Ayurvedic Perspectives on Food Adulteration: Risks for Healthy Individuals and Detection Strategies

Dr. Tejendra Singh[1], Dr. Imran Khan[2]
[1]*Assistant Professor, Department of Swasthavritta, Krishna Ayurvedic Medical College & Hospital, Bijnor, U.P. India.*
[2]*Assistant Professor, Department of Agad Tantra Evam Vidhi Vaidyak, Krishna Ayurvedic Medical College & Hospital, Bijnor, U.P. India.*

***Abstract*—Food is a fundamental necessity of life, providing essential nutrients required for growth, repair, maintenance of body tissues, and regulation of vital physiological processes. In the present era, food adulteration has emerged as a major global public health concern, particularly in developing countries, driven largely by commercial profit motives. Food adulteration involves the accidental or intentional addition, substitution, or contamination of food with inferior or prohibited substances, leading to deterioration of food quality and nutritional value. The health hazards associated with adulterated food range from malnutrition and gastrointestinal disturbances to neurological disorders, liver diseases, and even malignancies.**

In Ayurveda, food adulteration is described under the concept of Apamishrana, and the cumulative toxic effects resulting from the long-term consumption of adulterated or artificially mixed food substances are explained through the concept of Gara Visha, particularly Vishayukta Anna. Ancient Ayurvedic texts have elaborately discussed the characteristics, modes, and health consequences of such toxic food combinations. The effects of adulterated food closely resemble those described for Gara Visha, indicating a strong conceptual correlation.

This article emphasizes the relevance of Ayurvedic principles in understanding food adulteration and aims to highlight simple, practical household methods for detecting common adulterants, thereby promoting consumer awareness, food safety, and preventive healthcare.

***Index Terms*—Food adulteration, Apamishrana, Gara Visha, Vishayukta Anna, Food safety, Ayurveda.**

I. INTRODUCTION

Ayurveda has described the Trayopastambha for the healthy life of individuals.[1]

Food is one among the basic necessities of life along with air and water. The outcome of food is nothing but the healthy body as well as the disease. Out of the factors for maintenance of healthy life, food occupies the more importance because it is the basic medicament other than any substance. Food articles are supposed to maintain a state of equilibrium of Dosha, Dhatu, and Mala.[2]

Whatever we eat, it affects our body as well as mind. so we should eat both delicious and wholesome food which will provide nourishment to both the body and sense organs.

Natural products play an important role in maintaining the health of individuals. In the second half of the 19th century, the economic changes, industrial development and migration of the population from rural to urban areas, there was increasing demand for cheap foodstuffs, which contributed to the growth of mass food production, as well as to the increase in adulteration of foodstuffs.

Food adulteration has been a concern since the beginning of civilization, as it not only decreases the quality of food products but also results in number of ill effects on health. Food safety is a significant public concern directly impacting human health worldwide. With increasing adulteration, food safety has become an important research field.

Food Adulteration refers to the process by which the quality or the nature of a given food is reduced through addition of adulterants or removal of vital substance. Food adulterants refer to the foreign and usually inferior chemical substance present in food that cause harm or is unwanted in the food. Basically, during food adulteration, small quantity of non-nutritious substances is added intentionally to

improve the appearance, texture or storage properties of the food.

Food adulteration has been a major issue since ancient times as it decreases the quality of food and it can be injurious to health. Typical substances that are adulterated are not limited to food, cosmetics, pharmaceuticals, fuel, or other chemicals, that compromise the safety or effectiveness of the said substance.

