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, 2006 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 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 misrepresentation”.

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 diarrhoea 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.

**Brennanet al. (2004)** concluded the results of interviews with an extensive range of key stakeholders 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.

**Sudershanet 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 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.

**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 labels. 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) conducted a 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 of 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

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

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)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Food Article</th>
<th>Adulterant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wheat, rice, maize, jawar, bajra, chana, barley</td>
<td>Dust, pebble, stone, straw, weed seeds, damaged grain, weeviled grain, insects, rodent, hair and excreta</td>
</tr>
<tr>
<td>2.</td>
<td>Maida</td>
<td>Resultant atta</td>
</tr>
<tr>
<td>3.</td>
<td>Wheat bajra and other grains</td>
<td>Ergot (a fungus containing poisonous substance)</td>
</tr>
<tr>
<td>4.</td>
<td>Wheat bajra and other grains</td>
<td>Karnel bunt</td>
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<tr>
<td>5.</td>
<td>Sella rice (parboiled rice)</td>
<td>Metanil yellow (a non-permitted coal tar colour)</td>
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<tr>
<td>6.</td>
<td>Wheat flour</td>
<td>Excess bran</td>
</tr>
<tr>
<td>7.</td>
<td>Wheat flour</td>
<td>Chalk powder</td>
</tr>
<tr>
<td>8.</td>
<td>Atta, maidausuji (rawa)</td>
<td>Sand, soil, insects, webs, lumps, rodent hair and excreta</td>
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<tr>
<td>9.</td>
<td>Sago</td>
<td>Sand or talcum</td>
</tr>
<tr>
<td>10.</td>
<td>Dal whole and split</td>
<td>Khesari dal, clay stone, gravels, webs, insects, rodent hair and excreta</td>
</tr>
<tr>
<td>11.</td>
<td>Besan</td>
<td>Metanil yellow, khesari flour</td>
</tr>
<tr>
<td>12.</td>
<td>Pulses</td>
<td>Lead chromate</td>
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<tr>
<td>13.</td>
<td>Milk</td>
<td>Water, starch, urea, detergent. Vanaspati, formaline, synthetic milk</td>
</tr>
<tr>
<td>14.</td>
<td>Ghee, cottage, cheese, condensed milk, khoa, milk powder</td>
<td>Coal tar dyes</td>
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<tr>
<td></td>
<td>Item</td>
<td>Description</td>
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<tr>
<td>15.</td>
<td>Sweet curd</td>
<td>Vanaspati</td>
</tr>
<tr>
<td>16.</td>
<td>Rabdi</td>
<td>Blotting paper</td>
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<tr>
<td>17.</td>
<td>Khoa, chhana, paneer</td>
<td>Starch</td>
</tr>
<tr>
<td>18.</td>
<td>Fats and oils</td>
<td>Vanaspati or margarine, mashed potatoes, sweet potatoes and other starches</td>
</tr>
<tr>
<td>19.</td>
<td>Butter</td>
<td>Vanaspati or margarine, mashed potatoes other starches</td>
</tr>
<tr>
<td>20.</td>
<td>Edible oil</td>
<td>Prohibited colour</td>
</tr>
<tr>
<td>21.</td>
<td>Coconut oil</td>
<td>Any other oil</td>
</tr>
<tr>
<td>22.</td>
<td>Sugar</td>
<td>Chalk powder, urea and yellow colour (non permitted)</td>
</tr>
<tr>
<td>23.</td>
<td>Honey</td>
<td>Sugar solution</td>
</tr>
<tr>
<td>24.</td>
<td>Jiggery</td>
<td>Washing soda, chalk powder, metanil yellow coloursugar solution</td>
</tr>
<tr>
<td>25.</td>
<td>Bura sugar</td>
<td>Washing soda</td>
</tr>
<tr>
<td>26.</td>
<td>Sweetmeats, ice-cream and beverages</td>
<td>Metanil yellow (a non-permitted coal tar colour), saccharin</td>
</tr>
<tr>
<td>27.</td>
<td>Whole spices</td>
<td>Dirt, dust, straw, insect, damaged seeds, other seeds, rodent hair, and excrete</td>
</tr>
<tr>
<td>28.</td>
<td>Black pepper</td>
<td>Papaya seeds, light black pepper, coated with mineral oil</td>
</tr>
<tr>
<td>29.</td>
<td>Cloves</td>
<td>Volatile oil extracted (exhausted cloves), coated with mineral oil</td>
</tr>
<tr>
<td>30.</td>
<td>Mustard seed</td>
<td>Argemone seed</td>
</tr>
<tr>
<td>31.</td>
<td>Powdered spices</td>
<td>Added starch, common salt</td>
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<tr>
<td>32.</td>
<td>Turmeric powder</td>
<td>Coloured saw dust</td>
</tr>
<tr>
<td>33.</td>
<td>Turmeric whole</td>
<td>Lead chromate, chalik powder or yellow soap stone powder</td>
</tr>
<tr>
<td>34.</td>
<td>Chillies powder</td>
<td>Brick powder, salt powder, or talc, powder, artificial colours, water soluble coal tar colour</td>
</tr>
<tr>
<td>35.</td>
<td>Asofoetida (hing)</td>
<td>Soap stone, or other earthy material, starch, foreign resin</td>
</tr>
<tr>
<td>36.</td>
<td>Spices</td>
<td>Powdered bran and saw dust</td>
</tr>
<tr>
<td>37.</td>
<td>Cinnamon</td>
<td>Cassia bark</td>
</tr>
<tr>
<td>38.</td>
<td>Cumin seeds</td>
<td>Grass seeds coloured with charcoal dust</td>
</tr>
<tr>
<td>49.</td>
<td>Mango, banana</td>
<td>Calcium carbide</td>
</tr>
<tr>
<td>40.</td>
<td>Green chilli and green vegetables</td>
<td>Melachit green</td>
</tr>
<tr>
<td>41.</td>
<td>Green peas</td>
<td>Artificially coloured</td>
</tr>
</tbody>
</table>

*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 acids, 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 20th 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.

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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 Vietnamese 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.

Subbaraoet 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 (*Argemomexicana*) 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 (ICDDR), 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 ICDDR 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.