

A Critical Analysis on Chemicals Used in the Food Industry

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Abstract: Food is the most basic necessity of life. It contains the required vitamins, minerals and nutrients that are essential for the growth, repair and maintenance of the tissues present in the body. Most importantly, it provides the body with necessary energy to function properly. It is impossible to function without food. This is why production and consumption of food has been a major human activity for centuries now, but the use of modern methods and techniques to produce, process and pack food has increased the danger of being exposed to chemical compounds. Adapting advanced technologies in food production is leading to the mix up of chemicals with food which knowingly or unknowingly is causing a lot of health problems to the consumers or at times even death. Our ancestors had access to natural food products and kitchenware, which played a major role in maintaining their health, whereas in present times, it is very difficult to find chemical free food products. Chemicals are used in every step of the food production process. Pesticides and fertilisers are sprayed on crops to yield better, antibiotics and hormonal injections are given to poultry and cattle to breed and grow faster and now we also have chemically enhanced kitchen utensils which are all plausible reasons for the deterioration of health.

Key Words: Food, Basic necessity, Chemicals, Pesticides, Fertilisers, Antibiotics, Hormonal injections.

1. Introduction:

Chemicals are found everywhere. The entire universe is made up of chemical compounds. Chemicals make up all living and non living things. Chemicals that are used for processing food are generally considered to be safe for example, essentials nutrients like carbs, protein, fats, and fibre are all made up of chemical compounds. These help maintain a balanced diet.

Chemicals are used to preserve food or to increase their shelf life so that can be stored for long. For instance, food additives can extend the shelf life of meals; others, like colour, enhances and makes food more appealing. Food flavours are used to give a better taste and aroma and the usage of external nutritional supplements are becoming very common due to lack of vitamins and nutrients and the presence of a number of deficiencies.

Packaging also plays a very important role in attracting consumers. Fancy packaging might contain a lot of chemicals like plastic that can leach into food. It can be found In materials and containers like bottles, cups and plates that are designed to ease food handling and transportation. Crops are often sprayed with pesticides to avoid pests from damaging them and farm animals are injected with chemicals to treat them from diseases. All these chemicals might end up in food due to production procedures.

There are certain chemicals which are naturally released. They have adverse impacts too. For example, natural toxins produced by some plants and fungi have the potential to contaminate crops and pose a risk to both human and animal health. Additionally, both naturally occurring and artificial chemical substances that are present in the environment at different concentrations, such as in the soil, water, and atmosphere, might be exposed to people. Industrial contaminants like dioxins and PCBs are examples of it. Metals can be found in the environment either naturally or as a result of human activity.

Either way, chemicals tend to have a range of toxicological characteristics which may have adverse impacts on health. Chemicals are not very fatal or lethal unless we are frequently exposed to them, that too at high quantities. By identifying safe levels, scientists contribute to protect us against these negative impacts. Decision-makers who control the use of chemicals in food or work to reduce their presence in the food chain are informed by this scientific guidance.

Sources of Chemicals:

***Substances that are regulated to be used:**

For a variety of technical reasons, including good taste, shelf life, or nutritional value of food, several chemicals are added to it. For example, food additives, flavourings, enzymes, supplements, etc.

***Chemical Residues:**

The production and preparation of food usually leaves traces of chemicals, such as pesticide residues or additives used in animal feed which can be occasionally present in food. Food can unintentionally contain minute amounts of chemicals from packaging and other things that come in contact with it.

***Contaminants in Food:**

Various quantities of naturally occurring chemical substances, such as metals and nitrates, can be found in the soil, water, and atmosphere. These are environmental contaminants that come into existence as a result of human activities like farming, industry, car exhausts, or as a result of food production like high-temperature cooking. These contaminants can be present as residues in food. They can be picked up from the environment or consumed through tainted food or drinks.

Chemicals Used in the Food Industry

Chemicals are commonly used in the food industry for various purposes, ranging from preserving and enhancing food quality to ensuring safety and meeting consumer expectations. These substances play a pivotal role in the production, processing, and distribution of food products. While there are numerous chemicals used in the food industry, they can be broadly categorised into additives, preservatives, flavour enhancers, colorants, and processing aids.

In this discussion, we will delve into the types of chemicals used in the food industry, their functions, and the reasons behind their usage.

- **Additives:**

Food additives are substances added to food products to improve their texture, flavour, appearance, and shelf life. These chemicals can be natural or synthetic and are approved for use by regulatory agencies like the Food and Drug Administration (FDA) in the United States or the European Food Safety Authority (EFSA) in Europe. Additives include emulsifiers, stabilisers, thickeners, and anti-caking agents.

- **Preservatives:**

Preservatives are used to extend the shelf life of food products by inhibiting the growth of microorganisms such as bacteria, yeasts, and molds. This helps prevent spoilage and food-borne illnesses. Common preservatives include salt, sugar, vinegar, and synthetic compounds like benzoate's and sorbets.

- **Flavour Enhancers:**

Flavour enhancers are chemicals that intensify or modify the taste of food products. One of the most known flavour enhancer is Monosodium glutamate (MSG). These substances are used to create a more appealing taste profile and can help mask undesirable flavours that might result from processing or storage.

- **Colorants:**

Colorants are added to food products to enhance their visual appeal and make them more enticing to consumers. Natural colorants are derived from plants, fruits, and vegetables, while synthetic colorants are produced chemically. Colorants are often used to compensate for colour loss during processing or to create a uniform appearance.