According to The Prevention of Food Article Act, 1954, an article of food shall be deemed to be adulterated -

- If the article sold by a vendor is not of the nature, substance or quality demanded by the purchaser and is to his prejudice, or is not of the nature, substance or quality which it purports or is represented to be;
- If the article contains any other substance which affects, or if the article is so processed as to affect, injuriously the nature, substance or quality thereof;
- If any inferior or cheaper substance has been substituted wholly or in part for the article so as to affect injuriously the nature, substance or quality thereof;
- If any constituent of the article has been wholly or in part abstracted so as to affect injuriously the nature, substance or quality thereof;
- If the article had been prepared, packed or kept under insanitary conditions whereby it has become contaminated or injurious to health;
- If the article consists wholly or in part of any filthy, putrid, rotten, decomposed or diseased animal or vegetable substance or is insect infested or is otherwise unit for human consumption;
- If the article is obtained from a diseased animal; renders it injurious to health;
- If the container of the article is composed, whether wholly or in part, of any poisonous or deleterious substance which renders its contents injurious to health;
- If any colouring matter other than that prescribed in respect thereof is present in the article, or if the amounts of the prescribed colouring matter which is present in the article are not within the prescribed limits of variability;
- If the article contains any prohibited preservative or permitted preservative in excess of the prescribed limits;
- If the quality or purity of the article falls below the prescribed standard or its constituents are present in quantities not within the prescribed limits of variability, but which renders it injurious to health;
- If the quality or purity of the article falls below the prescribed standard or its constituents are present in quantities not within the prescribed limits of variability.

The Adulterated food has been linked to various chronic diseases like liver disorder, diarrhoea, stomach disorder, lathyrism, cancer, vomiting, dysentery, joint pain, heart diseases, food poisoning etc.

II. DEFINITION

According to Food Safety and Standards Authority of India (FSSAI) Act, 2006 “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” [3].

It can be through-

Deliberate addition

Substitution

Removal of substances

To corrupt, debase or make impure by the addition of a foreign or inferior substance or element to prepare for sale by omitting a valuable ingredient or by replacing more valuable ingredients with less valuable or inert and usually harmful ingredients or with ingredients different from those claimed.

Even in Ayurveda there are references of the food having harmful effects on body, be it due to addition of poisonous substances or due to improper combination. One among such concepts is the concept of Garavisha. It is a type if artificial poisoning where there is poisonous.

It can be seen that the effects on consumption of adulterated food are very similar to those of Garavisha. The harmful effects of these poisons may be of wide variety based on the properties of the combined substances. The prevention and treatment of those abnormal health events due to adulteration

can thus be adopted as per the Garavisha line of treatment.

Ayurveda also talks about deliberate poisoning for specific gains with[4] the use of the phrase Soubhagyaartha in the definition of Garavisha. Even the word garaartha by Chakrapani shows the deliberate nature of the poisoning which can also be seen as corresponding to intentional adulteration.

III. AIMS AND OBJECTIVES

1) To study the hazardous health effects caused by food adulteration.

2) To create public awareness regarding food safety and to prevent and control food adulteration.

IV. MATERIALS AND METHODS

Information was collected from Bhrihatrayee & Laghutrayee books, Review articles, various Research papers and related Journals.

Types of food Adulteration[5]:

1) Intentional: Economically motivated adulteration of food also known as food fraud is the intentional addition of food for financial gain. Substances are added in food to improve appearance, flavour, texture or storage properties for financial gain. eg. Food preservatives, mineral oil, water, chalk powder etc.

2) Incidental: It is attributed to ignorance, carelessness or lack of facilities for maintaining food quality. Eg. Pesticide, DDT residues present on the plant product, larvae in foods, droppings from rodents.

3) Metallic contamination: Metallic contaminants enter the food supply chain through environmental contamination or during food production process. Adverse health effects depend on chemical nature, the amount and duration of individual exposure etc. eg. Arsenic from pesticides, lead from water etc.

4) Packaging hazards: Polyethylene, polyvinyl chloride and allied compounds are used to produce flexible packaging material.

