) to 1.85±0.41 (cereals) was observed. For all the items mean change in awareness scores was significant statistically ($p<0.001$). The above table (4.7.3) was accepted on hypothesis. **Thakur *et al.*(2009)** also found thatmore than half (55%) of the subjects reported that adulterated food items when consumed is hazardous to health. Weakness, Nausea, Vomiting and Diarrhea were the health hazards reported by 17%, 21%, 23 % of the subjects respectively in the pretest. But significant gain in the knowledge of the subjects was observed during posttest.

SUMMARY

CHAPTER-V

SUMMARY

Food safety has emerged as an important global issue with international trade and public health implications. In response to the increasing number of food borne illnesses, governments all over the world are intensifying their efforts to improve food safety. The World Health Assembly adopted a resolution (WHA 53.15) in which, the World Health Organization (WHO) was asked "*to give greater emphasis on food safety…with the goal of developing suitable, integrated foodsafety systems for the reduction in health risk along the entire food chain, from primary producer to the consumers*".

It is undoubtedly a social evil which can be regarded as the outcome of an interaction between a number of social, economic, technical and human behavioural factors. It is a manifestation of a sick society and can be regarded as a crime similar to other crimes like theft, burglary or murder. Like any other crime, food adulteration is expected to continue in our society as long as the existing factors which generate crime will continue.

What is food adulteration? We have noticed the color of water excessively yellowish while washing the pulses than is expected of it. White stone powder is mixed in salt, chalk powder is also mixed in it. Fine pieces of soap bars are mixed in hing. Generally the pure ghee is adulterated with the vanaspati. Malachite green named chemical is used enormously in green vegetables like green chillies. Haldi powder is mixed up with metanil yellow. Vegetables look excessively reddish than desirable after the chilli powder is dropped into it while cooking. It happens due to the mixing up of rhodamine named chemical and the brick powder is also mixed up into it.

It is common in almost all developing countries. And it's ugly face is come out in the form of it’s harmful effects as stomach disorder giddiness and joint pain, diarrhea, liver disorder, dropsy, gastrointestinal problems, respiratory distress, oedema, cardiac arrest, glaucoma carcinogenic effects, paralysis etc. In a developing country which is at the lowest rung of the development ladder, food adulteration consists of relatively simple measures

It is felt that there is an urgent need for an impartial scientific study to determine the prevalence of food adulteration at household level in the country. Such study should not be undertaken by an interested party, the consumers or the law enforcers, but should be undertaken by a research institution in a properly designed and controlled manner. The National Institute of Health and Family Welfare and the Indian Council of Medical Research are ideally suited to undertake such a study in various parts of India in order to find out the extent of food adulteration, the types of foods which are commonly adulterated, the types of adulteration adopted, the common adulterants used, the health hazards of such type of adulteration and lastly, to explore as far as possible the motives for such adulteration.

In other words, such a study will generate for the first time data on the basis of which one can develop an "anatomy of food adulteration" and possibly, get an idea of the "profiles of the food adulterators" and the reasons for such adulteration. The results of such a study will be an eye opener for the consumers, law enforcers and also for those who are brooding for decades as to the reasons of food adulteration and how to prevent this menace.

This study will be conducted to make people aware about adulteration and its ill effects on health from their daily meal item, either, in cereals, pulses, fruits and vegetables or in milk and milk products and spices. Therefore, it is a need to make them aware with simple and easiest methods of detection of adulteration at household level with low cost value. Because most of the

people are well aware with adulteration and its ill effects but due to their busy life, less time availability and costly methods of adulteration detection techniques was done by laboratories only. People ignore this one of the major health problem causing element at community level.

Objectives

7. To know the existing knowledge of consumer toward food laws, food safety, consumer behavior, health hazard at study area.
8. To elicit and classified adulteration in food stuffs used at household preparation in day to day life as per five food groups.
9. To give demonstration and detection of adulteration of selected food stuffs with using low cost method.
10. To examine food quality by using sensory evaluation techniques and detection kits.
11. To evaluate domestic methods for adulterated foods by using learning kits in the study area.
12. To study correlated factors with adulteration and its impact on health hazard as well as consumer behavior in the study area.

The study was conducted in 3 parts at Lucknow district. Each part included period of study time, sample size, selected study subject and sampling methodology. A pilot study on 40 sample size was conducted to find out the percentage of food adulteration rate in various food stuffs consumed at household level. The study is explain under 3 parts which was collective approach of above following heads.

Result

5.1 Background profile of respondents

- Majority of consumers were aged 35-44 years (n=179; 59.7%), There were 4 (1.3%) consumers who were aged between 15 and 24 years.
- Except for 2 (0.7%) consumers, all the consumers were literate. Majority of consumers were graduate or above (n=210; 70%).
- Majority of consumers were non-working (n=240; 80%). Only 60 (20%) were working.
- Maximum number (n=227; 75.7%) were housewives.
- Maximum number of consumers (n=135; 45%) were from upper middle income group and 4 (1.3%) from upper income group.
- Majority of consumers were vegetarian (n=153; 51%) and only and 9 (3%) were occasional vegetarian.
- Majority of consumers were Hindus (n=222; 74%) and only and 6 (2%) Sikhs.
- Majority were from general category (n=154; 51.3%).
- Most of the consumers dwelled in pakka houses (n=279; 93%).
- Majority (n=169; 56.3%) had their own house.
- Green vegetables, Salad, coffee and fruit use were the most common food items consumed on daily basis while Fast food was the item which was reported to be consumed occasionally by majority of consumers.
- A total of 201 (67%) consumers used to watch television regularly whereas a total of 209 (67.7%) consumers used to read newspaper regularly.

Phase-I Preliminary Study

5.2 Consumer's knowledge assessment towards food adulteration

- Before intervention majority of consumers had low scores on consumer rights, consumer protection, consumer laws, food safety and food marks.
- Whereas high scores were reported only for 2 items consumer rights and food marks by 3 (1%) and 9 (3%) consumers respectively.

Level of awareness about adulteration in food stuffs

- Majority of consumers had low awareness scores for adulteration in different food stuffs.
- There were only two food items *i.e.* cereals and milk for which high scores were reported by 7 (2.33%) and 1 (0.33%) consumers respectively.

Frequency of adulterationfound in food items

- Majority of food items never had adulteration. The most frequent adulteration was that of dal-stone.

Consumer awareness regarding harmful effects of adulteration

- On evaluating the level of awareness regarding harmful effects of adulteration, majority of consumers were seen to be having low awareness about these.

Consumer's awareness about methods of adulteration detection

- All the consumers reported use of only sensory methods for detection of adulteration.

5.3 Classification of adulterations consumed at household level.

- Majority of consumers had no knowledge about type of adulterants found in cereals and its products less than fifty percent consumers had knowledge only about stone in rice(141), dirt in flour (36), sand in flour (35) and chalk in flour (09) were found as adulterant in cereal and its products.
- More than fifty per cent consumers had no knowledge about types of adulterant found in dals. Forty six per cent (138) consumers had knowledge about stone found in dal only

fourteen per cent (42) consumers out of three hundred had knowledge about colour was found as adulterant in dal.

- Majority of consumers (>50%) had no knowledge about types of adulterants found in fruits and vegetables. Less than fifty per cent consumers had knowledge about colour in vegetables (122, 40.00%), calcium carbide in mango (117, 39.00), calcium carbide in banana (75, 25.00%) urea in vegetables (70, 23.30%) and wax in fruits (16, 05.00%) adulterant were found in fruits and vegetables out of 300 consumers.
- More than sixty per cent consumers had no knowledge about types of adulteration found in milk and its products. Consumers (119, 39.00%) had knowledge only about water in milk and only consumers (13, 04.30%) had knowledge about potato in khoa was used as adulterant in milk and its products.
- Majority of consumers (>70%) had no knowledge about types of adulterants found in spices. Less than twenty per cent consumers had knowledge only about papaya seed in black pepper (37, 12.30%), dirt in chilli powder (35, 11.60%), brick powder in chilli powder (25, 08.30%), grass in cumin seeds and chalk was found in salt as adulterant in spices out of 300 consumers.

Frequency of Adulteration on Consumption pattern

- Majority of food items never had adulteration. The most common adulteration was stones in rice and dal. None of the food items, except salt-chalk had frequency of adulteration more than weekly. The most frequent adulteration was that of dal-stone. Flour-chalk (n=291), khoa-potato (n=287) and fruit-wax (n=284) were the least adulterated food products.

Phase-II Interventional study

5.4 Interventional study through sensory techniques

- Before intervention majority of consumers had poor knowledge of sensory technique for T3 (127), T2 (83), T4 (64), and T1 (51) respectively. For the items T4 (78), T2(53), and T1 (46) consumers had off knowledge for cereal and its products respectively. But after intervention more than fifty per cent consumers had good knowledge of sensory technique for T_3 (131), T_2 (90), T_1 (89) and T_4 (89) respectively.
- Before intervention only seventy nine consumers had good knowledge for item T_1 whereas consumers (70, and 01) had fair and poor knowledge for T_1 respectively in milk whereas after intervention more than ninety five per cent (146) consumers had good knowledge of sensory technique for adulteration detection in T_1.
- Before intervention majority of consumers had poor knowledge of sensory technique for T_2 (83), T_4 (64), T_1 (51) and T_3 (12) respectively whereas after intervention majority of consumers had good knowledge of sensory technique for T_4 (144), T_3 (136), T_1 (88) and T_2 (78) of adulteration detection in fruits and vegetables respectively.

Adulteration detection through detection kit

- Before intervention not any single consumer had knowledge about adulteration detection at household level through detection kit whereas after intervention more than ninety five per cent consumers had knowledge about adulteration detection through detection kit in cereal and its products for T_2 (145)and T_1 (144) items respectively.
- Before intervention no consumers had any knowledge about adulteration detection through detection kit in pulses and its products. After intervention more than eighty per

cent consumers (130, 129 and 126) had knowledge of adulteration detection in pulses and its products through detection kit at household level for all the three items T1, T3 and T2 respectively.

- Before intervention no consumers had knowledge about adulteration detection through detection kit at household level in milk and its products. Whereas in post intervention phase it was found that more than 90.00% consumers had knowledge of adulteration detection in T4 (143), T1 (141), T2 (138) and T3 (137) respectively.
- Before intervention consumers had no knowledge about adulteration detection in fats, oils, sugar and jiggery through detection kit. Whereas after intervention more than 85.00% consumers had found to be had knowledge of adulteration detection through detection kit for T1 (147), T2 (147), T5 (134), T4 (133) and T3 (130) respectively.

Phase-III Post Study

KAP level regarding consumer education after intervention

- After the intervention, majority of consumers had high scores for all the items. Maximum number of consumers with high score were observed for the item food marks (n=136; 90.7%).
- Minimum number of consumers with high scores were observed for the items consumer protection and consumer laws respectively (n=109; 72.7%).

KAP level regarding awareness about adulteration after intervention

- Majority of consumers had high level of awareness regarding adulteration and minimum for the item fruits (n=124; 82.67%).

KAP level regarding awareness about harmful effects adulteration after intervention

- Following intervention majority of consumers had good awareness of harmful effects of adulteration of food stuffs.
- Maximum number of consumers with high scores were observed for cereals and spices (n=131; 87.3%) while minimum number of consumers with high scores were observed for the item pulses (n=123; 82.0%).

CONCLUSION

CHAPTER-VI

CONCLUSION

It can be concluded that majority of respondents belonged to35-44 years, were graduate, non-working (n=240; 80%), housewives.Maximum number of consumers were belonged to upper middle income group, were vegetarian. Maximum number of consumers were Hindus dwelled in pakka and had their own house. Regarding consumption pattern, green vegetables, salad, coffee and fruit use were the most common food items consumed on daily basis. Majority of consumers used to watch television regularly whereas a total of 209 (67.7%) consumers used to read newspaper regularly.Further, consumer's knowledge regarding consumer education, types of adulteration, frequency of adulteration, hazardous effects of adulteration were found very low.

During intervention for all the food items majority of consumers had low level of knowledge about adulteration detection through sensory evaluation technique and through detection kit but after intervention majority of consumers had scores high level of knowledge about adulteration detection through sensory evaluation technique and through detection kit for all the food items as per five food groups.

In post study it was found that majority of consumers had high scores for all the items. Majority of consumers had high level of awareness regarding adulteration and harmful effects of adulteration of food stuffs.

The whole study shows that learning kit and manual was effectively developed which effectively improved the level of consumer's knowledge about consumer education, food adulteration, its detection at household level through sensory evaluation technique and learning kit and harmful effects of adulteration in food items.

RECOMMENDATION

CHAPTER-VII

RECOMMENDATON

Consumer is the largest economic group and central point of all marketing activities. With the rise in the income of people, the quality, the quantity and the sophistication of the consumer goods has also increased. The market is literally overflowing with the new products based in intricate technology. It is very difficult for the consumer to select one food item because of misleading advertisements, improper media emphasis and food adulteration. As a result of these malpractices, the ultimate victim is a consumer, who innocently takes adulterated foods and suffers. A good buying reflects philosophy about the nature of consumer and provides a logical means of organizing the vast quantity of information on variables that influence the buying practices.

While buying foods greater efforts on this line are necessary for targeted towards imparting knowledge and information on key health adulterant and its consequences would play a very important role in promoting awareness on food safety. Keeping the points in the mind following recommendations at various level must be implicated to control adulterant food consumption at household level and also create good practices having food quality among people.

1. **To the consumer**

Consumer being the ultimate user of the food product should be fully aware of consumer right, consumer law, consumer protection, food safety and standards and food marks and symbols practices that are prevent among a large number of population. Its helpful to educate themselves with the standardizing techniques and select products.

Majority of consumer have a strong consumer movement for proceeding exercise control over shopkeepers and manufacturers so that they can serve the consumer well.

2. **To the retailers**

   Retailers should choose wisely and purchase the best quality product (standard marks and symbols). Since they are the closest channel to he consumer and should take the initiative and suggest them the best products.

3. **To the wholesaler**

   It is mandatory that the wholesalers choose quality products and follow and learn quality management system for better stock cleaning and hygienic environments.

4. **To the manufacturers**

   Manufactures now a days are largely focused on increasing the profit and they care least about the wellbeing of the consumers. The attitude among the producers should be surveyed and force for followed principles involving business ethics.

5. **To the government**

   As centralized purchasing and retailing done by shopkeepers the government should be formulated proper channel of yielding production, food selling and its consumption among four once a year. Low quality product should be completely eradicated and launch programme like pulse polio.

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APPENDICES

ANNEXURE-I

Consumer Education Towards Food Adulteration and its Identification at Household Level by Using Low Cost Methods:

An Interventional Study

1. General Information
A: Individual Schedule

(a). Name of the respondent:

(b) Age:

(c). Date:

(d). Family No.:

(e). Address:

(e). Literacy status: Illiterate [ ] Primary [ ] Middle [ ] High School [ ] Intermediate [ ] Graduate [ ] Post graduate [ ] Professional [ ]
(f). Professional degree:

(g).	**Working status:** Working [ ] Non-working [ ] If working then nature of work: [ ]
(h).	**Occupation:** **Service[ ]** **Labour[ ]** **Business[ ]** Govt. S.[ ] Skilled[ ] Small[ ] Private[ ] Unskilled[ ] Big[ ] Semi private[ ] **Housewife[ ]** **Student[ ]** **Any other[ ]**
2.	**Marital status:** Married [ ] Unmarried [ ]
3.	**Nature of diet:**

	Vegetarian [ ]	Eggetarian [ ]
	Non-vegetarian [ ]	Occasional non-vegatarian [ ]

B: Family Schedule

1.	**Date :**
2.	**Muhalla No.:**
3.	**Family No.:**
4.	**Religion:** Hindu [ ] Muslim [ ] Sikh [ ] Christian [ ] Others [ ]
5.	**Caste:** SC/ST [ ] OBC [ ] General [ ] Others [ ]
6.	**Name of the head of the family:**
7.	**Name of the respondent:**
8.	**Type of the family:** Nuclear [ ] Compound [ ] Joint [ ] Stem type [ ] Extended [ ]
9.	**Total no. of family members** **4-7 [ ] ≥ 8-11 [ ] ≥ 12-14 [ ]**

10. Sources of family income

S. No.	Name of earning member	Nature of job	Income/month

	Sub-total of income		

11.(a)	**Income from agriculture** Income (Rs.)/month: [ ]
(b)	**Total land area** (hectare): [ ]
(c)	**Income from house property: [ ]**
(d)	**Other sources of income:**
(e)	**Total income:**
(f)	**Per capita income:**
12.(a)	**House amenities**
	Housing type: Pakka [ ] Kachcha [ ] Semi pakka [ ]
	Nature of house: Own [ ] Rented [ ]
	No. of rooms: [ ]
	No. of living rooms: [ ]
(b) (i)	**Belongings:** Factory[ ] Shop[ ] Additional plot[ ] Additional house[ ] A.C.[ ] Car[ ] Computer[ ] Ordinary Car[ ] Fax[ ] Internet[ ] Mobile[ ] Generator[ ]
(ii)	Jet-pump[ ] Scooter/Motorcycle[ ] VCD[ ] T.V.[ ] Microwave[ ] Telephone[ ]

	Radio[ ] Tape recorder[ ] Inverter[ ]	

(c). Use/consumption pattern various food items:

S. No.	Items	Daily	3-4 days	Weekly	Occasionally	Never
1.	Milk					
2.	Vegetables					
3.	Fruits					
4.	Dal pulses					
5.	Animal products					
6.	Fast foods					

(d).	**Leisure time activities**
(i)	**Habit of news paper reading:** Regular own[ ] Regular other[ ] Occasionally[ ] Never[ ]
(ii)	**Habit of watching T.V.:** Regular own[ ] Regular other[ ] Occasionally[ ] Never[ ]
	Total amenity score: [ ]
	Socio economic status: [ ]

13. Consumption pattern of special food item

Food item	Daily	Once/twice in a week	Weekly	Occasionally	Never
Milk					
Green veg.					