Common Adulterants

Sr.no.	Food product	Adulterant	Harmful effects
1	Milk	➢ Unhygienic water ➢ Chalk powder ➢ Soap water ➢ Starch ➢ Hydrogen peroxide ➢ Urea	➢ Food poisoning ➢ Heart problem ➢ Cancer ➢ Vomiting ➢ Nausea
2	Coffee powder	➢ Tamarind seed ➢ Chicory powder	➢ Diarrhea ➢ Stomach disorders ➢ Giddiness ➢ Joint pain
3	Chili powder	➢ Brick powder ➢ Saw dust	➢ Stomach problems ➢ Artificial color can cause cancer ➢ Hepatotoxicity
4	Turmeric powder	➢ Yellow aniline dye Non-permitted colorants like metanil yellow	➢ Carcinogenic ➢ Stomach disorders
5	Mustard seeds and oil	➢ Argemone seeds	➢ Epidemic dropsy ➢ Severe glaucoma
6	Ice-cream	➢ Washing powder	➢ Liver disorders ➢ Stomach disorders
7	Green chilies	➢ Malachite green (coloured dye)	➢ Carcinogenic

			➢ Hepatotoxicity
8	Ghee	➢ Vegetable oil ➢ Animal body fats	➢ Anemia ➢ Enlargement of heart
9	Sugar	➢ Chalk powder	➢ Stomach disorders
10	Tea	Colored and processed used tea leaves	➢ Liver disorders

Garavisha and Food adulteration:

Ayurveda not only explains about natural toxins (Sthavara and Jangama Visha) but also gives equal importance to artificial toxins (Garavisha) also. Garavisha is well explained by our ancient Acharyas. In Ayurveda, the toxic combination of poisonous or non-poisonous substances which exert toxic effects on health after interval of some time comes under the concept of Garavisha. Since it takes some time this type of poison to get metabolized, it doesn't cause instantaneous death of a person.[6] Nowadays due to the influence of fast life, fast foods, adulteration, pesticides, environmental pollutants people are exposed to toxins from many angles which one day become intolerance as far as health is concerned. The toxicogenesis of food, milk and drink additives is near about similar to that of Garavisha which reduces Jatharagni and absorption in gastro-intestinal tract which leads to disease.

Herbal Medicine and Adulteration:

The share of herbal medicines in the worldwide medicine market is remarkable and increases every year. Recently different scientific and monitoring investigations reported to contain undeclared synthetic drugs, metals or other toxic substances in high concentration in herbal medicine which may put the health of patients at risk.[7] Different studies reported the presence of glucocorticoids (dexamethasone, betamethasone, prednisolone, hydrocortisone), non-steroidal anti-inflammatory drugs (diclofenac, ibuprofen), anti-hypertensive agents (amlodipine, valsartan, clonidine, metoprolol) and so many other types of therapeutic synthetic agents as adulterants in the preparations of traditional herbal medicines that are sold as 100% pure, naturally originated free from side-effects.[8]

Sometimes these adulterations may be due to the following reasons -

1) Confusion in vernacular names between traditional system of medicines and local dialects.
2) Lack of knowledge about the authentic plants.
3) Non availability of the authentic plants.
4) Similarity in morphology and/or aroma.
5) Careless collection
6) Other unknown reasons

The intake of adulterated herbal medicine was suspected to cause the health problems like- allergic reactions, vomiting, skin rash, stomach upset, headache, mouth ulcers, muscle weakness, movement disorders, liver failure, kidney failure, lead poisoning, arsenic poisoning, mercury poisoning etc.[9]

V. PREVENTION AND CONTROL OF FOOD ADULTERATION[10]

The prevention of adulteration of food is the best way to maintain the health. Food adulteration can not only be a result of need for quick profit but also can result from shortages and increased prices, consumer demand for variety in food, lack of awareness, negligence among customers and inadequate enforcement of food laws and food safety measures. It can be adulterant as a whole or its consumption can be prevented by proper governing body to ensure food safety, formulation of proper legislation and their implementations, by public awareness about the common adulterated food, their ill effects and proper testing methods of susceptible food items.