Salad					
Fruits					
Dry fruits					
Coffee					
Fish					
Milk products					
Fast foods					
Fermented					
Miscellaneous					

2. Specific Information

A:	**Consumer education**
1.	**Do you know about consumer education?** **Yes/No** Right to safety[ ] Right to information[ ] Right to choice[ ] Right to be heard[ ] Right to redress[ ] The right to consumer education[ ]
2.	**Do you know that consumer protection covers a wide range of topics?** **Yes/No** Product liability[ ] Privacy rights[ ] Unfair business practices[ ] Fraud mispresentation[ ]
3.	**Do you know about consumer laws deals with wide range of issues?**

	Yes/No Credit repair[ ] Debt repair[ ] Product safety[ ] Service[ ] Sales contract[ ] Bill collector regulation[ ] Pricing[ ] Utility turnoffs[ ] Consolidation[ ] Personal loans that may lead to Bankcrupty[ ]
4.	**Do you know about Food Safety and Standard Act?** **Yes/No** ✓ The prevention of food adulteration act, 1954[ ] ✓ The fruit products order, 1955[ ] ✓ The meat food product order, 1973[ ] ✓ The vegetable oil products (control) order, 1947[ ] ✓ The edible oils packaging (regulation) order, 1993[ ] ✓ The solvent extracted oil, de oiled meal, and edible[ ] ✓ The milk and milk products order, 1992[ ] ✓ Essential commodities act, 1955 relating to food[ ]
24.	**Do you know about different food marks/symbols used to determine the quality of packed/canned food items?** **Yes/No** ✓ AGMARK[ ] ✓ Green mark for vegetable products[ ] ✓ Red mark for non-veg. products[ ]
B.	**Identified five food groups of adulteration**

5. Do you know items names under five food groups?

Yes/No

S.No.	**Food groups**	**Items**
1.	Cereals and their products	
2.	Pulses and legumes	
3.	Fruits and vegetables	

4.	Milk and milk products	
5.	Fats, oils, sweets and jaggery	
6.	Food additives, color, flavors, spices and condiments	

6. Do you know about type of adulteration in food stuffs at day to day life?

Yes/No

S.No.	Food groups	Adulterants	Remark
1.	**Cereals and their products**	Stones/Melathian/Ergot/Sand/dirt/ chalk powder	
2.	**Pulses and legumes**	Kesari/stone/color dye stuffs	
3.	**Fruits and vegetables**	Melachit green/urea/calcium carbide/Copper sulphate/ oxytocin/wax/cheap colors, sacchrin/ pesticides & herbicides,	
4.	**Milk and milk products**	Urea/starch/white color/water/ arrowroot/ potato/ blotting paper	
5.	**Fats, oils, sweets and jaggery**	Argemone seeds/ argemone oil/ Vanaspati/mashed potato/ sweet potato/rancid stuff/synthetic coloring matter/castor oil/ invert sugar/jaggery/chalk powder/ washing soda	
6.	**Food additives, color, flavors, spices and condiments**	Papaya seeds/light berries/ Powdered bran and saw dust/ Dung powder/common salt/brick powder/sand/dirt/filth/Choti elaichi seeds/starch of maize/ wheat/tapioca/rice/lead chromate/ metanil yellow/Grass seeds colored with charcoal dust/ soap stone/other earthy matter/ chalk	
7.	**Others:** Common salt	Chalk powder/ white powdered stone	

	Tea	used up tea leaves/coloured outer coats of dhal & some colourants	
	Coffee	Chicory powder (without declaration) tamarind seed/ date seed powder	

C. Classification of adulteration according to five food groups

S. No.	Food groups	Products	Adulterants	Frequency			
				Daily	**Twice a day**	**Weekly**	**Forth nightly**
1.	**Cereals**	Rice	Stones,				
		Grains	Melathian				
		Bajra	Ergot				
		Wheat flour	Sand, dirt, chalk powder				
2.	**Pulses**	Arhar dal	Kesari, stone, color dye stuffs				
3.	**Fruits & vegetables**	Green vegetables	Melachit green				
		Vegetables	Urea				
		Mango	Calcium carbide				
		Banana	Calcium carbide				
			Copper sulphate, oxytocin, wax, cheap colors, sacchrin, pesticides & herbicides,				

4.	**Milk & milk product**	Milk	Urea, starch, white color, water, arrowroot				
		Khoa	Potato				
		Chhena	Bloting paper				
5.	**Fats, oils, sweets, juices, jams, jaggery**	Mustard seeds	Argemone seeds				
		Mustard oil	Argemone oil				
		Ghee	Vanaspati, mashed potato, sweet potato, rancid stuff, synthetic coloring matter				
		Vegetable oil	Castor oil				
		Sweets, juices, jams	Non permitted coaltar dye (metanil yellow)				
		Honey	Invert sugar, jaggery				
		Sugar	Chalk powder				
		Bura sugar	Washing soda				
6.	**Food additives, color flavor, condiments and spices**	Black pepper	Papaya seeds/light berries				
		Spices(ground)	Powdered bran and saw dust				
		Coriander powder	Dung powder, common salt				
		Chillies	Brick powder, sand, dirt, filth				
		Badi Elaichi	Choti elaichi seeds				

		seeds					
		Turmeric powder	Starch of maize, wheat, tapioca, rice, lead chromate, metanil yellow				
		Cumin seeds (black jeera)	Grass seeds colored with charcoal dust				
		Asofoetida	soap stone, other earthy matter, chalk, foreign resins galbanum, colophony resins				
		Cloves	From which volatile oil has been extracted				
7.	**Others**	Common salt	Chalk powder, white powdered stone				
		Tea	used up tea leaves, coloured outer coats of dhal & some colourants				
		Coffee	Chicory powder (without declaration) tamarind seed, date seed powder				

D.	**Classification of harmful effects of adulteration according to five food groups**			
S. No.	**Food groups**	**Products**	**Adulterants**	**Diseases/ affected body part**

1.	**Cereals**	Rice	Stones,	Poisonous, Stomach disorder
		Grains	Melathian	
		Bajra	Ergot	
		Wheat flour	Sand, dirt, chalk powder	
2.	**Pulses**	Pulses	Colour dye stuffs	Stomach pain, ulcer, Liver problems, Tumor
		Dhal	Kesari, stone, color dye stuffs	Paralysis Neurotoxic, bent knees, Toxic dyes are carcinogenic
3.	**Fruits & vegetables**	Green vegetables	Melachit green	Chemical laden fruits and vegetables can prove disastrous for digestive system, eyes and liver Can result in vomiting and diarrhea in childrens Kidney failure Oxytocin can lead to brain damage
		Vegetables	Urea	
		Mango	Calcium carbide	
		Banana	Calcium carbide	
			Copper sulphate, oxytocin, wax, cheap colors, sacchrin, pesticides & herbicides,	
4.	**Milk & milk product**	Milk	Urea, starch, white color, water, arrowroot	
		Khoa	Potato	
		Chhena	Bloting paper	
5.	**Fats, oils, sweets, juices, jams, jaggery**	Mustard seeds	Argemone seeds	Dropsy-Gastrointestinal problems, fever, swelling of feet and legs, oedma, glucoma, respiratory distress, cardiac arrest.
		Mustard oil	Argemone oil	Dropsy-Gastrointestinal problems, fever, swelling of feet and legs, oedma,

				glucoma, respiratory distress, cardiac arrest
		Edible oil	Mineral oil	Damage to liver, carcinogenic effects
			Karanja oil (pungam oil)	Heart problems, liver damage
		Ghee	Vanaspati, mashed potato, sweet potato, rancid stuff, synthetic coloring matter	
		Vegetable oil	Castor oil	Stomach problems
		Sweets, juices, jams	Non permitted coaltar dye (metanil yellow)	Toxic and carcinogenic
		Honey	Invert sugar, jaggery	
		Sugar	Chalk powder	Liver disorder
		Bura sugar	Washing soda	Diarrhoea, vomiting
6.	**Food additives, color flavor, condiments and spices**	Black pepper	Papaya seeds/light berries, rotten pepper	Stomach, liver problems
		Spices(ground)	Powdered bran and saw dust	
		Coriander powder	Dung powder, common salt	
		Chillies	Brick powder, sand, dirt, filth, artificial color	Stomach problems, toxic
		Badi Elaichi seeds	Choti elaichi seeds	
		Turmeric powder	Starch of maize, wheat, tapioca, rice, lead chromate,	Carcinogenic, degeneration of reproductive organs, highly carcinogenic

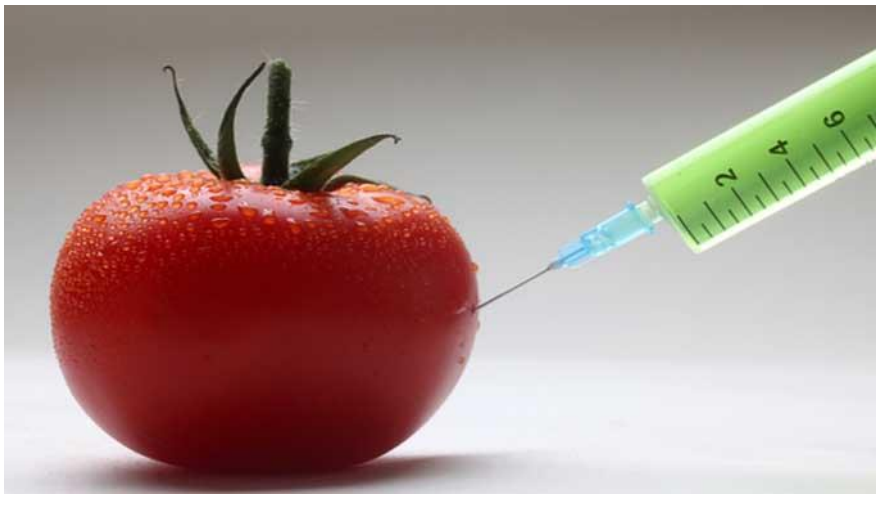
			metanil yellow	
		Cumin seeds (black jeera)	Grass seeds colored with charcoal dust	
		Asofoetida	soap stone, other earthy matter, chalk, foreign resins galbanum, colophony resins	Allergy, dysentery
		Cloves	From which volatile oil has been extracted	
7.	**Others**	Common salt	Chalk powder, white powdered stone	Stomach disorder
		Tea	used up tea leaves, coloured outer coats of dhal & some colourants	Liver disorder
		Coffee	Chicory powder (without declaration) tamarind seed, date seed powder	Stomach disorder, giddiness, and joint pain (in some cases), Diarrhea

E.	**Classification of adulteration detection methods according to five food groups**
7.	**What methods you use to identify the adulteration in cereals and their products?**
8.	**What methods you use to identify the adulteration in pulses and legumes?**

9.	**What methods you use to identify the adulteration in fruits and vegetables?**
10.	**What methods you use to identify the adulteration in milk and milk products?**
11.	**What methods you use to identify the adulteration in fats, oils, sweets and jaggery?**
12.	**What methods you use to identify the adulteration in food additives, colors, flavours, condiments and spices?**
13.	**Do you know about different methods of adulteration detection in food items?** **Yes/No** ✓ Labs[ ] ✓ Camps organized by governments[ ] ✓ Domestic methods of adulteration detection[ ]
14.	**Do you know about sensory evaluation techniques to examine the food quality?** **Yes/No** ✓ Appearance[ ] ✓ Color[ ] ✓ Flavor[ ] ✓ Mouth feel[ ]
15.	**Do you know about domestic methods for detection of adulteration in food items?**

	Yes/No

A
Practical Manual
on
Identification of Adulteration at Household Level with Low Cost Methods



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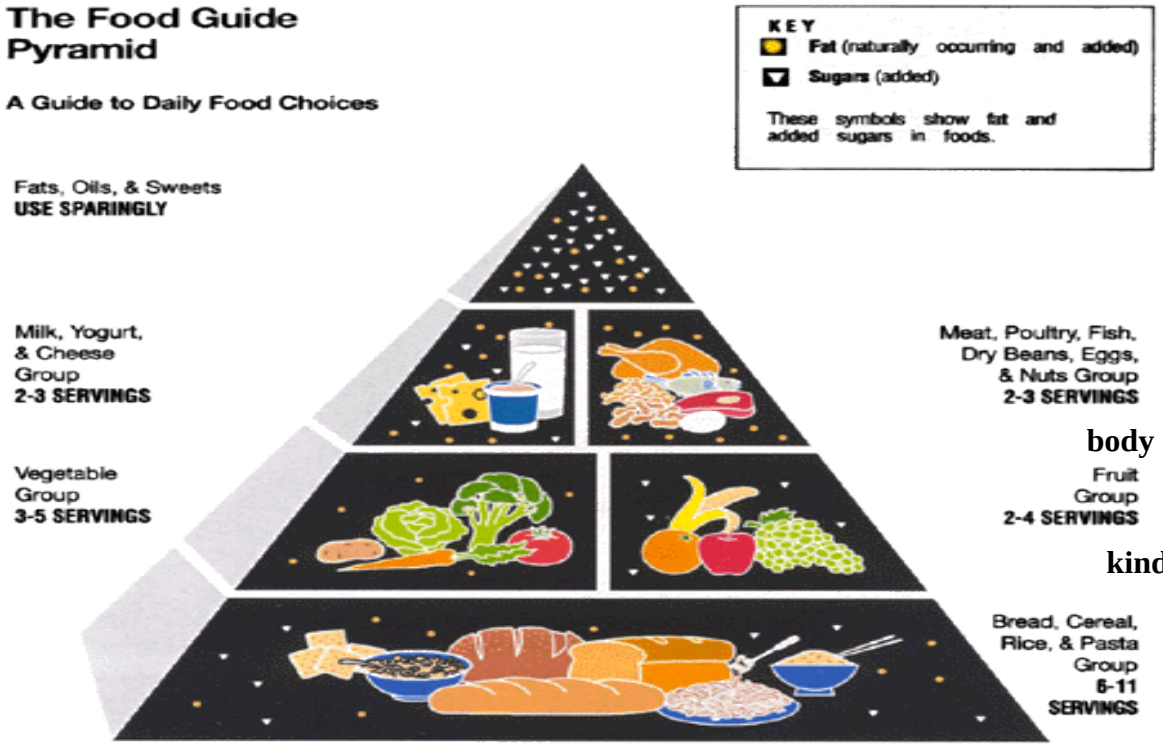
The Five Food Groups



Your body needs many kinds of food

to help you feel well and be healthy. That's why it's a good idea to make sure that you have several servings a day from each of the five food groups. They are:

Bread and Cereals

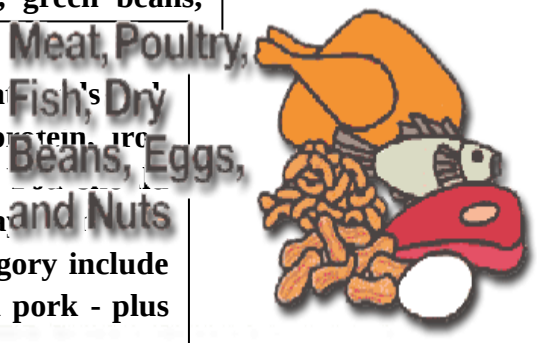
The grains and other ingredients in these foods give your body the carbohydrates it needs, as well as iron, fiber and other important elements. Foods in this category include rice, cereals, breads and pasta.

Fruits and Vegetables

Mother Nature put vitamins A and C in the foods in this group, which taste good and are good for you! Four or more servings a day from this food group will give you more vitamins and fiber to keep your energy levels high! Foods in this category include tomatoes, green beans,

Meat

Your body is like an engine that [illegible] and meat "fuels" you with protein, iron and other essential nutrients. [illegible] eat at least two servings a day from this food group. Foods in this category include beef, chicken, fish, turkey and pork - plus eggs and nuts!



Milk and milk products

Contain calcium and protein, which make your bones strong and help you grow into a healthy adult. At least three servings a day are recommended. Foods in this category include milk, cheese, yogurt and ice cream.

Other Food

Not every food fits easily into one of the groups we've already listed. Items in this group may contain a lot of fat or sugar and aren't as healthy as the foods we've discussed so far. For that reason, it's recommended that you limit your intake of them. Foods in this category include soda, butter, margarine, candy and processed snack foods.

Adulteration

- ✓ ***Substance is added which depreciates or injuriously affects it.***
- ✓ ***Cheaper or inferior substances are substituted are wholly or in part.***
- ✓ ***It is an imitation.***
- ✓ ***Any valuable or necessary constituent has been wholly or in part abstracted.***
- ✓ ***It is coloured or otherwise treated, to improve its appearance or if it contains any added substance injurious to health.***

- ✓ *Right to**safety**against hazardous goods and services*
- ✓ *Right to be**informed** about the quality, quantity, purity and standard price*
- ✓ *Right to **choose**from a variety at competitive prices*

- ✓ *Right to be **heard***
- ✓ *Right to seek **redressal***
- ✓ *Right to **consumer education***

Acts and Programmes related to Food Safety and Adulteration

- ✓ *The Prevention of Food Adulteration Act, **1954***
- ✓ *Fruits and Vegetable Products (Control) Order- FPO **1955***
- ✓ *Meat Food Products Order (MFPO)**1973***
- ✓ *Bureau of Indian Standards Act, **1986***
- ✓ *Standards of Weights and Measures Act, **1976***
- ✓ *The Consumer Protection Act, **1986***
- ✓ *Standards of Weights and Measures (Enforcement) Act, **1985***

- ✓ *Vegetable Products Control Order,* ***1976***
- ✓ *Solvent Extracted Oil, De-oiled Meal and*
- ✓ *Edible Flour Control Order,* ***1967***
- ✓ *Edible Oils Packaging (Regulation) Order,* ***1988***

Food Standards

- ✓ ***ISI***
- ✓ ***AGMARK***
- ✓ ***FPO***
- ✓ ***ECO Mark***
- ✓ ***Red Mark***
- ✓ ***Green Mark***

Tips To Consumers - While Shopping Food Products

- ✓ *Read the label before Purchase*
- ✓ *2. Purchase food articles from licensed vendors and insist on Bill or Cash Memo.*
- ✓ *Prefer foods sold in packed containers even if you have to pay more.*
- ✓ *Prefer food certified by Government agencies like*
- ✓ *Prefer use of iodised salt in place of common salt.*
- ✓ *Avoid coloured foods especially /sweetmeats/ sharbets/ice-candy.*
- ✓ *Avoid silver leaves or other decoratives on food.*

- ✓ *Buy food articles from reputed firms.*
- ✓ *Do not buy cut/exposed fruits/vegetables.*
- ✓ *Report to Health Officer/ Director (PFA)/Food & Drugs Administration in case of any complaint regarding food adulterati*

Sensory Techniques for Evaluation of Food Quality

When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic.

Sensory quality is a combination of different senses of perception combining into play in choosing and eating a food. Appearance, flavor and mouth feel decide the acceptance of the food.

The effective characteristics are not the property of the food, but the subject's reaction to the sensory qualities of foods. This reaction is highly conditioned by a variety of psychological and social factors and in the final analysis, plays a vital role in the acceptance and preference of foods.

Sensory Characteristic of Food

- ✓ *Appearance*
- ✓ *Color*
- ✓ *Flavour*

The flavor of food odour, taste and a composite of sensation known as mouth feel has three components:-

- ✓ *Odour*
- ✓ *Taste*
- ✓ *Mouth feel*
- ✓ *Texture*
- ✓ *Astringency*
- ✓ *Consistency*

Advice to Consumer

- ✓ *Select fruits and vegetables without spots or necrosis (lesions) and any abnormality.*
- ✓ *Wash fruits and vegetables thoroughly with water (preferably) running potable water before eating and cooking.*
- ✓ *Purchase fruits and vegetables from known dealers.*
- ✓ *Peeling of fruits before consumption and vegetables before cooking will reduce exposure to pesticide.*
- ✓ *Do not buy and consume cut fruits from open market.*
- ✓ *Throw away fruits and vegetables infected by mould/fungus.*
- ✓ *To minimize the hazards of pesticide residues, discard the outer leaves of leafy vegetables such as lettuce and cabbage.*
- ✓ *Do not wash fruits and vegetables with detergents as they may get absorbed inside.*

- ✓ *Ensure the quality of fruits and vegetables by sending them to voluntary testing laboratories.*
- ✓ *Wash your hands with soap and potable water, use clean utensil and clean cutting board with stainless steel knives.*

PURCHASE OF FOOD PRODUCTS

- ✓ *Don't buy spoilt products. It is dangerous to health*
- ✓ *Check manufacturing and expiry date, weight, manufacturer address etc.*
- ✓ *If perishables, check if it has been stored in freezer/cold storage properly.*
- ✓ *Avoid cheap and colourful food with hazardous colour additives*
- ✓ *Avoid product swithout manufacture raddress. You have no recourse in case of any problem*
- ✓ *Avoid purchase of unbranded products like oil without sealed packs*

Food Group-I

CEREALS, GRAINS and PRODUCTS

Cereals, Grains &Products		
Wheat	*Rice*	*Maize*
Bajara	*Pearl*	*Millet*
Suji	*Maida*	*Vermicelli*

Tests for Cereals, Grains and Products

Common Adulterants

Stones	*Melathian*	*Ergot*
Sand or Talcum	*Dirt*	*Chalk powder*
Karnel Bunt	*Metanil Yellow*	*Urea*
Resultant Atta	*Soil*	*Insect*
Webs	*Lumps*	*Rodent Hair/Excrete*

Adulterant-I (Ergot in Wheat, Bajra and Other grains)

Ingredient:-20 gm common salt, 100 ml water, sample
Method:- ✓ *Purple black longer sized grains in bajra show the presence of ergot.*

- ✓ *Put some grains in a glass tumbles containing 20 per cent salt solution (20 gm common salt to 100 ml water) purple black longer size grain ergot floats over the surface while round grains settle down.*

Health Hazards:-

- ✓ *Poisonous*
- ✓ *Stomach disorder*

Adulterant-II (Excess Bran in Wheat Flour)

Ingredient:- *water, Sample*

Method:-

- ✓ *Sprinkle on water surface.*
- ✓ *Bran will float on the surface.*

Health Hazards:-

- ✓ *Poisonous*
- ✓ *Stomach disorder*

Adulterant-III (Chalk Powder in Wheat Flour)

Ingredient:- *dil. HCl, sample*

Method:-

- ✓ *Shake sample with dil. HCl.*
- ✓ *Efferescence indicates chalk.*

Health Hazards:-

- ✓ *Poisonous*
- ✓ *Stomach disorder*

Adulterant-IV (Karnel Bunt in Wheat Flour & Other Grains)

Ingredient:- *sample*
Method:- ✓ *The effected wheat karnel have a dull appearance blackish in colour and rotten fish smell.*
Health Hazards:- ✓ *Poisonous* ✓ *Stomach disorder*

<u>Adulterant-V(Metanil Yellow in Sella Rice or Par Boiled Rice)</u>

Ingredient:-*dil. HCl sample*
Method:- ✓ *Rub a few grains in the palm of two hands.* ✓ *Yellow would get reduced or disappear.* ✓ *Add a few drops of dil. HCl to a few rice grains mixed with little water, presence of pink colour indicates presence of metanil yellow.*
Health Hazards:- ✓ *Poisonous* ✓ *Stomach disorder*

<u>Adulterant-VI (Urea in Parchred Rice)</u>

Ingredient:- *dil. HCl, sample*
Method:- ✓ *Take 30 numbers of parched rice in test-tube.*

- ✓ *Add 5 ml of distilled water in it.*
- ✓ *Mix up the contents thoroughly by shaking the test-tube.*
- ✓ *After 5minutes, filter the water-contents, and add half teaspoon of powder of arhar or soyabean in it.*
- ✓ *Leave it for 5 minutes, and then dip a red litmus paper in the mixture.*
- ✓ *Take out the litmus paper after 30 seconds and examine it.*
- ✓ *A blue colouration indicates the presence of urea in the parched rice.*

Health Hazards:-

- ✓ *Poisonous*
- ✓ *Stomach disorder*

Adulterant-VII (Sand or Talcum in Sago)

Ingredient:-*sample*

Method:-

- ✓ *Put a little quantity of sago in mouth, it will have gritty feel, if adulterated.*
- ✓ *Burn the sago, if pure, it will swell and leave hardly any ash.*
- ✓ *Adulterated sago will leave behind appreciable quantity of ash*

Health Hazards:-

- ✓ *Poisonous*
- ✓ *Stomach disorder*

Adulterant-VIII (Resultant Atta or Cheap Flour in Maida)

Ingredient:-*sample*

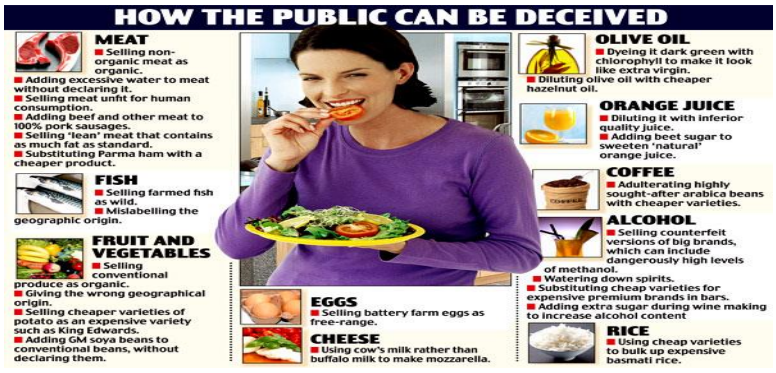
Method:-

- ✓ *When dough prepared from resultant or left out atta, more water has to be used.*

✓ *The normal taste of chapattis prepared out of wheat is somewhat sweetish whereas those prepared out of adulterated wheat will taste insipid.*
Health Hazards:- ✓ *Poisonous* ✓ *Stomach disorder*

<u>Adulterant-IX (Sand, Soil, Insect, Webs, Lumps, Rodent Hair, Excrete in Suji, Maida, Atta)</u>

Ingredient:-*sample*
Method:- ✓ *These can be identified by visual examination.*
Health Hazards:- ✓ *Poisonous* ✓ *Stomach disorder*



Food Group-II

PULSES & LEGUMES

Pulses and Legumes		
Arhar	Red Gram	Black gram
Rajama	Lentil	Cow Pea
Pegion Pea	Chick Pea	Besan

Tests for Pulses and Legumes

Common Adulterants

Colour dye stuffs	Kesari	Stone
Color dye stuffs		

Adulterant-I (Khesari Dal in Arhar, Chana)

Ingredient:-*50 ml dil. HCl, sample*

Method:- ✓ *Add 50 ml dil. HCl to small quantity of dal and keep on simmering for 45 minutes.* ✓ *If pink colour is developed it will confirm the presence of khesari dal.*
Health Hazards:- ✓ *Paralysis* ✓ *Neurotoxic* ✓ *Bent Knees*

<u>Adulterant-II (Lead Chromate in Arhar, Chana)</u>

Ingredient:-*HCl, 5 ml water,5 gms pulses*
Method:- ✓ *Shake 5 gms of pulses with 5 ml of water and add few drops of HCl.* ✓ *Pink colour indicate the presence of lead chromate.*
Health Hazards:- ✓ *Paralysis* ✓ *Neurotoxic* ✓ *Bent Knees*

<u>Adulterant-III (Khesari Flour in Besan)</u>

Ingredient:-*HCl, 5 ml water,5 gms pulses*
Method:- ✓ *Add 50 ml of dilHCl to 10 gms of sample and keep on simmering water for about 15 minutes.* ✓ *The pink colour, if developed, indicates, the presence of khesari flour.*
Health Hazards:- ✓ *Paralysis* ✓ *Neurotoxic* ✓ *Bent Knees*

Food Group-III

MILK &MEAT PRODUCTS

Milk & Meat Products		
Milk	Khoa	Chhena
Paneer	Ghee	Butter
Rabdi	Sweet Curd	

Test for Milk & Meat Products

Common Adulterants

Urea	Starch	White color
Water	Arrowroot	Potato
Blotting paper		

Adulterant-I (Urea in Milk)

Ingredient:-*sample, urea detective reagent*
Method:- ✓ *Take 2ml milk in a test tube and add 2ml urea detective reagent and mix well.* ✓ *It distinct deep yellow colour appears. It means urea is present in the milk.*
Health Hazards:-

Adulterant-II (Starch in Milk)

Ingredient: *sample, starch detective reagent*
Method:- ✓ *Boil 2 or 3ml milk in a test tube and cool it.,* ✓ *Add 2 or 3 drop of starch detective reagent if dark blue colour appears.* ✓ *It means starch is present in the milk.*
Health Hazards:-

Adulterant-III (Soda in milk)

Ingredient: *sample, soda detective reagent*
Method:- ✓ *Take 2ml milk in a test tube and add 2ml soda detective reagent mix well.* ✓ *If indicate pink colour it means soda is present in the milk.*
Health Hazards:-

Adulterant-IV (Detergent in milk)

Ingredient:-*sample, detergent detective reagent*
Method:- ✓ *Take 3ml milk in a test tube and add 1 or 2 drops detergent detective reagent.* ✓ *If appears dark purple colour, it means detergent is present in the milk.*
Health Hazards:-

<u>Adulterant-V (Mashed Potato, Sweet Potato etc. in Ghee)</u>

Ingredient:-*2-3 drops iodine solution, sample*
Method:- ✓ *Boil 5 ml of sample.* ✓ *Cool it to room temperature, then add 2-3 drops of iodine solution.* ✓ *Blue colour indicate the presence of starch which disapprears on boilng and reappears on cooling.*
Health Hazards:-

<u>Adulterant-VI (Washing Powder in Butter)</u>

Ingredient:-*lemon juice, sample*
Method:- ✓ *Put some drops of lemon juice on the sample.* ✓ *Bubbles are observed on the presence of washing powder.*
Health Hazards:-

<u>Adulterant-VII (Blotting Paper in Rabdi)</u>

Ingredient:-*3 ml HCl, 3 ml distilled water, sample*
Method:- ✓ *Take a teaspoon of rabdi in a test-tube.* ✓ *Add 3 ml of HCl and 3 ml of Distilled Water.* ✓ *Stir the content with a glass rod. Remove the rod and examine.* ✓ *Presence of fine fibres to the glass rod will indicate the presence of blotting paper in rabdi.*
Health Hazards:-

Adulterant-VIII (Vanaspati in Sweet Curd)

Ingredient:-*10 drops HCl, sample*
Method:- ✓ *Take 1 teaspoon full of curd in a test-tube.* ✓ *Add 10 drops of HCl.* ✓ *Mix up the contents shaking the test tube gently. After 5 minutes, examine the mixture.* ✓ *The red colouration indicates the presence of vanaspati in the curd.*
Health Hazards:-

Food Group-IV

FRUITS & VEGETABLES

Fruits & Vegetables		
Mango	*Banana*	*Apple*
Pear	*Bitter gourd*	*Leafy Vegetables*

Common Adulterants

Calcium Carbide	*Copper Sulphate*	*Oxytocin*
Wax	*Cheap Colours*	*Sacchrin*
Pesticides	*Herbicides*	

Adulterant-I (Calcium Carbide in Mangoes & Bananas)

Ingredient:-*sample*
Method:-*If the fruit is uniformly well coloured, or if black blotches appear on the skin in two or three days, we could suspect chemical ripening.*
Health Hazards:- ✓ *Disastrous for digestive system* ✓ *Disastrous for eyes & liver*

Adulterant-II (Oxytocin in Pumpkin, Watermelon, Brinjal, Gourd, Cucumber)

Ingredient:-*sample*
Method:-*Abnormal growth of pumpkin, watermelon, brinjal, gourd &*

cucumber shows the presence of oxytocin.
Health Hazards:- ✓ *Damage of the brain* ✓ *Kidney Failure*

Adulterant-III (Wax in Apples & Pears)

Ingredient:-*sample*
Method:-*if apple & pear coated with wax then the layer of wax could be suspected when it scratches with knife.*
Health Hazards:- ✓ *Damage of the brain* ✓ *Kidney Failure* ✓ *Vomiting* ✓ *Diarrhoea*

Adulterant-IV (Cheap Colours in Bitter Gourd, Leafy Vegetables & other Vegetables)

Ingredient:-*sample*
Method:-*If the vegetables are coloured with cheap colours, it will appear during washing with water.*
Health Hazards:- ✓ *Kidney Failure* ✓ *Vomiting*

Food Group-V

FATS & SUGARS

Fats & Sugars		
Mustard Oil	Olive Oil	Coconut Oil
Groundnut Oil	Sun Flower Oil	Sesme Oil
Butter		

Tests for Fats & Sugars

Common Adulterants

Mineral oil	Karanja oil (pungam oil)	Vanaspati
Mashed potato,	Sweet potato	Rancid stuff
Synthetic coloring Matter	Castor oil	Non permitted coaltar dye (metanil yellow)
Invert sugar jiggery	Chalk powder	Washing soda

Adulterant-I (Argemone Oil in Mustard Oil)

Ingredient:-HCl, sample
Method:- ✓ Heat the mixture of oil with little amount of HCl for 2-3

minutes. ✓ *The occurance of red colour layer indicates the presence of argemone oil.*
Health Hazards:- ✓ *Dropsy* ✓ *Gastrointestinal problems* ✓ *Fever* ✓ *Swelling of feet & legs* ✓ *Oedema* ✓ *Glucoma* ✓ *Respiratory distress* ✓ *Cardiac arrest*

Adulterant-II (Argemone Oil in Coconut Oil)

Ingredient:-*HCl, sample*
Method:- ✓ *Heat the mixture oil with little amount of HCl for 2-3 minutes.* ✓ *The occurance of red colour layer indicates the presence of argemone oil.*
Health Hazards:- ✓ *Dropsy-Gastrointestinal problems* ✓ *Fever* ✓ *Swelling of feet & legs* ✓ *Oedema* ✓ *Glucoma* ✓ *Respiratory distress* ✓ *Cardiac arrest*

Adulterant-III (Any Other Oil in Coconut Oil)

Ingredient:-*sample*
Method:-

✓ *Place a small bottle of oil in a refrigerator.* ✓ *Coconut oil solidifies leaving the adulterant as a separate layer.*
Health Hazards:-