In India the food safety is ensured by the Food Safety and Standards Authority of India (FSSAI) governed by the ministry of Health and Family Welfare. The FSSAI implements and enforces food regulations as prescribed in the food safety and standards act, 2006 (FSS Act). According to the Food Safety and Standards (Licensing and Registration of Food Business) Regulation 2011, it is mandatory for all food businesses operators, manufacturers, wholesalers, retailers, hotels, restaurants, importers, distributers to have an FSSAI registration/license so

they are in compliance with FSS Act. Consumers are urged to buy only those foods which have the FSSAI mark on them proving their safety.
The common people can protect themselves from the hazards of adulteration by being conscious of what they buy and eat. Testing foods that are commonly adulterated for their purity before consumption is a very effective way of preventing health hazards. The FSSAI has also brought out some simple tests to be performed to common food items to test for their purity.

The common people can protect themselves from the hazards of adulteration by being conscious of what they buy and eat. Testing foods that are commonly adulterated for their purity before consumption is a very effective way of preventing health hazards. The FSSAI has also brought out some simple tests to be performed on common food items to test for their purity. A few easy tests are:[11]

- Milk for detergent – shake 5-10 ml of milk with same amount of water, formation of lather indicates presence of detergent.
- For synthetic milk – has a soapy feeling on rubbing between fingers and turns yellowish on heating
- Milk and milk products like khoa for starch – boil with water, allow it to cool and add iodine solution if it turns blue there is starch.
- Coconut oil for other oils – keep oil in refrigerator, pure coconut oil will solidify leaving the adulterant.
- Sugar for chalk powder or plastic sugar– dissolve a little quantity in water, chalk powder or plastic will not dissolve.
- Sugar for urea – dissolve a little quantity of sample in water smell of ammonia shows presence of urea.
- Honey for added sugar – put a drop of sample honey into a beaker of water, if it does not disperse in water, it is pure
- Cereals and pulses for ergot fungus – put some sample grains into a beaker containing 20% salt solution, the fungus will float and grains will settle down.
- Black pepper seeds for papaya seeds – put some sample in rectified spirit, the black pepper will sink and papaya seeds will float.
- Turmeric whole for lead chromate for colour– leaves colour on washing
- Chilli and turmeric powder for artificial colouring– sprinkle the powder on top of a beaker of water, the artificial colour descents as colourful streaks.
- Asafoetida for impurities – when burnt if it burns like camphor then it is pure.
- Cumin seeds for grass seeds covered with charcoal dust – rub the sample on the palm, if the palm turns black it is adulterated.
- Artificially coloured vegetables and pulses – mix in water and keep for half hour, the colour will be there for water also.
- Coffee powder for chicory powder – sprinkle the sample on a beaker of water the coffee will float and chicory powder will sink leaving a trail of colour.

❖ Physical Tests –

- Argemona mexicana seeds (prickly poppy) are black in color but not in uniformly smooth and round.
- Kesari dal is wedge shaped.
- Iron fillings in tea can be separated by using magnet.
- Ergot seeds are lighter than bajra and float on water.
- Sand, gravel, pebbles can be observed and removed physically.

Chemical Tests (for the following adulterants)

S. No.	Food materials	Common Adulterants	Tests

1.	Ghee and butter	Vanaspati ghee, starch, potato	*Add a little sugar & HCL to melt sample of ghee or butter, shake it for 5 minutes presence of pink color in aqueous layer indicate vanaspati ghee. *Add 2ml of water in ghee or butter boil, add few drops of iodine solution to it, appearance of blue color indicate the presence of starch in the sample.
2.	Mustard oil	Argemone oil	5 ml oil + conc. HNO_3 orange/red color indicate the presence of argemone oil.
3.	Sugar	Washing soda or chalk powder	Sample of sugar add dil. HCl - brisk effervescence indicates presence of washing soda or chalk powder.
4.	Red chili powder	Brick powder or dyes	Red chili powder in a beaker + distilled powder + brick powder settle down in the bottom, appearance of red color indicates the presence of dyes.
5.	Pepper	Dried papaya powder	Sample + water = dried papaya, seed floats over the surface of water, pure pepper settles down
6.	Turmeric powder	Yellow chalk powder	Sample turmeric powder + 2 ml HCl = brisk effervescences indicate presence of chalk powder.

Criteria for selection of Food[12]:

- Selection of wholesome and non- adulterated food is essential for daily life to make sure that such foods don't cause any health hazard.
- Visual examination of the food before purchase makes sure to ensure absence of insects, fungus, foreign matters etc. So consumer should purchase the food thoroughly after proper examination.
- Label declaration of packed food is very important for knowing the ingredients and nutritional value. It also helps in checking the fresh- ness 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.
- Consumer of cut fruits being sold in unhygienic conditions should be avoided. It is always better to buy certified food from reputed shop.

VI. PRECAUTIONS[13]

- By taking few precautions, we can escape from consuming adulterated products.
- Take only packed food items of known companies.
- Buy items from reliable retail shops.
- Check the ISI mark or Agmark.
- Buy products of only air tight brands.
- Avoid craziness for artificially colored sweets and buy only from reputed shops.
- Do not buy sweets or snacks kept in open.
- Avoid buying things from street side vendors.

VII. MITIGATION MEASURES FOR ADDRESSING FOOD ADULTERATION

- There must be proper surveillance of the implementation food laws.
- There should be monitoring of the activities with periodical records of hazards regarding food adulteration.
- There should be periodical training programmes for Senior Officer/Inspector/Analysts for food safety
- There should be consumer awareness programmes organized by holding

exhibitions/seminars/training programmes and publishing pamphlets.

- There should be strict actions regarding the punishment for those who are involved in food adulteration.
- There should be help and support from International INGOs for implementation of food laws.

One of the most effective ways could be by raising the standard of public morals and spreading awareness among manufacturers, traders and consumers. This would essentially root out the menace of adulteration. It is also necessary that those who infringe the food laws must be hunted out, prosecuted and suitably punished. This will serve as a deterrent to others who may be tempted to make a fast buck at the cost of human life.

VIII. MANAGEMENT

The management of the harmful effects of food adulteration is dependent on the type of adulterant and period of exposure. Even so, the steps of management can be broadly divided under the main headings like

S. No.	Treatment Modality	Ayurvedic Parlance
1.	Removal of toxins	Sadyah Vamana
2.	Prevention of further exposure	Pathya Bhojana
3.	Management of symptoms	Shamana Chikitsa & Agada Prayoga
4.	Rehabilitative food & Life style Modification	Hitahaara & Vihara Sevana

IX. DISCUSSION

Food adulteration remains a significant public health concern in the modern era due to the complex and extensive food production and distribution systems. The involvement of large-scale manpower in food processing and marketing increases the likelihood of adulteration at various stages of the food supply chain. Commonly consumed food items such as milk and milk products, edible oils and fats, spices, tea, and coffee are frequently adulterated using artificial colours, flavouring agents, preservatives, and pesticide residues.

An emerging concern is the adulteration of herbal foods and medicines with synthetic pharmaceutical substances to enhance their perceived therapeutic efficacy. Such practices pose serious health risks and may lead to toxic effects, especially with long-term consumption. Continuous intake of adulterated food has been associated with gastrointestinal, neurological, immunological disorders, multi-organ dysfunction, and carcinogenic outcomes.

Although several analytical techniques are available for the detection of food adulteration, prevention through public awareness and regulatory enforcement remains the most effective strategy. Consumers must be educated regarding food quality, labeling, and safe purchasing practices to minimize exposure to adulterants.