<u>Adulterant-IV (Vanaspati or Margarine in Butter)</u>

Ingredient:-*Conc. HCl, sugar, sample*
Method:- ✓ *Take about one teaspoon full of melted sample of butter withequal quantity of concentrated HCl in a stoppered test-tube and add to it a pinch of sugar.* ✓ *Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of vanaspati or margarine.*
Health Hazards:-

<u>Adulterant-V (Vanaspati or Margarine in Ghee)</u>

Ingredient:-*Conc. HCl, sugar, sample*
Method:- ✓ *Take about one teaspoon full of melted sample of ghee with equal quantity of concentrated HCl in a stoppered test tube and add to it a pinch of sugar.* ✓ *Shake for one minute and let it for 5 minutes.* ✓ *Appearance of crimson colour in lower (acid) of vanaspati or margarine.*
Health Hazards:-

<u>Adulterant-VI (Mashed potatoes, Sweet Potatoes& other Starches in Ghee, Butter)</u>

Ingredient:-*iodine solution, sample*
Method:- ✓ *The presence of mashed potatoes and sweet potatoes in a*

sample of ghee can easily be detected by adding few drops of iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/ other starches are present.
Health Hazards:-

<u>Adulterant-VII (Prohibited Color in Edible Oil)</u>

Ingredient:-*5 ml HCl, sample*
Method:- ✓ *Take 5 ml of sample in a test-tube and add 5 ml of concentrated HCl.* ✓ *Shake gently.* ✓ *Let it stand for 5 minute. Colour will separate in the upper layer of the solution.*
Health Hazards:- ✓ *Damage to liver* ✓ *Carcinogenic effects*

<u>Adulterant-VIII (Washing Powder in Bura Sugar)</u>

Ingredient:-*1 ml HCl, sample*
Method:- ✓ *Add 1 ml HCl to the sample.* ✓ *Adulterated sample will give effervesence with HCl.*
Health Hazards:- ✓ *Diarrhoea* ✓ *Vomiting*

<u>Adulterant-IX (Washing Powder in Jaggery)</u>

Ingredient:-*1ml HCl, sample*
Method:- ✓ *Add 1 ml of HCl to the sample.*

✓ *Magenta coloration will show the presence of metanil yellow.*
Health Hazards:-

Food Group-VI

SPICES

Spices		
Chilli Powder	Black Pepper	Turmeric Powder
Jeera	Asofoetida	Black Cardamom
Corriander Powder	Cloves	Mustard Seeds

Tests for Spices

Common Adulterants

Papaya seeds/light berries	Rotten pepper	Powdered bran	Saw dust	Dung powder	Common salt
Brick powder	Sand	Dirt	Filth	Artificial color	Chotielaichi seeds
Starch of maize	Wheat	Tapioca	Rice	Lead chromate	Metanil yellow
Grass seeds colored with charcoal dust	Soap stone	Other earthy matter	Chalk	Foreign resins galbanum	Colophony resins

Adulterant-I (Brick Powder in Chilli Powder)

Ingredient:-*Water, Sample*
Method:- ✓ *Take some amount of water in a glass container then add the sample to it.* ✓ *Brick powder start settling down as soon as the adulterant sample was put into the water whereas most of the pure red chilli powder remains on the top and the rest settles.*
Health Hazards:- ✓ *Stomach problems* ✓ *Toxic*

Adulterant-II (Papaya Seeds in Black Pepper)

Ingredient:-*Water, Sample*
Method:- ✓ *Take some water in a glass, and add the pepper seeds to it.* ✓ *Papaya seeds will float whereas, the black pepper seeds will settle down.*
Health Hazards:- ✓ *Stomach* ✓ *Liver problems*

Adulterant-III (Metanil Yellow in Turmeric Powder)

Ingredient:-*dil. HCl, sample*
Method:- ✓ *Add few drops of DilHCl to the sample.* ✓ *Instant appearance of violet colour which disappears on dilution with water indicates pure turmeric.*
Health Hazards:- ✓ *Carcinogenic* ✓ *Degeneration of reproductive organs*

Adulterant-IV (Seeds Colored with Charcoal Dust in Jeera)

Ingredient:-*sample*
Method:- ✓ *Simply rub the cumin seeds on palm, if palm turns black, adulteration is indicated.*
Health Hazards:-

<u>Adulterant-V (Soapstone or Other Earthy Matter in Asofoetida)</u>

Ingredient:-*H_2O, sample*
Method:- ✓ *Shake a little quantity for powdered sample with H_2O.* ✓ *The adulterant will settle down.*
Health Hazards:- ✓ *Allergy* ✓ *Dysentry*

<u>Adulterant-VI (Green Cardamom Seeds in Black Cardamom)</u>

Ingredient:-*sample*
Method:- ✓ *Separate out the seeds by physical examination.* ✓ *The seeds of black cardamom have nearly plain surface without wrinkle or streaks while seeds of green cardamom have pitted or wrinkled ends.*
Health Hazards:-

Food Group-VII

OTHER FOOD ITEMS

OTHER FOOD ITEMS		
Tea	*Coffee*	*Common Salt*
Iodized Salt	*Vinegar*	*Bura sugar*
Jaggery		

Test for Others

Common Adulterants

Chalk powder	*White powdered stone*	*Used up tea leaves*
Coloured outer coats of dhal & some colourants	*Chicory powder (without declaration) tamarind seed*	*Date seed powder*

Adulterant-I (Artificial Dye in Tea Leaves)

Ingredient:-*blotting paper, sample*
Method:- ✓ *Put the tea leaves on a moist blotting paper.* ✓ *The artificial dye will imparts its colour.*
Health Hazards:- ✓ *Liver disorder*

<u>Adulterant-II (Tamarind Powder or Date Seeds in Coffee)</u>

Ingredient:-*sample*
Method:- ✓ *Simply sieve the coffee seeds.* ✓ *Only coffee particles will get retained.* ✓ *And the rest impurities will come on the sieve.*
Health Hazards:- ✓ *Stomach disorder* ✓ *Giddiness* ✓ *Joint pain* ✓ *Diarrhea*

<u>Adulterant-III (White Powdered in Common Salt)</u>

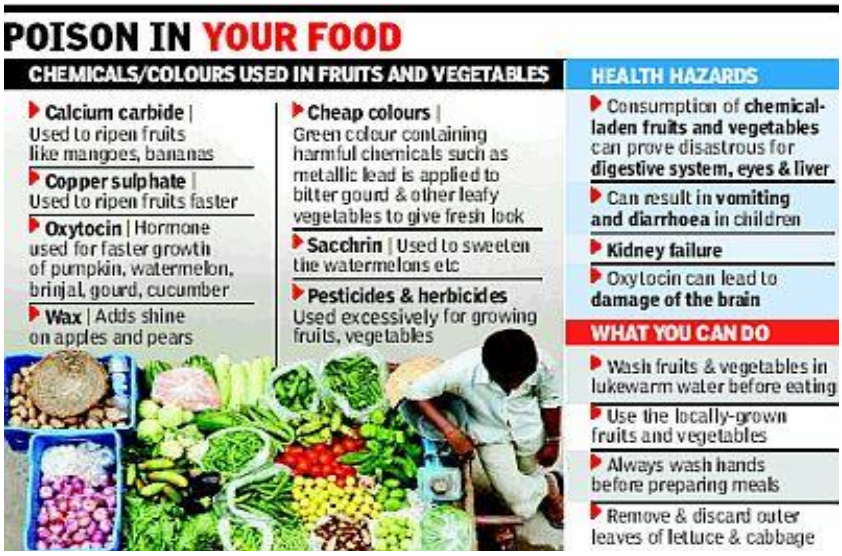
Ingredient:-*water, sample*
Method:- ✓ *Stir a spoonful of sample of salt in a glass of water.* ✓ *The presence of chalk will make solution white and other insoluble impurities will settle down.*
Health Hazards:- ✓ *Stomach disorder*

<u>Adulterant-IV (Common Salt in Iodized Salt)</u>

Ingredient:-*potato, lemon juice, sample*
Method:- ✓ *Cut a piece of potato, add salt and wait minute and add two drops of lemon juice.* ✓ *If iodized salt blue colour will develop.* ✓ *In case of common salt, there will be no blue colour.*
Health Hazards:-

<u>Adulterant-V (Mineral acid in Vinegar)</u>

Ingredient:-*metanil yellow indicator paper, sample*
Method:- ✓ *Test with metanil yellow indicator paper, in case, the colour changes from yellow to pink, mineral acid is present.*
Health Hazards:-



Two get three-month imprisonment for selling adulterated salt

Fine also imposed on salt manufacturer and vendor

Staff Reporter

TUTICORIN: A salt manufacturer and a vendor has been sentenced to undergo three months imprisonment each for manufacuturing and selling adulterated salt. On September 6, 2007, A.R.Sankaralingam, Food Inspector of Tirunelveli Corporation collected a sample of "Thirumani Crystal Salt" from the grocery shop of one Murugesan, son of Natarajan, who sold the product at Sindhupoondurai, Tirunelveli, and sent it for analysis to the food analysis laboratory.

Analysis of the sample revealed that the salt was high in moisture content and less in iodine content and also the sodium chloride content of the product was below the prescribed standards as per the Prevention of Food Adulteration Act and Rules.

The Food Inspector preferred a complaint against the vendor, Murugesan, and T. Murugesan, the manufacturer of the above adulterated salt. Besides a fine of Rs. 500 each was also imposed by K.S. Paul Pandian, Judicial Magistrate – IV of Tirunelveli. Assistant Public Prosecutor Jeyajeeva appeared in this case.

35 lakh litres of milk is consumed by Delhi everyday | **10** per cent of the total milk is branded | **90** per cent is sold through dairies and milk vendors | **91** samples were taken from across Delhi for tests | **13** of 45 samples of which results were out were spurious

Watch out! That glass of milk may not be safe


Branded as well as non-branded milk was found to be adulterated.

By **Kumar Vikram** in New Delhi

CHANCES are that the milk you drink is adulterated. And the government may not be equipped with tools to identify some of the substances found in spurious milk.

A test initiated by the Delhi government's health department has revealed that 29 per cent of milk samples collected from across the Capital is adulterated. The government insists there is nothing to worry as the milk was only found to have excess water.

The tests were triggered by a raid carried out by the Haryana Police on May 29 at a chilling plant in Dharuhera in Rewari district of Haryana, about 100 km from Delhi. The police seized 74,000 litres spurious milk, 150 kg caustic soda, 158 bags of milk powder and 16 barrels of glucose. The spurious milk was reportedly meant for supply in Delhi.

The Delhi government had received a number of complaints following the raid and had ordered the inquiry. Ninety-one samples were taken from various vendors across the city and were sent for examination. On Friday, test results of 45 samples were revealed and 13 were found to be adulterated.

THE CAPITAL'S MILK WOES


The govt laboratory doesn't have tools to identify urea, soda and other chemicals used in spurious milk
— Naresh Kadyan, activist


Milk was mixed only with water. It did not have full cream content. We have the tools to test samples
— Kiran Walia, minister

29 per cent of the samples adulterated

Naresh Kadyan, representative of the International Organisation for Animal Protection, had lodged the initial complaint. He said some more samples, including samples from Mother Dairy and other brands, were lifted from the Prashant Vihar area of North-West Delhi. "These have been sent for examination," he said.

Kadyan said the health department did not have the required equipment to identify all kinds of adulteration. "The government wants to play down the issue at the cost of the people's health. The government's laboratory does not have the equipments which can identify urea, soda and other chemicals used to manufacture spurious milk," said Kadyan. He said he would file a public interest litigation regarding the issue.

However, Delhi health minister Kiran Walia denied the supply of spurious milk.

"The milk was adulterated only with water. It didn't contain cream content," she said. She also rejected Kadyan's allegation and insisted that the government laboratory had all the tools required to test the quality of milk.

When asked if any particular brands of milk, such as Mother Dairy, were found to be spurious, Walia said it was being verified. "I had asked my team to take samples of all the varieties of milk being sold. But I will have to check if any of the branded milk packets were found to be spurious," she said.

According to an estimate, Delhi consumes about 35 lakh litres milk each day. Most of this comes from Haryana, Uttar Pradesh and Rajasthan. Of this, 10 per cent of the total milk is branded while 90 per cent is sold through various dairies and milk vendors across the city.

Delhi health minister said milk was diluted

It has been found that dairy owners also use Oxytocin injection to increase the amount of milk produced by animals. "This is illegal. But everybody in the business uses it. Besides, milk is adulterated with the caustic soda, palm or refined oil, shampoo and synthetic milk," Kadyan said.

Caustic soda is mixed to prevent the milk from getting damaged. "Milk is brought to Delhi from faraway places. It takes hours to reach. Some milk suppliers don't have proper cooling systems. So they mix caustic soda to keep the milk safe. The chemical is harmful," said Kadyan.

During its investigation, the Haryana Police had found that the milk was brought to Dharuhera from Dausa in Rajasthan. After adulteration, it was meant to be distributed in the Capital under the Delhi Milk Scheme.

आप चाकलेट खा रहे हैं या निर्दोष बछड़ों का मांस?

● आचार्य बालकृष्ण

चाकलेट का नाम सुनते ही बच्चों में गुदगुदी न हो, ऐसा हो ही नहीं सकता। बच्चों को खुश करने का प्रचलित साधन है चाकलेट। बच्चों में ही नहीं, वरन् किशोरों तथा युवा वर्ग में भी चाकलेट ने अपना विशेष स्थान बना रखा है। पिछले कुछ समय से टॉफियों तथा चाकलेटों का निर्माण करने वाली अनेक कंपनियों द्वारा अपने उत्पादों में आपत्तिजनक अखाद्य पदार्थ मिलाये जाने की खबरें सामने आ रही हैं। कई कंपनियों के उत्पादों में तो हानिकारक रसायनों के साथ-साथ गायों की चर्बी मिलाने तक की बात का रहस्योद्घाटन हुआ है।

सन् 1847 में अंग्रजों ने कारतूसों में गायों की चर्बी का प्रयोग करके सनातन संस्कृति को खण्डित करने की साजिश की थी, परन्तु मंगल पाण्डेय जैसे वीरों ने अपनी जान पर खेलकर उनकी इस चाल को असफल कर दिया। अभी फिर यह नेस्ले कंपनी चालें चल रही है। अभी मंगल पाण्डेय जैसे वीरों की ज़रूरत है। ऐसे वीरों को आगे आना चाहिए। लेखकों, पत्रकारों को सामने आना चाहिए। देशभक्तों को सामने आना चाहिए। देश को खण्ड-खण्ड करने के मलिन मुरादे वालों और हमारी संस्कृति पर कुठाराघात करने वालों को सबक सिखाना चाहिए।

गुजरात के समाचार पत्र गुजरात समाचार में प्रकाशित एक समाचार के अनुसार नेस्ले यू.के.लिमिटेड द्वारा निर्मित किटकेट नामक चाकलेट में कोमल बछड़ों के रैनेट (मांस) का उपयोग किया जाता है। यह बात किसी से छिपी नहीं है कि किटकेट बच्चों में खूब लोकप्रिय है। अधिकतर शाकाहारी परिवारों में भी इसे खाया जाता है।

नेस्ले यू.के.लिमिटेड की न्यूट्रिशन आफिसर श्रीमती वाल एन्डर्सन ने अपने एक पत्र में बताया: किटकेट के निर्माण में कोमल बछड़ों के रैनेट का उपयोग किया जाता है। फलतः किटकेट शाकाहारियों के खाने योग्य नहीं है। इस पत्र को अन्तर्राष्ट्रीय पत्रिका यंग जैन्स में प्रकाशित किया गया था। सावधान रहो, ऐसी कंपनियों के कुचक्रों से! टेलिविज़न पर अपने उत्पादों को शुद्ध दूध से बनते हुए दिखाने वाली नेस्ले लिमिटेड के इस उत्पाद में दूध तो नहीं परन्तु दूध पीने वाले अनेक कोमल बछड़ों के मांस की प्रचुर मात्रा अवश्य होती है। हमारे धन को अपने देशों में ले जाने वाली ऐसी अनेक विदेशी कंपनियाँ हमारे सिद्धान्तों तथा परम्पराओं को तोड़ने में भी कोई कसर नहीं छोड़ रही हैं। व्यापार तथा उदारीकरण की आड़ में भारतवासियों की भावनाओं के साथ खिलवाड़ हो रहा है।

हालैण्ड की एक कंपनी वैनेमैली पूरे देश में धड़ल्ले से फ्रूटेला टॉफी बेच रही। इस टॉफी में गाय की हड्डियों का चूरा मिला होता है, जो कि इस टॉफी के डिब्बे पर स्पष्ट रूप से अंकित होता है। इस टॉफी में हड्डियों के चूर्ण के अलावा डालडा, गोंद, एसिटिक एसिड तथा चीनी का मिश्रण है, ऐसा डिब्बे पर फार्मूले (सूत्र) के रूप में अंकित है। फ्रूटेला टॉफी ब्राजील में बनाई जा रही है तथा इस कंपनी का मुख्यालय हालैण्ड के जुडिआई शहर में है। आपत्तिजनक पदार्थों से निर्मित यह टॉफी भारत सहित संसार के अनेक अन्य देशों में भी धड़ल्ले से बेची जा रही है।

चीनी की अधिक मात्रा होने के कारण इन टॉफियों को खाने से बचपन में ही दाँतों का सड़ना प्रारंभ हो जाता है तथा डायबिटीज़ एवं गले की अन्य बीमारियों के पैदा होने की संभावना रहती है। हड्डियों के मिश्रण एवं एसिटिक एसिड से कैंसर जैसे भयानक रोग भी हो सकते हैं।

सन् 1847 में अंग्रेजों ने कारतूसों में गायों की चर्बी का प्रयोग करके सनातन संस्कृति को खण्डित करने की साजिश की थी, परन्तु मंगल पाण्डेय जैसे वीरों ने अपनी जान पर खेलकर उनकी इस चाल को असफल कर दिया। अभी फिर यह नेस्ले कंपनी चालें चल रही है। अभी मंगल पाण्डेय जैसे वीरों की ज़रूरत है। ऐसे वीरों को आगे आना चाहिए। लेखकों, पत्रकारों को सामने आना चाहिए। देशभक्तों को सामने आना चाहिए। देश को खण्ड-खण्ड करने के मलिन मुरादे वालों और हमारी संस्कृति पर कुठाराघात करने वालों को सबक सिखाना चाहिए। देव संस्कृति भारतीय समाज की सेवा में सज्जनों को साहसी बनना चाहिए। इस ओर सरकार का भी ध्यान खींचना चाहिए।

ऐसे हानिकारक उत्पादों के उपभोग को बंद करके ही हम अपनी संस्कृति की रक्षा कर सकते हैं। इसलिए हमारी संस्कृति को तोड़ने वाली ऐसी कंपनियों के उत्पादों के बहिष्कार का संकल्प लेकर आज और अभी से भारतीय संस्कृति की रक्षा में हम सबको कंधे-से-कंधा मिलाकर आगे आना चाहिए।

THE TIMES OF INDIA, MUMBAI
WEDNESDAY, JANUARY 11, 2012 **TIMES CITY**

Substances Like Urea, If Ingested For a Prolonged Period Even In Small Doses, Can Damage Vital Organs

45% of Mumbai's milk likely to be adulterated: Labs

70% of milk in Delhi, country is adulterated

Spiked with Detergent, Fat, Urea & Water

Kounteya Sinha | TNN

New Delhi: Beware, your daily glass of good health could actually be doing you harm. As much as 70% of milk samples picked up from the capital by a government agency failed to conform to standards.