According to Ayurveda, Ahara (food) plays a pivotal role in both the maintenance of health and the causation of disease and is regarded as one of the Trayopasthambha (three pillars of life). Even minor alterations in food quality can significantly impact health. Intentional or unintentional modification of food substances renders them harmful to the body they are meant to nourish, which aligns with the concept of food adulteration.

To ensure food safety, national and international regulatory standards have been established. Strict implementation of these regulations, along with ethical practices and community participation, is essential to reduce food adulteration and protect public health.

X. CONCLUSION

Food adulteration is a serious and growing public health concern worldwide. It compromises food quality and leads to multiple health hazards, including gastrointestinal, neurological, immunological disorders, multi-organ damage, and cancer. The presence of adulterants even in medicinal products further aggravates this issue. Financial gain driven by unethical practices remains a major cause,

particularly in developing and underdeveloped countries where monitoring and enforcement of food safety laws are often inadequate.

Although complete detection of adulterants may not be possible through visual examination alone, basic vigilance such as checking for visible contaminants and avoiding unhygienic sources can help reduce risk. Public awareness and active participation, especially by educated sections of society, are essential to discourage adulteration and protect future generations. While several regulations, including the Prevention of Food Adulteration Act, 1954, have been enacted to ensure food safety from production to consumption, strict enforcement remains crucial.

The harmful effects of adulterated food are comparable to poisoning and can be correlated with the Ayurvedic concept of Garavisha. Therefore, integrating ancient Ayurvedic knowledge with modern food safety measures, along with judicious use of purificatory therapies and antidotal approaches, may help counteract the adverse health effects of inferior-quality food. Strengthening legislation, enforcement, and public awareness is vital for ensuring food safety and overall public health.

REFERENCES

[1] Kale S, editor, (Reprinted). Charak Samhita, Sootra Sthana; Tristraishaniya: Delhi: Chowkhambha Sanskrit Pratishthan, 2019; 178: 11- 34.

[2] Sharma H, editor, Kashyapa Samhita, Khilasthan; Bhojyopakramaniyadhyay: Verse no. 03. Banarasa: Chowkhambha Sanskrit Series, 2002.

[3] Quick test for some adulterants in food –Food safety and standards authority of India (FSSAI), New Delhi, 2012

[4] Sharma, R.K & Bhagawan Das, Charaka Samhita, Chikitsa Sthana (23/233), Vol. IV, Varanasi, Chaukhambha Sanskrit Series office, Reprint, 2014, 380

[5] Elizabeth R, Banu W. Swasthavritta-An Approach to Food Adulteration. International Ayurvedic Medical Journal {online}, 2018; 6(4): 851-855.

[6] Kale S, Charak Samhita, Chikitsa Sthana; Vishachikitsadhyaya: Delhi: Chowkhambha Sanskrit Pratishthan, 2014; 529: 23 - 14.

[7] Marcus DM, Groilman AP. Botanical Medicines-The need for new regulations. New Engl J Med, 2002; 347: 2073-6.

[8] Haneef J, Shaharyar M, Husain A, Rashid M, Mishra R, Siddique NA, Pal M. Analytical methods for the detection of undeclared synthetic drugs in traditional herbal medicines as adulterants. Drug Test Anal, 2013; 5: 607-13.

[9] Posadzki P, Watson L, Ernst E. Contamination and adulteration of herbal medicinal products (HMPs): An overview of systematic reviews. European Journal of Clinical Pharmacology, 2013; 69(3): 295-307.

[10] https://www.lkouniv.ac.in/site/writereaddata/sit

[11] Quick test for some adulterants in food: Instruction Manual Part II (Methods for Detection of adulterants), Food Safety and Standards Authority of India, 2012 June 08 Available from: old.fssai.gov.in/Portals/0/Pdf/Final_Test_kit_Manual_II%2816-08-2012%29.pdf

[12] Websites www.wikipedia.org & www.google.com

[13] http://extwprlegs1.fao.org/docs/pdf/ind10950.pdf