Of the 71 samples randomly taken from Delhi for testing by the Food Safety Standards Authority of India (FSSAI), 50 were found to be contaminated with glucose and skim milk powder (SMP), which is usually added to milk in the lean season to enhance volumes.

▶Detergent found, P 10

Elsewhere in the 33 states and UTs study, milk was found adulterated with detergent, fat and even urea, besides the age-old dilution with water. Across the country, 68.4% of the samples from Jammu & Kashmir 81% from Punjab, 76% from Rajasthan, 70% from Delhi and Haryana and 65% from Maharashtra failed the test. Around half of the samples from Madhya Pradesh (48%) also met a similar fate.

States with comparativ

NOT TOO HEALTHY

State	% Of Bad Milk Samples
W Bengal*	100
Gujarat	89
J&K	83
Punjab	81
Rajasthan	76

*100% samples also found adulterated in **Orissa, Bihar, Chhattisgarh, Jharkhand**

Best States	
Goa, Puducherry	0
Andhra Pradesh	6.7
Tamil Nadu	12
Karnataka	22

daily sun

TRUE & IMPARTIAL

WALTON

DIGEST

HSC exams start today

Raw salt dirt cheap, retail rate sky-high

Middlemen, big market players to blame

Ensuring safe food

- Roadside food vendors brought under its purview
- Single licence for various kinds of products
- Timebound mechanism for registration, issue of licence
- Agency to handle registration, licence application

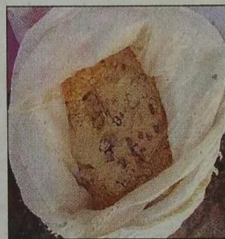
पुष्टाहार में मिले शीशे के टुकड़े

- कंकड़ भी पाए गए, बच्चों के स्वास्थ्य से खिलवाड़

जासं, गाजीपुर : बच्चों के सरकारी आहार के साथ मजाक का सिलसिला थम नहीं रहा है। सरकारी मशीनरी लापरवाह बनी हुई है। इसी का एक नमूना भावरकोल ब्लॉक के चांदपुर आंगनबाड़ी केंद्र पर शनिवार को सामने आया। यहां पुष्टाहार की बोरियों में कंकड़, मिट्टी व शीशे के टुकड़े पाए गए।

आंगनबाड़ी कार्यकर्ता सरस्वती मिश्र ने बोरी खोली और बच्चों के पुष्टाहार में मिलावट देख अवाक रह गई। यह सूचना गांव वालों तक पहुंची और देखते ही देखते हड़कंप की स्थिति उत्पन्न हो गई। ग्रामीणों ने पुष्टाहार वितरण पर रोक लगाई।

आंगनबाड़ी कार्यकर्ता का कहना था कि ये बोरियां परियोजना कार्यालय से भेजी गई हैं। उधर, जब इस बाबत बाल विकास परियोजना अधिकारी रमावती सिंह से बात की गई तो उन्होंने सिर्फ इतना कहकर अपने कर्तव्य की इतिश्री कर ली कि जांच कराई जाएगी।



बेकार पुष्टाहार जागरण

मिड-डे-मील की सब्जी में कीड़ा

वाराणसी : काशी विद्यापीठ ब्लॉक के पूर्व माध्यमिक विद्यालय कादीपुर में शनिवार को बच्चों को परोसे गए सब्जी में कीड़ा मिला। बच्चों ने भोजन खाने से इन्कार कर दिया। इसकी शिकायत प्रधानाध्यापक शकुंतला देवी से की। खबर फैलते ही कई ग्रामीण स्कूल पर आ धमके। हंगामा हुआ, नारेबाजी की साथ ही आरोप लगाया कि स्कूल में मानक के तहत कभी छात्र-छात्राओं को भोजन नहीं दिया जाता। कुछ लोग सब्जी तो कु... चावल व सब्जी दोनों में ही कीड़े पाये जाने की बात कह रहे थे। ख... शिक्षा अधिकारी प्रदीप मिश्रा ने क... कि इसकी जांच होगी।

मिड डे मील के बाद आयरन की गोली से 11 बच्चों की हालत बिगड़ी

जागरण संवाददाता, हाथरस : हाथरस ब्लाक के गांव पैकवाड़ा के पूर्व माध्यमिक विद्यालय में मिड-डे मील में बांटी गई खीर खाने के बाद आयरन की गोली से एक-एक कर 11 बच्चों की हालत बिगड़ गई। इन बच्चों को पहले उल्टी हुई, फिर चक्कर आए और वे बेहोश होने लगे तो हड़कंप मच गया। सूचना पर विद्यालय पहुंचे अभिभावक काफी देर तक घरेलू नुस्खे अपनाते रहे। पर हालत में कोई सुधार नहीं हुआ तो सूचना जिला अस्पताल को दी गई। डाक्टरों की टीम के साथ गांव पहुंचे सीएमओ डा. आरपी सिंह ने बच्चों का इलाज किया। शाम तक सभी बच्चों की हालत सुधर पाई।

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8 | दैनिक जागरण लखनऊ/अयोध्या (फैजाबाद), 4 जुलाई 2013 फैजाबा...

सफेद दूध के काले कारोबारी बेलगा...

मुकेश कुमार, फैजाबाद

यहां सत्ता की मर्जी पर ही काले कारोबार करने वालों पर चाबुक चलता है। इस तथ्य की पुष्टि मिलावटी व नकली दूध अथवा खोया के खिलाफ खाद्य सुरक्षा विभाग की खामोशी से ही समझा जा सकता है। वर्ष 2013 में मिलावटी दूध की जांच के लिए नमूने एकत्र करने का अभियान नहीं चला। जाहिर सी बात है कि विभागीय अमले को सत्ता का भय सता रहा है।

आखिरी बार वर्ष 2012 के अप्रैल माह में अभियान चला था। वर्ष 2011 में अभियान के दौरान सौ नमूने लिए गए थे। तब जांच रिपोर्ट के मद्देनजर दोषियों पर कार्रवाई भी की गई थी। जिले में नकली दूध के कारोबार का मामला सामने नहीं आया था, यहां ज्यादातर नमूने अधोमानक पाए गए थे। अधोमानक पानी की ज्यादा मिलावट के कारण सामने आया था। इस वर्ष गर्मी के मौसम में जो अभियान चला वह अन्य खाद्य पदार्थों के खिलाफ था, न कि दूध के। यहां खोया व पनीर के मामले में भी विभाग की सुस्ती बरकरार रही।

विभाग सुस्त

- आखिरी बार वर्ष 2012 के अप्रैल माह में चला था अभियान

मिलावटखोरों के संरक्षण में अवैध रूप से दूध से मलाई निकालने के साथ ही मिलावटी खाद्य पदार्थों की बिक्री का धंधा क्षेत्र में बड़ी तेजी से फलफूल रहा है। इस धंधे के केंद्र शहर से सटे इलाके सोहावल, मसौधा, पूरबाजार हैं।

बिना लाइसेंस चल रहीं क्रीम निकालने की मशीनें : खाद्य एवं औषधि विभाग से लाइसेंस प्राप्त कर मशीन द्वारा दूध से वसा की मात्रा कम कर टोंड मिल्क बनाया जाता है। क्षेत्र में चोरी से लगभग दो दर्जन मशीनें चलाई जा रही हैं। टोंड मिल्क बनाए जाने वाले स्थानों पर प्रातः से ही दूधियों का जमावड़ा लगना शुरू हो जाता है। मशीन द्वारा क्रीम निकाल लिया जाता है। दूधिये दूध को गाढ़ा करने के लिए अरारोट, मैदा, डालडा आदि मिलाकर बिक्री करते हैं। नियमानुसार टोंड मिल्क के डिब्बे पर 'सेपरेटेड मिल्क' लिखा होना चाहिए, जिससे लोगों को पता चल सके। यहां दूधियों द्वारा केनों पर टोंड व फुल क्रीम मिल्क नहीं लिखवाया गया है। इसी का लाभ उठा लोगों को झांसा दिया जाता है।

सेहत से खिलवाड़

'दूध पीने से हड्डियां मजबूत होंगी और दिमाग तेज होगा' ऐसा कहते हुए हर मां अपने बच्चों को दूध पीने के लिए प्रेरित करती है, लेकिन अब यही दूध खतरनाक साबित हो सकता है। दूध में विभिन्न प्रकार की हानिकारक चीजें मिलाकर लोगों की जिंदगी से खिलवाड़ किया ... कहना पराब्रह्मनान के प्र... प्रसाद दुबे का।

"समय-समय पर अभियान चल... जिलाधिकारी के निर्देश पर अक... जाती है। यहां नकली दूध के माम... सामने नहीं आए। इसलिए विशेष... जरूरत नहीं पड़ी। जब निर्देश मि... अभियान चलेगा।"

हीरालाल, मुख्य खाद्य सु...

तरौली बाजार के संजय ... कि मशीन से मक्खन ... मिलावटी मक्खन बेच रहे हैं... सामाजिक कार्यकर्ता ... राहुल प्रताप सिंह आरोप... नकली व मिलावटी दूध ह... रोग का कारण बनता है... रामशंकर वर्मा का कहन... से ज्यादा मात्रा में दू... लिए हानिकारक आक्स... इंजेक्शन का भी इस्तेमा... है। ऐसे में दूध बीमा... साबित हो रहा है।

मिड डे मील पर अब सामूहिक जिम्मेदारी से करना होगा काम

जागरण ब्यूरो, नई दिल्ली : बिहार में मिड डे मील खाने से 23 बच्चों की मौत के बाद केंद्र सरकार ने कहा है कि इस हादसे ने हमें सतर्क कर दिया है। मानव संसाधन मंत्री पल्लम राजू ने शनिवार को कहा कि ऐसे हादसे रोकने के लिए सामूहिक जिम्मेदारी से काम करना होगा। उन्होंने कहा कि हादसे की रिपोर्ट सरकार को मिल गई है और अब फोरेंसिक रिपोर्ट मिलने का इंतजार है।

राजू ने कहा कि केंद्र चाहता है कि मिड डे मील योजना को सही तरीके से

फूड प्व...
पांच स...

जासं, अलीगढ़ : टप्पल में रवि... में बरातियों के देर से पहुं... घरातियों के खाना खाने के बा... में हड़कंप मच गया। एक के ... लोगों के बीमार पड़ने से सभ... फूल गए। माना जा रहा है वि... में गाजर के हलवे में मिलाव... लोगों की तबीयत बिगड़ गई... डीएम के निर्देश पर 10 एंबुले... को जिला मुख्यालय इलाज ... कई बीमार लोगों का निजी... इलाज चल रहा है।

टप्पल के मोहल्ला गंज ... डीलर हाजी हफीज खां की ... को निकाह होना था। मथुरा के... नासिर के बेटे आरिफ की य...

...ता साफ रहेगा। ठंडक रहेगी।
सूर्य 5:18 (अस्त) 6:54 (उदय-कल)
तापमान 25.8 (अधि.) 10.1 (न्यून.)
आर्द्रता 88 (अधि.) 49 (न्यून.)
देहरादून जागरण
देहरादून, 28 नवंबर 2013

सेहत पर सरकार नहीं फ्रिकमंद

लैब ने 14 दिन में रिपोर्ट देने से किए हाथ खड़े

जागरण संवाददाता, देहरादून: उत्तराखंड में सरकार ही सेहत से खिलवाड़ पर उतारू है। अब इससे ज्यादा हास्यास्पद स्थिति और क्या होगी कि रूद्रपुर स्थित खाद्य लैब के विश्लेषक ने हाल ही में शासन को एक पत्र लिखकर सीधे-सीधे सैंपलों की रिपोर्टिंग 14 दिनों में करने से हाथ खड़े कर दिए हैं। लैब में अधिक सैंपलों की प्राप्ति व सीमित संसाधनों का हवाला देते हुए कहा गया है कि 110 दिनों से पहले वह जनपदों से आए सैंपलों की रिपोर्ट नहीं दे पाएंगे।

खाद्य सुरक्षा एवं मानक अधिनियम-2006 स्पष्ट कहता है कि सैंपलिंग के 14 दिनों के अंदर खाद्य पदार्थों की जांच रिपोर्ट जारी कर दी जाए लेकिन उत्तराखंड की खाद्य जांच प्रयोगशाला ने इस अधिनियम को मजाक बना दिया है। दीवाली के दौरान देहरादून जनपद सहित प्रदेश की तमाम जनपदों में खाद्य पदार्थों के नमूने भरे गए। बताया जाता है कि समूचे प्रदेश से लैब में 307 नमूने जांच के लिए गए थे। इनमें सर्वाधिक 83 नमूने अकेले देहरादून से गए थे। बहरहाल, अब इस मामले में नया मोड़ आ गया है। खाद्य पदार्थों नमूनों की अधिकतता के कारण एकाएक लैब ने इनकी तत्काल जांच से हाथ खड़े कर दिए हैं। इस मामले में खाद्य विश्लेषक एके कौशिक ने आयुक्त खाद्य सुरक्षा को एक पत्र लिखकर अवगत कराया है कि एक्ट के प्रावधानों के अनुरूप लैब 14 दिनों में सैंपलों की रिपोर्टिंग कर पाने में सक्षम नहीं है। पत्र में कहा गया है कि इन सैंपलों की रिपोर्ट 110 दिनों से पहले किसी भी सूरत में दे पाना संभव नहीं है। ऐसे में समझा जा सकता है कि आम जन को मिलावट से बचाने के लिए सरकार ने जो सिस्टम प्रदेश में विकसित किया है कि वह कितना मजबूत है।

- शासन को पत्र भेजकर 110 दिनों में रिपोर्टिंग का मांगा समय
- दीवाली के दौरान पूरे प्रदेश में भरे गए थे 307 सैंपल

तो नाटक है सैंपलिंग

जिस सिस्टम में वर्तमान में उत्तराखंड में खाद्य पदार्थों की सैंपलिंग व जांच का काम चल रहा है वह किसी नाटक से कम नहीं है। त्योहारों के दौरान पूरा हो-हल्ला मचाकर खाद्य संरक्षा एवं मानक प्राधिकरण सैंपलिंग के नाम पर व्यापारियों के बीच उतर तो जाता है और खाद्य पदार्थों की सैंपलिंग लेता है। लेकिन इन सैंपलों की जल्द रिपोर्ट न आने के कारण मिलावटखोरों को इस सैंपलिंग का डर नहीं रहता।

जिम्मेदारों की निष्क्रियता से नहीं लग पा रही मिलावट पर लगाम

- 110 दिन में मिलती है, 14 दिन में आने वाली सैंपलिंग रिपोर्ट
- डेरी विकास विभाग को नहीं मिलावट मिलने पर कार्यवाही का अधिकार

जागरण संवाददाता, देहरादून: दूध में मिलावट से भले ही सर्वोच्च अदालत चिंतित हो, लेकिन राज्य सरकार व उसकी जिम्मेदार एजेंसियों को शायद इसकी परवाह नहीं। अगर होती तो कम से कम सैंपलिंग को लेकर तो गंभीरता नजर आती। यहां तो सैंपलिंग की जो रिपोर्ट 14 दिन में आ जानी चाहिए थी, उसे अपनी ही रुद्रपुर स्थित लैब से राजधानी पहुंचने में 110 दिन लग जा रहे हैं। जाहिर है इस हाल में मिलावटी दूध की बिक्री पर रोक लगने की उम्मीद करना भी बेमानी होगा।

दूध में मिलावट कोई नई बात नहीं, लेकिन इसे रोकने को शायद ही कभी गंभीरता से पहल हुई हो। ले-देकर सैंपलिंग होती भी है तो खानापूर्ति के लिए। बताइए जांच के लिए जब अपनी लैब नहीं थी, तब भी रिपोर्ट आने में तीन से चार महीने लगते थे और अब रुद्रपुर में अपनी लैब है, तब भी। उस पर डेरी विकास विभाग को सैंपल भरने का अधिकार है न मिलावट मिलने पर कार्यवाही का। कहने का मतलब मिलावटखोरों को खुली छूट है, फिर भले ही लोगों का स्वास्थ्य चौपट क्यों न हो जाए।

जनवरी से अब तक भरे गए सैंपल

उत्पाद	सैंपल	फेल
दूध	51	18
दुग्ध पदार्थ	45	06
वर्ष 2012 में भरे गए सैंपल		
दूध	40	14
दुग्ध पदार्थ	31	02

(नोट: जांच में सभी कंपनियों के दूध में फैट का प्रतिशत कम मिला।)

सैंपल नहीं भर सकता विभाग

जनपद देहरादून में प्रतिदिन 3.30 लाख लीटर दूध का उत्पादन होता है, जबकि 1.5 लाख लीटर बाहर से मंगाना पड़ता है। इसकी आपूर्ति पैकेट व खुले दूध के रूप में होती है। लेकिन, मुश्किल यह है कि डेरी विकास विभाग के पास सैंपलिंग का अधिकार नहीं। हालांकि, विभाग स्वयं के स्तर से दूध की जांच के लिए जागरूकता अभियान चलाता है। विभाग के उपनिदेशक जयदीप अरोड़ा बताते हैं कि अब तक जितने भी अभियान चलाए गए, एकमात्र शिकायत पानी की मिलावट की मिली।

चार कंधों पर 16 लाख का भार

जनपद में सिर्फ चार एफएसओ सैंपलिंग का कार्य देख रहे हैं, जिनकी तैनाती नगर निगम, बाहरी क्षेत्र व ऋषिकेश, विकासनगर व मसूरी और कालसी व चकराता में है। हैरत देखिए कि इनके पास कोई साधन-संसाधन भी नहीं, जिससे कार्य के नाम पर महज औपचारिकता निभाई जाती है।

...तो क्या ऑक्सीटोसिन वाले दूध से बनेंगी सेंवइयां

पानी, पाउडर, केमिकल व इंजेक्शन लाएंगे स्वाद ■ दुग्ध निर्माता समितियां और दूधिए पूरी करेंगे डिमांड

संजय शुक्ल, लखनऊ

ईद में सेंवइयों की मिठास घोलने के लिए इस बार राजधानी में करीब 15 फीसद तक अतिरिक्त दूध की जरूरत होगी और यह डिमांड पूरी भी हो जाएगी, मगर हाल के वर्षों के अनुभव से आशंका पैदा हो गई है कि बढ़ी मांग पूरी करने के लिए पशुओं को ऑक्सीटोसिन इंजेक्शन का दर्द और उपभोक्ताओं को इसके साइड इफेक्ट झेलने पड़ सकते हैं।

विभिन्न वैज्ञानिक संस्थाओं के दूध में मिलावट के पिछले नतीजे बताते हैं कि करीब 90 फीसद तक नमूनों में ऑक्सीटोसिन की मात्रा पाई गई है। इन नतीजों ने ईद के मद्देनजर चिंता बढ़ा दी है। ऑक्सीटोसिन इंजेक्शन लगाने से दुधारू पशु जल्दी और पूरी मात्रा में दूध देते हैं जबकि सामान्य स्थिति में वह स्वपोषण और अपने बच्चों के लिए दूध बचा लेते हैं।

उप मुख्य पशु चिकित्साधिकारी डॉ एसके अग्रवाल के मुताबिक इंजेक्शन के इस्तेमाल से तात्कालिक तौर पर करीब 15 फीसद तक दूध की मात्रा बढ़ जाती है पर वास्तविक उत्पादन नहीं बढ़ता बल्कि पशु के शरीर में बचा हुआ दूध भी बाल्टी में आ जाता है। आम दिनों में राजधानी में प्रति व्यक्ति 200 एमएल के हिसाब से रोजाना साढ़े सात से आठ लाख लीटर दूध की मांग होती है। पराग के प्रवक्ता देवेंद्र प्रताप सिंह का अनुमान है कि ईद के दृष्टिगत इस मांग में करीब 15 फीसद का इजाफा होगा। राजधानी में मांग का आधा हिस्सा पैकड दूध के रूप में होता है जबकि आधी आपूर्ति दूधिए करते हैं। (पानी, सोडा, यूरिया की मिलावट देखें- जागरण सिटी पेज 4)

मिठाई कम दूध ज्यादा

राजधानी में पराग, अमूल, नमस्ते इंडिया, पारस, ज्ञान आदि करीब आधा दर्जन ब्रांड पैकेट बंद दूध सप्लाई करते हैं। इन्होंने मिठाई व अन्य दुग्ध उत्पादों का उत्पादन कम कर व पाउडर का उपयोग कर दूध की मांग पूरी करने का इंतजाम किया है। अमूल के प्रबंधक राजीव त्रिपाठी के मुताबिक वह डेढ़ लाख लीटर दूध सप्लाई करते हैं। ईद पर अतिरिक्त मांग का अनुमान है। पराग के देवेंद्र प्रताप सिंह का भी ऐसा ही अनुमान है।

राजधानी में दूध आपूर्ति

मांग - करीब आठ लाख ली.
पैकेट - करीब चार लाख ली.
दूधिए - करीब चार लाख ली.
ईद पर बढ़ी मांग - 10 से 15 फीसद

ऑक्सीटोसिन का कमाल

■ ऑक्सीटोसिन चार साल से एक प्रतिबंधित दवा है जो सिर्फ डॉक्टर के नुस्खे पर ही मेडिकल स्टोर से दी जाती है लेकिन हकीकत में यह जनरल स्टोरों में भी उपलब्ध है ■ प्रतिबंध से पहले इसका 5 एमएल का एक वायल 50 पैसे का मिलता था जो अब 3 से 4 रुपये में मिलता है ■ लंबे समय तक ऑक्सीटोसिन इंजेक्शन वाले दूध के इस्तेमाल से शरीर में कई हार्मोनल बदलाव आते हैं

बच्चियों से बचपना छीन रहा ऑक्सीटोसिन

◆ आइआइटीआर का शोध

रूमा सिन्हा, लखनऊ

दूध में मौजूद ऑक्सीटोसिन बच्चियों का बचपन छीन रहा है। ऑक्सीटोसिन एक हार्मोन है जो दूध के साथ बेवजह बच्चियों के शरीर में पहुंच कर पैवस्त हो रहा है और उन्हें समय से पूर्व 'बड़ा' कर रहा है। यह स्थिति माता-पिता के लिए चिंता का कारण होने के साथ ही मेडिकल साइंस के लिए भी परेशानी का सबब बन रही है।

भारतीय विष विज्ञान अनुसंधान संस्थान (आइआइटीआर) की फूड टॉक्सीकोलॉजी विभाग द्वारा यह खुलासा किया गया है। आइआइटीआर द्वारा ब्रांडेड, डेयरी और बाजार में उपलब्ध सभी किस्मों के दूध के दूध के 55 नमूनों से लिए गए। दूध के नमूनों में ऑक्सीटोसिन की मात्रा शून्य के मुकाबले 20 से 11000 पाइको ग्रा. प्रति लीटर पाई गई। खास बात यह कि सभी नमूनों में ऑक्सीटोसिन पाया गया।

55	नमूनों के दूध की जांच की गई
100%	नमूनों में ऑक्सीटोसिन मिला
20 से 11,000	पाइकोग्राम प्रति एमएल ऑक्सीटोसिन की मात्रा पाई गई

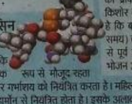
◆ एक पाइको ग्राम एक मिली ग्राम का एक अरबवां हिस्सा होता है। यानी एक के आगे नौ शून्य लगाएं तब एक अरब होगा। एक मिली लीटर एक लीटर का एक हजारवां हिस्सा है।

रिप्रोडक्टिव टॉक्सीकोलॉजी जरनल में इसी वर्ष प्रकाशित शोध के बारे में जानकारी देते हुए आइआइटीआर के फूड टॉक्सीकोलॉजी विभाग के प्रमुख डॉ. मुकुल दास ने बताया कि बच्चियों का मासिक धर्म अमूमन 15-16 वर्ष की आयु में आरंभ होता था लेकिन अब 10-11 वर्ष की आयु में ही बच्चियां किशोरावस्था में पहुंच जाती है। प्रयोगशाला में देखा गया कि ऑक्सीटोसिन हार्मोन से अंडाणु जल्दी परिपक्व होता है। यह हार्मोन के निरंतर शरीर में पैवस्त होने के कारण हो रहा है।

डॉ. दास बताते है कि अभी तक दूध में ऑक्सीटोसिन की मात्रा जानने के लिए भी कोई विधि नहीं थी। संस्थान ने पहली बार ऑक्सीटोसिन की मात्रा का पता लगाने के लिए विधि विकसित की है। यह शोध अंतरराष्ट्रीय जरनल फूड एनालिटीकल मैथड्स में प्रकाशित किया गया है। इसका प्रयोग सभी एनॉलिटिकल लैब कर सकेंगी। यह भी शोध जारी है कि विभिन्न अंगों पर इसका क्या प्रभाव पड़ता है।

विघटित नहीं होता ऑक्सीटोसिन

ऑक्सीटोसिन 9 अमीनोएसिड्स का छोटा पेपटाइड है। पेपटाइड यानी प्रोटीन के छोटे हिस्से। अभी तक यह भ्रांति थी कि जब यह हार्मोन हमारे शरीर मे पहुंचता है तो पाचक एजाइम इसे एमीनो एसिड्स मे तब्दील कर देता है और इसे शरीर एब्जार्ब कर लेता है। लेकिन शोध मे पाया गया कि ऑक्सीटोसिन का विघटन पाचक एंजाइम नही कर पाते। ऐसे मे यह शरीर में पैवस्त होकर नुकसान पहुंचाता है।



शरीर में होता है ऑक्सीटोसिन

क्वीन मेरी अस्पताल की महिला रोग विशेषज्ञ डॉ एसपी जेसवार बताती है कि शरीर मे ऑक्सीटोसिन हार्मोन प्राकृतिक रूप से मौजूद रहता है। यह मस्तिष्क मे उत्पन्न होता है और गर्भाशय को नियंत्रित करता है। महिलाओं मे प्रसव के दौरान गर्भाशय का संकुचन व फैलना इसी हार्मोन से नियंत्रित होता है। इसके अलावा स्तनपान के लिए दूध भी इसी हार्मोन की वजह से उत्पन्न होता है। डॉ जेसवार कहती है कि जरूरत पर शरीर मे इसका निर्माण होता है और जब जरूरत नही होती तो फिर इसका बनना कम हो जाता है। ऐसे मे लगातार बगैर जरूरत ऑक्सीटोसिन के शरीर मे पहुंचने का प्रभाव [illegible]

उबालने से भी नही खत्म होता

दूध उबालने से ऑक्सीटोसिन खत्म नही होता। यही नही शरीर के पाचक एंजाइम भी इसका विघटन नही कर पाते।

मीनाकी का कारण

केजीएमयू के डिपार्टमेंट ऑफ फिजियोलॉजी की प्रोफेसर डॉ. वाणी गुप्ता बताती है कि किशोर बच्चों पर किए गए शोध मे देखा गया है कि बच्चियो मे मीनाकी (अंडाणु बनने का समय) व फीलाकी (स्तनों मे उभार) समय से पूर्व हो रहा है। यह दूध व वसायुक्त भोजन अधिक लेने के कारण होता है।

गंगा-जमुनी तहजीब का जायका भी है सेंवई

रूमा सिन्हा, लखनऊ

वैसे तो सेंवई दुकानों पर पूरे साल ही मिलती है लेकिन रमजान शुरू होते ही बाजार तरह-तरह की सेवइयों के ढेर सज जाते है। सेवई कहा से आई इसके बारे मे अलग-अलग दावे किए जाते है। नवाब जाफर मीर अब्दुल्ला कहते है कि हिंदुओं मे खास त्योहारों मे इसे दूध के साथ पका कर तैयार किया जाता था और जब नवाब आए तो उनके खानसामो ने भी इसे अपनी तरह से बनाकर मीठे व्यंजनों मे शामिल कर लिया। इसकी लज्जत इतनी थी कि ईद के मौके पर विशेष रूप से बनाई जाने लगी।

दूसरी तरफ सेंवई बनाने वाले अमीनाबाद के शहाबत हुसैन कहते है कि आसिफुद्दौला के जमाने से खानसामे सेवई को मीठी डिश के रूप मे तैयार करते थे। मैदा से तैयार होने वाली सेंवई को घरो मे हाथ से पतली-पतली रुई की बाती की तरह महिलाएं बनाती थी। धीरे-धीरे इसे बड़े पैमाने पर मशीन से बनाया जाने लगा। नवाब जाफर मीर अब्दुल्ला कहते है कि छन्नी में मैदे की लोई को बनाकर रखा जाता था जिसे कोल्हू के बैल द्वारा घूम कर चलाया जाता था। इससे लंबी-लंबी सेंवई निकलती थी जिसे आदमी द्वारा कोहनी से हथेली तक लेकर डंडो पर डालकर सुखाया जाता था। आज भी सेंवई को इसी तरह से बनाया जाता है फर्क इतना है कि मशीनो का इस्तेमाल होने लगा है। शहाबत बताते है कि ईद पर सेवई की जबर्दस्त मांग होती है। इसे पूरा करने के लिए सुबह की अजान के साथ ही कारीगर सेंवई बनाने मे जुट जाते है। पूरा परिवार इस काम मे जुटता है। हिंदुओं के त्योहार रक्षाबंधन मे भी इसे बनाने का रिवाज है फर्क बस इतना कि हिंदु इसे दूध मे बनाते है जबकि मुस्लिम ज्यादातर सूखी किमाम वाली सेवई बनाते है। नवाब मीर जाफर अब्दुल्ला इसे गंगा जमुनी तहजीब से जोड़ कर देखते है। वह कहते है कि आसपास पड़ने वाले इद-उल-फित्र व रक्षा बंधन पर सेंवइयों की मिठास त्योहार की खुशी को कई गुना बढ़ा देती है।

सेंवई के भी साइज हैं

सेंवई जीरो नंबर, एक नंबर व 2 नंबर के रूप मे तैयार की जाती है। यह नंबर सेंवई की मोटाई के हिसाब से रखे जाते हैं। जीरो नंबर की सेंवई बहुत बारीक होती है। एक नंबर की उससे कुछ मोटी जबकि 2 नंबर की उससे भी मोटी होती है।

बारीक सेंवई पसंद करने वालो मे बनारसी सेवई की सबसे अधिक मांग होती है। यह सेवई बाल की तरह बारीक होती है। दरअसल बनारस मे ऐसी सेंवई ज्यादा बनाई जाती थी इसलिए इनका नाम बनारसी सेंवई पड़ गया है। अलबत्ता मशीनो से तैयारी की जाने वाली यह सेवई लखनऊ मे भी जगह-जगह तैयार की जाती है। कच्ची व भुनी दो तरह की सेंवई बाजार में बिकती हैं। भुनी सेवई को सीधे ही बनाया जा सकता है जबकि कच्ची सेंवई को भून कर बनाते है।

पानी, सोडा, यूरिया की मिलावट

जासं, लखनऊ : गत दिसंबर व जनवरी माह में दुग्ध संघ ने दूध में मिलावट की जांच के लिए शिविर लगाया था। इसमें 300 नमूनों का परीक्षण किया गया तो 280 नमूनों में पानी व सोडा, 18 में यूरिया व दो में फार्मोलिन की मिलावट पायी गई। पराग के पशु चिकित्साधिकारी वीपी जायसवाल के मुताबिक ऑक्सीटोसिन की जांच के लिए गहन परीक्षण की जरूरत होती है। यानी, इस शिविर में ऑक्सीटोसिन जांच नहीं हुई।

यहां से आता है दूध

राजधानी में काकोरी, मलिहाबाद, रहीमाबाद, शाहजहांपुर, हरदोई, सीतापुर, मिश्रिख, उन्नाव, अजगैन, नवाबगंज, रायबरेली आदि क्षेत्रों से दूध की आपूर्ति होती है। यहां से दूध लाने वाले दूधिए चारबाग, ठाकुरगंज, सीतापुर रोड सहित विभिन्न मंडियों में दूध बेचते हैं।

बढ़ेंगे दाम

■ अभी मंडी में साढ़े सात सौ से आठ सौ रुपये प्रति केन (20 लीटर प्रति केन) दूध उपलब्ध है। ईद पर इसके हजार रुपये तक जाने की संभावना

■ घरेलू स्तर पर दूधिए की सप्लाई अभी 28 से 35 रुपये प्रति लीटर है। जानकारों का कहना है कि इस दूध में पानी की मिलावट तय है

इस्तेमाल से पहले जांच लें दूध

■ थोड़े से दूध को चिकनी सतह पर डाले। दूध बिना निशान छोड़े बहे तो उसमें पानी की मिलावट है। दूध जितना शुद्ध होगा, उतना गहरा निशान छोड़ कर बहेगा।

■ दूध के नमूने में एथिल अलकोहल व रोजोलिक अम्ल की कुछ बूंदे डाले तो मिलावट होने पर रंग लाल हो जाएगा। यह दूध में सोडियम बाइकार्बोनेट होने का प्रमाण है।

■ दूध के नमूने यूरिपेज एंजाइम डालकर उसे हिलाएं। फिर कुछ बूंद पोटेशियम कार्बोनेट डालकर उस पर फिल्टर पेपर रख दे। फिल्टर पेपर लाल रंग और फिर हरा रंग यूरिया मिला होने का प्रमाण है।

मुद्दा

दैनिक जागरण 11

घटना से सीखने की जरूरत

जहर की खुराक!

निगरानी और जवाबदेही बढ़ाने की दरकार

यहां सेवाभावना से बनता-बंटता है मिड डे मील


Think
Healthy
Thoughts

ANNEXURE-III

Evaluation Sheet-I

Consumer Education

Consumer Rights

	Yes	No
1. Right to safety	☐	☐
2. Right to information	☐	☐
3. Right to choice	☐	☐
4. Right to heard	☐	☐
5. Right to redress	☐	☐
6. Right to consumer education	☐	☐

Consumer Protection Covers Wide Range of Topics	**Yes**	**No**
1. Product liability	☐	☐
2. Privacy rights	☐	☐
3. Unfair business practices	☐	☐
4. Fraud mispresentation	☐	☐

Consumer Laws Deals with Wide Range Issues	**Yes**	**No**
1. Credit repair	☐	☐
2. Debt repair	☐	☐
3. Product Safety	☐	☐
4. Service	☐	☐
5. Sales contract	☐	☐
6. Bill collector regulation	☐	☐
7. Pricing	☐	☐
8. Utility turnoffs	☐	☐

9. Consolidatio ☐ ☐
10. Personal loans that may be bankcrupty ☐ ☐

Food Safety and Standard Acts	**Yes**	**No**
1. The prevention of food adulteration act	☐	☐
2. The fruit products order	☐	☐
3. The meat food product order	☐	☐
4. The vegetable oil products (control) order	☐	☐
5. The edible oils packaging (regulation) order	☐	☐
6. The solvent extracted oil, deoiled meal and edible	☐	☐
7. The milk and milk products order	☐	☐
8. Essential commodities acts relating to food	☐	☐

Food Marks and Symbols	**Yes**	**No**
1. AGMRARK	☐	☐
2. Green mark	☐	☐
3. Red mark	☐	☐

Evaluation Sheet-II
Identified Adulterants& Health Hazards

Are you identified adulterant in following food items

S.No.	Food Items	Yes	No	Health Hazards
1.	**Cereals, grains and products**			➢ Poisonous, Stomach disorder
	Ergot in wheat, bajara, and other grains			
	Excess bran in wheat flour			
	Chalk powder in wheat flour			
	Karnel bunt in wheat flour & other grains			
	Resultant atta or cheap floiu in maida			
2.	**Pulses and legumes**			➢ Stomach pain, ulcer, Liver problems, ➢ Tumor, Paralysis Neurotoxic, bent knees, Toxic dyes are carcinogenic
	Khesari dal in arhar&chana			
	Lead chromate in arhar and chana			
	Khesari flour in besan			
3.	**Milk and meat products**			
	Water in milk			
	Starch in milk			
	Urea in milk			
	Soda in milk			
	Detergent in milk			
4.	**Fruits and vegetables**			➢ Chemical laden fruits and vegetables can prove disastrous for digestive system, eyes and liver, ➢ Can result in vomiting and diarrhea in childrens ➢ Kidney failure ➢ Oxytocin can lead to brain damage
	Calcium carbonate in mangoes & bananas			
	Oxytocin in pumpkin, watermelon, brinjal, gourd, cucumber			
	Wax in apples & pears			
	Cheap colour in bitter gourd, leafy vegetables & other vegetables			
5.	**Fats and sugars**			➢ Dropsy-Gastrointestinal problems, fever, swelling of feet and legs, oedma, glucoma, respiratory distress, cardiac arrest, ➢ Damage to liver, carcinogenic effects, ➢ Heart problems, liver damage
	Argemone oil in mustard oil			
	Argemone oil in cocnut oil			
	Margarine or vanaspati in ghee			
	Washingpowder in bura sugar			
	Washing powder in jiggery			

Abstract

1. Name of the author:	**Anita Gautam**
2. Enrolment No.:	**643/11**
3. Title of the thesis:	**Consumer education towards food Adulteration and its identification at household level by using low cost methods:An interventional study.**
4. Degree to which it is submitted:	**Doctor of Philosophy**
5. Major field:	**HumanDevelopmentandFamily Studies**
6. Faculty:	**Home Science**
7. Major advisor:	**Dr. Neetu Singh**
8. University:	**Babasaheb Bhimrao Ambedkar University, (A Central University)**

Introduction

Food adulteration is undoubtedly a social evil which can be regarded as the outcome of an interaction between a number of social, economic, technical and human behavioural factors. It is a manifestation of a sick society and can be regarded as a crime similar to other crimes like theft, burglary or murder. Like any other crime, food adulteration is expected to continue in our society as long as the existing factors which generate crime will continue.

Thus, the study was conducted to make people aware about adulteration and its ill effects on health from their daily meal item, either, in cereals, pulses, fruits and vegetables or in milk and milk products and spices. Therefore, it is a need to make them aware with simple and easiest methods of detection of adulteration at household level with low cost value. Thus, the study was undertaken with the following objectives: 1. To know the existing knowledge of consumer toward food laws, food

safety, consumer behavior, health hazard at study area.2.To elicit and classified adulteration in food stuffs used at household preparation in day to day life as per five food groups.3. To give demonstration and detection of adulteration of selected food stuffs with using low cost method.4.To examine food quality by using sensory evaluation techniques and detection kits.5.To evaluate domestic methods for adulterated foods by using learning kits in the study area.6. To study correlated factors with adulteration and its impact on health hazard as well as consumer behavior in the study area.

Material and Methods

The present study was carried out in three phases i.e. phase-I, phase-II, phase-III.

Phase-I Preliminary Study

- Selection of sample and household
- Consumer education assessment toward food adulteration
- Identification of food adulteration as per five food groups

Phase-II Interventional Study

- Preparation of a learning kit for detection of adulteration at household level by using low cost methods.
- Demonstration of low cost methods for detection of adulteration in common food items

Phase-III Post Study

- Evaluation sheet was prepared to know the level of improvement in the knowledge of respondents.

Result

Background profile of respondents

- Majority of consumers were aged 35-44 years (n=179; 59.7%), There were 4 (1.3%) consumers who were aged between 15 and 24 years.Except for 2 (0.7%) consumers, all the consumers were literate. Majority of consumers were graduate or above (n=210; 70%).Majority of consumers were non-working (n=240; 80%). Only 60 (20%) were working.Maximum number of respondents (n=227; 75.7%) were housewives.
- Maximum number of consumers (n=135; 45%) were from upper middle income group and 4 (1.3%) from upper income group.Majority of consumers were vegetarian (n=153; 51%) and only and 9 (3%) were occasional vegetarian.Majority of consumers were Hindus (n=222; 74%) and only and 6 (2%) Sikhs.
- Majority were from general category (n=154; 51.3%).Most of the consumers dwelled in pakka houses (n=279; 93%). Majority (n=169; 56.3%) had their own house.Green vegetables, Salad, coffee and fruit use were the most common food items consumed on daily basis while Fast food was the item which was reported to be consumed occasionally by majority of consumers.A total of 201 (67%) consumers used to watch television regularly whereas a total of 209 (67.7%) consumers used to read newspaper regularly.

Phase-I Preliminary Study

- Before intervention majority of consumers had low scores on consumer rights, consumer protection, consumer laws, food safety and food marks. Whereas high scores were reported only for 2 items – consumer rights and food marks by 3 (1%) and 9 (3%) consumers respectively.

- Majority of consumers had low awareness scores for adulteration in different food stuffs. There were only two food items *i.e.* cereals and milk for which high scores were reported by 7 (2.33%) and 1 (0.33%) consumers respectively.
- Majority of food items never had adulteration. The most frequent adulteration was that of dal-stone.
- On evaluating the level of awareness regarding harmful effects of adulteration, majority of consumers were seen to be having low awareness about these.All the consumers reported use of only sensory methods for detection of adulteration.

Phase-II Interventional Study

- **Effect of intervention on sensory techniques used by consumers for detection of Adulteration:**

  Before intervention only 03.30 percent (05) respondents had scores good level of knowledgeof sensory technique for adulteration detection in cereals, for milk it was 52.60 percent (79). Regarding fruits and vegetables only 5 respondents (03.30) had scores good level knowledge about sensory technique from 150 respondents.After intervention. After intervention majority of respondents i.e. 89 (59.30%) had scores good level of knowledge of sensory technique for detection of adulteration in cereals regarding milk it was 146 (97.30). Regarding fruits and vegetables 127 respondents (84.60%) had scores good level of knowledge of sensory technique.

- **Effect of adulteration detection kit used for adulteration detection**

  Before intervention for all the food items all the respondents (150) had no knowledge about adulteration detection through detection kit but after intervention majority of

respondents (145) had knowledge of adulteration through kit for cereals and its products. Regarding pulses and its products majority of respondents (130) had knowledge. Regarding milk it was 143 (95.30) and for fats, oils, sugar and jiggery it was 147 (98.00) had knowledge of adulteration detection of food through detection kit.

Phase-III Post Study

- After the intervention, majority of consumers had high scores for all the items. Maximum number of consumers with high score were observed for the item food marks (n=136; 90.7%). Minimum number of consumers with high scores were observed for the items consumer protection and consumer laws respectively (n=109; 72.7%).
- Majority of consumers had high level of awareness regarding adulteration and minimum for the item fruits (n=124; 82.67%).Following intervention majority of consumers had good awareness of harmful effects of adulteration of food stuffs. Maximum number of consumers with high scores were observed for cereals and spices (n=131; 87.3%) while minimum number of consumers with high scores were observed for the item pulses (n=123; 82.0%).

Keywords: Food Adulteration, Food safety, Health Hazards

Name and Address of Respondents of Ratankhand

S.NO	NAME	ADDRESS	LOCALITY	CITY
1	SaritaBharti	1/635	Ratankhand	Lucknow
2	Mamata	1/331	Ratankhand	Lucknow
3	Babita	1/405	Ratankhand	Lucknow
4	Savita	1/415	Ratankhand	Lucknow
5	Sarojini	1/413	Ratankhand	Lucknow
6	Janakdevi	1/332	Ratankhand	Lucknow
7	Sheetal	1/337	Ratankhand	Lucknow
8	Archna	1/339	Ratankhand	Lucknow
9	Gudiya	1/340	Ratankhand	Lucknow
10	Babbi	1/340	Ratankhand	Lucknow
11	Suman	1/348	Ratankhand	Lucknow
12	Somwati	1/349	Ratankhand	Lucknow
13	Sunita	1/635	Ratankhand	Lucknow
14	Chanchal	1/351	Ratankhand	Lucknow
15	Bhanumati	1/353	Ratankhand	Lucknow
16	Himani	1/306	Ratankhand	Lucknow
17	Alka	1/263	Ratankhand	Lucknow
18	AlkaTiwari	1/275	Ratankhand	Lucknow
19	Tara	1/265	Ratankhand	Lucknow
20	Sucheta	1/278	Ratankhand	Lucknow
21	Roli	1/281	Ratankhand	Lucknow
22	Vandana	1/244	Ratankhand	Lucknow
23	Binoo	1/200	Ratankhand	Lucknow
24	Soni	1/204	Ratankhand	Lucknow
25	Anupriya	1/206	Ratankhand	Lucknow
26	MamtaGiri	1/209	Ratankhand	Lucknow
27	Shailendri	1/208	Ratankhand	Lucknow
28	Sushma	1/211	Ratankhand	Lucknow
29	Pratigya	1/214	Ratankhand	Lucknow
30	Pratiksha	1/215	Ratankhand	Lucknow
31	Richa	1/296	Ratankhand	Lucknow
32	Shalvi	1/363	Ratankhand	Lucknow
33	Ragini	1/223	Ratankhand	Lucknow
34	Shweta	1/221	Ratankhand	Lucknow
35	Sampriti	1/443	Ratankhand	Lucknow
36	Priti	1/360	Ratankhand	Lucknow
37	Rajita	1/359	Ratankhand	Lucknow
38	Puja	1/441	Ratankhand	Lucknow

39	Manju	1/365	Ratankhand	Lucknow
40	Neelima	1/440	Ratankhand	Lucknow
41	Asha	1/367	Ratankhand	Lucknow
42	Shanti	1/371	Ratankhand	Lucknow
43	Geeta	1/373	Ratankhand	Lucknow
44	Bharti	1/324	Ratankhand	Lucknow
45	Sumanlata	1/421	Ratankhand	Lucknow
46	Guddi	1/429	Ratankhand	Lucknow
47	Megha	1/426	Ratankhand	Lucknow
48	Shilpi	1/425	Ratankhand	Lucknow
49	Saroj	1/378	Ratankhand	Lucknow
50	Maya	1/1305	Ratankhand	Lucknow
51	Kamlesh	1/635	Ratankhand	Lucknow
52	Vimla	1/503	Ratankhand	Lucknow
53	Sumatidevi	1/502	Ratankhand	Lucknow
54	Kalpana	1/501	Ratankhand	Lucknow
55	DeeptiSrivastava	1/1063	Ratankhand	Lucknow
56	Sumitra Mishra	1/1015	Ratankhand	Lucknow
57	Akankshakashyap	1/458	Ratankhand	Lucknow
58	Kalpana Singh	1/491	Ratankhand	Lucknow
59	Madhurima	1/465	Ratankhand	Lucknow
60	Parul	1/462	Ratankhand	Lucknow
61	Umrawati	1/521	Ratankhand	Lucknow
62	Poonam	1/184	Ratankhand	Lucknow
63	Abha	1/1037	Ratankhand	Lucknow
64	Shubham	1/1028	Ratankhand	Lucknow
65	Ritu	1/1027	Ratankhand	Lucknow
66	Khushbu	1/1022	Ratankhand	Lucknow
67	Annu	1/1109	Ratankhand	Lucknow
68	Ratna	1/635	Ratankhand	Lucknow
69	Rekha	1/1130	Ratankhand	Lucknow
70	Rajshee	1/1129	Ratankhand	Lucknow
71	Jamunadevi	1/1121	Ratankhand	Lucknow
72	Madhu	1/1128	Ratankhand	Lucknow
73	Induthdani	1/1097	Ratankhand	Lucknow
74	Kamala	1/1088	Ratankhand	Lucknow
75	Vimlesh	1/1093	Ratankhand	Lucknow
76	Geetaverma	1/1212	Ratankhand	Lucknow
77	Meetali	1/1213	Ratankhand	Lucknow
78	Surabhi	1/1217	Ratankhand	Lucknow
79	Astha	1/1071	Ratankhand	Lucknow

80	Sunita	1/1218	Ratankhand	Lucknow
81	Sadhna	1/1067	Ratankhand	Lucknow
82	Shalini	1/1222	Ratankhand	Lucknow
83	Pragya	1/1198	Ratankhand	Lucknow
84	Priti	1/1229	Ratankhand	Lucknow
85	Kriti	1/1234	Ratankhand	Lucknow
86	Pratimadevi	1/1160	Ratankhand	Lucknow
87	Aradhna	1/1161	Ratankhand	Lucknow
88	Neelam	1/1167	Ratankhand	Lucknow
89	Bindu	1/1170	Ratankhand	Lucknow
90	Gayatri	1/1171	Ratankhand	Lucknow
91	Sudhasingh	1/1173	Ratankhand	Lucknow
92	Purnima	1/1177	Ratankhand	Lucknow
93	Sonam	1/1183	Ratankhand	Lucknow
94	Kusum	1/1184	Ratankhand	Lucknow
95	Rani	1/1207	Ratankhand	Lucknow
96	Kramta	1/1209	Ratankhand	Lucknow
97	Pinki	1/1139	Ratankhand	Lucknow
98	Rita tiwari	1/1121	Ratankhand	Lucknow
99	Nishasingh	1/1129	Ratankhand	Lucknow
100	Reedhishukla	1/1130	Ratankhand	Lucknow

Name and Address of Respondents of Rajnikhand

S.NO.	NAME	ADDRESS	LOCALITY	CITY
1.	Chandra vati	5/14	Rajnikhand	Lucknow
2.	Jameela	5/13	Rajnikhand	Lucknow
3.	Kamla Devi	5/12	Rajnikhand	Lucknow
4.	Ranno Devi	5/11	Rajnikhand	Lucknow
5.	JanakDulari	5/5	Rajnikhand	Lucknow
6.	Sunita	5/7	Rajnikhand	Lucknow
7.	Parvatidevi	5/6	Rajnikhand	Lucknow
8.	Ram dulari	5/10	Rajnikhand	Lucknow
9.	Gayatri	5/8	Rajnikhand	Lucknow
10.	Jyoti	5/4	Rajnikhand	Lucknow
11.	Meera	5/3	Rajnikhand	Lucknow
12.	Kumud	5/2	Rajnikhand	Lucknow
13.	Priyanka	5/1	Rajnikhand	Lucknow
14.	Ramrati	3/205	Rajnikhand	Lucknow
15.	Phoolkumara	3/200	Rajnikhand	Lucknow
16.	Jamunapremi	3/204	Rajnikhand	Lucknow

17.	Katyanaravat	3/199	Rajnikhand	Lucknow
18.	Ram kumarsoni	3/198	Rajnikhand	Lucknow
19.	Rajsridevi	3/201	Rajnikhand	Lucknow
20.	Phoolmati	3/203	Rajnikhand	Lucknow
21.	Sri matiumasingh	3/202	Rajnikhand	Lucknow
22.	Sri matichandravati	3/206	Rajnikhand	Lucknow
23.	Malti	3/75	Rajnikhand	Lucknow
24.	Sonam	3/74	Rajnikhand	Lucknow
25.	Kusum	3/72	Rajnikhand	Lucknow
26.	Suman	3/71	Rajnikhand	Lucknow
27.	Syam kumara	3/73	Rajnikhand	Lucknow
28.	Hemlata	3/79	Rajnikhand	Lucknow
29.	Pushpa	3/78	Rajnikhand	Lucknow
30.	Rani	3/77	Rajnikhand	Lucknow
31.	Syama	3/76	Rajnikhand	Lucknow
32.	Savitri	2/16	Rajnikhand	Lucknow
33.	Ranjana	2/17	Rajnikhand	Lucknow
34.	Phoolmati	2/18	Rajnikhand	Lucknow
35.	Gajaritya	2/26	Rajnikhand	Lucknow
36.	Dropti	2/28	Rajnikhand	Lucknow
37.	Ramjanki	2/50	Rajnikhand	Lucknow
38.	Parvati	2/51	Rajnikhand	Lucknow
39.	Vrinda	2/52	Rajnikhand	Lucknow
40.	Diksha	2/56	Rajnikhand	Lucknow
41.	Rano	2/55	Rajnikhand	Lucknow
42.	Savitri	2/27	Rajnikhand	Lucknow
43.	Shakuntaladevi	2/26	Rajnikhand	Lucknow
44.	Shivaarti	2/25	Rajnikhand	Lucknow
45.	Savitridevi	2/24	Rajnikhand	Lucknow
46.	Bibban	2/23	Rajnikhand	Lucknow
47.	Ramvati	2/22	Rajnikhand	Lucknow
48.	Babita	2/19	Rajnikhand	Lucknow
49.	Ramdevi	2/16	Rajnikhand	Lucknow
50.	Lalta	2/14	Rajnikhand	Lucknow
51.	Phoolkumari	2/15	Rajnikhand	Lucknow
52.	Chandra kala	4/98	Rajnikhand	Lucknow
53.	Jai devi	4/99	Rajnikhand	Lucknow
54.	Kantidevi	4/97	Rajnikhand	Lucknow
55.	Ram dulari	4/96	Rajnikhand	Lucknow
56.	Bhanumati	4/95	Rajnikhand	Lucknow
57.	Ramkali	4/94	Rajnikhand	Lucknow
58.	Seeta	4/93	Rajnikhand	Lucknow

59.	Kavita	4/86	Rajnikhand	Lucknow
60.	Chutki	4/87	Rajnikhand	Lucknow
61.	Jagdevi	4/88	Rajnikhand	Lucknow
62.	Rama	4/89	Rajnikhand	Lucknow
63.	Jagrati	4/90	Rajnikhand	Lucknow
64.	Ramlalli	4/91	Rajnikhand	Lucknow
65.	Rajidevi	4/94	Rajnikhand	Lucknow
66.	Kanchan	6/17	Rajnikhand	Lucknow
67.	Janki	6/18	Rajnikhand	Lucknow
68.	Syama	6/19	Rajnikhand	Lucknow
69.	Ratna	6/20	Rajnikhand	Lucknow
70.	Llita	6/21	Rajnikhand	Lucknow
71.	Kalavati	6/22	Rajnikhand	Lucknow
72.	Chandravati	6/23	Rajnikhand	Lucknow
73.	Ramdevi	6/24	Rajnikhand	Lucknow
74.	Babali	6/29	Rajnikhand	Lucknow
75.	Sudha	6/30	Rajnikhand	Lucknow
76.	Vimlesh	6/31	Rajnikhand	Lucknow
77.	Krishnakumari	6/35	Rajnikhand	Lucknow
78.	Ramrati	6/37	Rajnikhand	Lucknow
79.	Rajrani	6/40	Rajnikhand	Lucknow
80.	Puja	6/41	Rajnikhand	Lucknow
81.	Rekha	6/42	Rajnikhand	Lucknow
82.	Priyanka	6/43	Rajnikhand	Lucknow
83.	Phoolmati	6/45	Rajnikhand	Lucknow
84.	Lalata	3/325	Rajnikhand	Lucknow
85.	Radhasingh	3/ 326	Rajnikhand	Lucknow
86.	Nirmala	3/327	Rajnikhand	Lucknow
87.	Kiran	3/329	Rajnikhand	Lucknow
88.	Savitri	3/334	Rajnikhand	Lucknow
89.	Sonam	3/335	Rajnikhand	Lucknow
90.	Kamla	3/333	Rajnikhand	Lucknow
91.	Aarti	3/336	Rajnikhand	Lucknow
92.	Kumudpandey	3/337	Rajnikhand	Lucknow
93.	Rekha	3/338	Rajnikhand	Lucknow
94.	Asha	3/339	Rajnikhand	Lucknow
95.	Pushpa	3/340	Rajnikhand	Lucknow
96.	Meera	3/341	Rajnikhand	Lucknow
97.	Neerja	2/322	Rajnikhand	Lucknow
98.	Rajkumari	2/323	Rajnikhand	Lucknow
99.	Savitrisingh	2/325	Rajnikhand	Lucknow
10(	Brijesh	2/326	Rajnikhand	Lucknow

Name and address of Respondents of South City

S.NO	NAME	ADDRESS	LOCALITY	CITY
1	Pooja	E-78	South City	Lucknow
2	Shailendri	E-76	South City	Lucknow
3	Kamala	E-178	South City	Lucknow
4	Geeta	E-179	South City	Lucknow
5	Niharika	E-125	South City	Lucknow
6	Ramsheedevi	E-74	South City	Lucknow
7	Lakshmi	E-95	South City	Lucknow
8	Santosha	E-96	South City	Lucknow
9	Seema	E-97	South City	Lucknow
10	Mamta	E-98	South City	Lucknow
11	Kanti	E-99	South City	Lucknow
12	Kanchan	E-100	South City	Lucknow
13	Sudha	E-101	South City	Lucknow
14	Archna	E-102	South City	Lucknow
15	Kavita	E-103	South City	Lucknow
16	Nagma	E-104	South City	Lucknow
17	Renu	E-105	South City	Lucknow
18	Shweta	E-106	South City	Lucknow
19	Rakhi	E-109	South City	Lucknow
20	Usha	E-110	South City	Lucknow
21	Sanjana	E-107	South City	Lucknow
22	Neeta	E-108	South City	Lucknow
23	Menu	E-73	South City	Lucknow
24	Indu	F-72	South City	Lucknow
25	Manju	F-70	South City	Lucknow
26	Neelam	F-93	South City	Lucknow
27	Pinki	F-94	South City	Lucknow
28	Suman	F-95	South City	Lucknow
29	Kramta	F-96	South City	Lucknow
30	Rani	F-97	South City	Lucknow
31	Sharda	F-98	South City	Lucknow
32	Babbi	F-99	South City	Lucknow
33	Kiran	F-100	South City	Lucknow
34	Sarita	F-109	South City	Lucknow
35	Naval	F-110	South City	Lucknow
36	Kirti	F-108	South City	Lucknow

37	Jyoti	F-107	South City	Lucknow
38	Asha	F-106	South City	Lucknow
39	Radha	F-105	South City	Lucknow
40	Nahid	F-104	South City	Lucknow
41	Purnima	F-103	South City	Lucknow
42	Rekha	F-101	South City	Lucknow
43	Shalini	F-102	South City	Lucknow
44	Reenu	J-172	South City	Lucknow
45	Urmiladevi	J-171	South City	Lucknow
46	Mithlesh	J-170	South City	Lucknow
47	Ashadevi	J-94	South City	Lucknow
48	Lalli Devi	J-95	South City	Lucknow
49	Neha	J-96	South City	Lucknow
50	Reshma	J-97	South City	Lucknow
51	Nisha	J-98	South City	Lucknow
52	Rinki	J-99	South City	Lucknow
53	Priyanka	J-100	South City	Lucknow
54	Babali	D-149	South City	Lucknow
55	Shikha	D-150	South City	Lucknow
56	Shivangi	D-153	South City	Lucknow
57	Vandana	D-157	South City	Lucknow
58	Shilpi	D-158	South City	Lucknow
59	Alka	D-159	South City	Lucknow
60	Rita	D-161	South City	Lucknow
61	Ragini	D-162	South City	Lucknow
62	Kalpana	D-173	South City	Lucknow
63	Arti	D-172	South City	Lucknow
64	Pratiksha	D-171	South City	Lucknow
65	Nafis	D-163	South City	Lucknow
66	Madhu	D-165	South City	Lucknow
67	Neetu	D-164	South City	Lucknow
68	Priti	B-26	South City	Lucknow
69	Sunita	B-16	South City	Lucknow
70	Meena	B-15	South City	Lucknow
71	Renu	B-12	South City	Lucknow
72	Ritu	B-28	South City	Lucknow
73	Promila	B-37	South City	Lucknow
74	Akansha	B-22	South City	Lucknow
75	Shipra	B-21	South City	Lucknow
76	Nitu	B-35	South City	Lucknow
77	Ragini	B-34	South City	Lucknow

78	Spardha	D-121	South City	Lucknow
79	Jyotika	D-67	South City	Lucknow
80	Reena	D-91	South City	Lucknow
81	Rajni	D-162	South City	Lucknow
82	Parul	E-1	South City	Lucknow
83	Meenakshi	E-16	South City	Lucknow
84	Kritika	C-47	South City	Lucknow
85	Shivangi	C-41	South City	Lucknow
86	Manjulata	C-194	South City	Lucknow
87	Savita	C-192	South City	Lucknow
88	Beenu	C-179	South City	Lucknow
89	Veena	C-190	South City	Lucknow
90	Ushadevi	C-182	South City	Lucknow
91	Himani	C-185	South City	Lucknow
92	Latika	G-78	South City	Lucknow
93	Mishridevi	A-172	South City	Lucknow
94	Phoolmati	A-171	South City	Lucknow
95	Savitridevi	B-10	South City	Lucknow
96	Pushpa	B-6	South City	Lucknow
97	Kanchan	B-13	South City	Lucknow
98	Nirmala Devi	D-60	South City	Lucknow
99	Rajrani	D-56	South City	Lucknow
100	Kamlesh	D-81	South City	Lucknow

Abstract

9. Name of the author:	**Anita Gautam**
10. Enrolment No.:	**643/11**
11. Title of the thesis:	**Consumer education towards food Adulteration and its identification at household level by using low cost methods: An interventional study.**
12. Degree to which it is submitted:	**Doctor of Philosophy**
13. Major field:	**Human Development and Family Studies**
14. Faculty:	**Home Science**
15. Major advisor:	**Dr. Neetu Singh**
16. University:	**Babasaheb Bhimrao Ambedkar University, (A Central University)**

Food adulteration is undoubtedly a social evil which can be regarded as the outcome of an interaction between a number of social, economic, technical and human behavioural factors. It is a manifestation of a sick society and can be regarded as a crime similar to other crimes like theft, burglary or murder. Like any other crime, food adulteration is expected to continue in our society as long as the existing factors which generate crime will continue.

Thus, the study was conducted to make people aware about adulteration and its ill effects on health from their daily meal item, either, in cereals, pulses, fruits and vegetables or in milk and milk products and spices. Therefore, it is a need to make them aware with simple and easiest methods of detection of adulteration at household level with low cost value. Thus, the study was undertaken with the following objectives: 1. To know the

existing knowledge of consumer toward food laws, food safety, consumer behavior, health hazard at study area.2.To elicit and classified adulteration in food stuffs used at household preparation in day to day life as per five food groups.3. To give demonstration and detection of adulteration of selected food stuffs with using low cost method.4.To examine food quality by using sensory evaluation techniques and detection kits.5.To evaluate domestic methods for adulterated foods by using learning kits in the study area.6. To study correlated factors with adulteration and its impact on health hazard as well as consumer behavior in the study area.

The present study was carried out in three phases i.e. phase-I, phase-II, phase-III.

Phase-I Preliminary Study

- Selection of sample and household
- Consumer education assessment toward food adulteration
- Identification of food adulteration as per five food groups

Phase-II Interventional Study

- Preparation of a learning kit for detection of adulteration at household level by using low cost methods.
- Demonstration of low cost methods for detection of adulteration in common food items.

Phase-III Post Study

- Evaluation sheet was prepared to know the level of improvement in the knowledge of respondents.

Background profile of respondents

- Majority of consumers were aged 35-44 years (n=179; 59.7%), There were 4 (1.3%) consumers who were aged between 15 and 24 years.Except for 2 (0.7%) consumers, all the consumers were literate. Majority of consumers were graduate or above (n=210; 70%).Majority of consumers were non-working (n=240; 80%). Only 60 (20%) were working.Maximum number of respondents (n=227; 75.7%) were housewives.
- Maximum number of consumers (n=135; 45%) were from upper middle income group and 4 (1.3%) from upper income group.Majority of consumers were vegetarian (n=153; 51%) and only and 9 (3%) were occasional vegetarian.Majority of consumers were Hindus (n=222; 74%) and only and 6 (2%) Sikhs.
- Majority were from general category (n=154; 51.3%).Most of the consumers dwelled in pakka houses (n=279; 93%). Majority (n=169; 56.3%) had their own house.Green vegetables, Salad, coffee and fruit use were the most common food items consumed on daily basis while Fast food was the item which was reported to be consumed occasionally by majority of consumers.A total of 201 (67%) consumers used to watch television regularly whereas a total of 209 (67.7%) consumers used to read newspaper regularly.

Phase-I Preliminary Study

- Before intervention majority of consumers had low scores on consumer rights, consumer protection, consumer laws, food safety and food marks. Whereas high scores were reported only for 2 items – consumer rights and food marks by 3 (1%) and 9 (3%) consumers respectively.
- Majority of consumers had low awareness scores for adulteration in different food stuffs. There were only two food items *i.e.* cereals and milk for which high scores were reported by 7 (2.33%) and 1 (0.33%) consumers respectively.

- Majority of food items never had adulteration. The most frequent adulteration was that of dal-stone.
- On evaluating the level of awareness regarding harmful effects of adulteration, majority of consumers were seen to be having low awareness about these.All the consumers reported use of only sensory methods for detection of adulteration.

Phase-II Interventional Study

- **Effect of intervention on sensory techniques used by consumers for detection of Adulteration:**

  Before intervention only 03.30 percent (05) respondents had scores good level of knowledgeof sensory technique for adulteration detection in cereals, for milk it was 52.60 percent (79). Regarding fruits and vegetables only 5 respondents (03.30) had scores good level knowledge about sensory technique from 150 respondents.After intervention.After intervention majority of respondents i.e. 89 (59.30%) had scores good level of knowledge of sensory technique for detection of adulteration in cereals regarding milk it was 146 (97.30). Regarding fruits and vegetables 127 respondents (84.60%) had scores good level of knowledge of sensory technique.

- **Effect of adulteration detection kit used for adulteration detection**

  Before intervention for all the food items all the respondents (150) had no knowledge about adulteration detection through detection kit but after intervention majority of respondents (145) had knowledge of adulteration through kit for cereals and its products. Regarding pulses and its products majority of respondents (130) had knowledge. Regarding milk it was 143 (95.30) and for fats, oils, sugar and jiggery it was 147 (98.00) had knowledge of adulteration detection of food through detection kit.

Phase-III Post Study

- After the intervention, majority of consumers had high scores for all the items. Maximum number of consumers with high score were observed for the item food marks (n=136; 90.7%). Minimum number of consumers with high scores were observed for the items consumer protection and consumer laws respectively (n=109; 72.7%).
- Majority of consumers had high level of awareness regarding adulteration and minimum for the item fruits (n=124; 82.67%).Following intervention majority of consumers had good awareness of harmful effects of adulteration of food stuffs. Maximum number of consumers with high scores were observed for cereals and spices (n=131; 87.3%) while minimum number of consumers with high scores were observed for the item pulses (n=123; 82.0%).

Keywords: Food Adulteration, Food safety, Health Hazards.

Resume

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2. **Anita Gautam&Neetu Singh (2016).**Assessment of Consumer's Awareness about Food Adulteration and its Harmful Effects in the Body*International Journal Of Research,* 4**(3):** 321-324.
3. **Anita Gautam&Neetu Singh (2014).** Existing Knowledge on Consumer Education at Household Level in Lucknow District *International Journal of Science & Research,* 12**(3):** 2490-2492.
4. **Anita Gautam&Neetu Singh (2013).**Hazards of New Technology in Promoting Food Adulteration *IOSR-Journal of Environmental Science, Toxicology & Food Technology,* 1**(5):** 08-10.
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6. **Anita Gautam&SavitaSingal (2014**). Development of Low Cost Solar Box for Safe Drying of Fresh Vegetables *International Journal of Advanced Scientific & technical Research,* 4**(1):** 334-342.

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Declaration

I hereby declare that the information given above is true to the best of my knowledge & belief and no part of it is false and nothing has been concealed herein.

Date:
Place: Lucknow-(U.P.), (India) (Anita Gautam)