- **Processing Aids:**

Processing aids are chemicals used during the manufacturing process to improve the efficiency of various processes, such as fermentation, filtration, and extraction. They are not intended to have a direct impact on the final product but help ensure the production process runs smoothly.

Reasons for Chemicals being used:

- **Food Safety and Preservation:**

One of the primary reasons for using chemicals in the food industry is to ensure food safety. Preservatives and antimicrobial agents help prevent the growth of harmful microorganisms, reducing the risk of foodborne illnesses. Additionally, these chemicals extend the shelf life of products, reducing food waste.

- **Texture and Stability:**

Additives like emulsifiers and stabilisers improve the texture and consistency of food products. They prevent ingredients from separating and help maintain a desirable appearance and texture throughout the product's shelf life.

- **Flavour Enhancement:**

Flavour enhancers contribute to the overall taste experience of food products. They can help balance and intensify flavours, making the food more enjoyable to consume.

- **Appearance and Appeal:**

Colorants are used to enhance the visual appeal of food products. They can make products look more appetising and attractive to consumers.

- **Efficiency in Production:**

Processing aids streamline manufacturing processes, leading to greater efficiency and reduced production costs. This can ultimately result in more affordable food products for consumers.

- **Consumer Expectations:**

Consumers often have specific expectations regarding the appearance, taste, and texture of food products. Chemicals are used to meet these expectations and maintain a consistent quality across batches.

2. Review of Literature.

A review on mechanisms and commercial aspects of food preservation and processing.

Authors: Sadat Kamal Amit, Md. Mezbah Uddin, Rizwanur Rahman, S. M. Rezwanul Islam & Mohidus Samad Khan

<https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0130-8>

Summary and Analysis: One of the major revolutionary inventions of human civilization was acquiring the knowledge to preserve foods as it was the precondition to man to settle down in one place and to develop a society. However, increasing shelf lives of food items without compromising original food properties is still critical and challenging. Food is an organic perishable substance, which is susceptible to spoilage due to microbial, chemical, or physical activities. Different traditional techniques, such as drying, chilling, freezing, and fermentation, had been evolved in the past to preserve foods and to maintain their nutrition value and texture. With time and growing demands, preservation techniques have been improved and modernized. Irradiation, high-pressure food preservation, and pulsed electric field effect are the latest innovations used to increase shelf life of foods. Different chemical reagents have also been introduced as food additives and preservatives. However, there are growing concerns of using chemical additives and preservatives in food items because of possible health hazards.

Chemical Contamination Pathways and the Food Safety Implications along the Various Stages of Food Production: A Review

Authors: Kgomoetso Lebelo, Ntsoaki Malebo, Mokgaotsa Jonas Mochane and Muthoni Masinde

<https://www.mdpi.com/1660-4601/18/11/5795>

Summary and Analysis: The study of chemical toxicity in the food industry is fundamental and needs to be supported by rigorous toxicological studies. This will improve the quality of food products offered by the food industry and will ultimately benefit consumers. Heavy metals, antibiotics and POP contamination can cause adverse human health effects and thus needs regulation through adequate legislative interventions and proper monitoring standards supported by sound scientific data. The already existing interventions such as the bioremediation of pollutants are effective. However, more research needs to be conducted on the sustainability and financial impact of these solutions as a control strategy in the food industry. This review revealed a plethora of studies that could be undertaken to further narrow the toxicological effects of chemicals on food sources.

Further research might explore how toxic chemicals in food are transferred from farms to consumers in developing countries. This kind of toxicological study might compare the toxicological effects by region and even the proximity of exposure to food sources and the environmental drivers of food contamination. Threshold limits need to be developed for various chemicals at low concentrations. An in-depth study could further explore the food safety management systems in place at the national level of food control including the relationships with stakeholders and consumers. This paper highlighted that most studies on heavy metal exposure were conducted in Asian countries such as China and Japan, notwithstanding the contribution of the European Union through the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). Significant work has been carried out to foster compliance in Europe through the regulation of chemicals in various industries including the agricultural sector. However, more methodological work needs to examine and test the same studies in a new context, such as Africa. Thus, comparing the types of exposure from a broad spectrum such as cultural diversity, food staples, food safety systems, and climatic variations in agricultural land.

Effects of food additives and preservatives on man- A review

Authors: Inetianbor, J. E., Yakubu, J. M. and Ezeonu, S. C.

https://www.researchgate.net/publication/277714512_EFFECTS_OF_FOOD_ADDITIVES_AND_PRESERVATIVES_ON_MAN-A_REVIEW

Summary and Analysis: This review work has examined the various effects of food additives and preservatives on man. Additives have been used for many years to preserve, flavour, blend, thicken and colour foods, and have played an important and essential role in reducing serious nutritional deficiencies (Nutrition Supplement Additives). Additives help to assure the availability of wholesome, appetizing and affordable foods that meet consumer's demands from season to season while also helping to preserve food from spoilage from microorganism. Food additives play a vital role in the food industries, but the various adverse effects associated with them remain a problem that need to be fought by us. Synthetic food additives react with the cellular component of the body leading to the various food disturbances (effects). If we must use food additives, because of their advantages, they should be the natural ones which have minimal effects and those that are generally recognized as safe (GRAS) and in the case of those not generally recognized as safe (Non GRAS), the acceptable daily intakes (ADIs) should not be exceeded. To minimize the risk of developing health problems due to food additives and preservatives, one should avoid the foods containing these additives and preservatives. Before purchasing the canned food, its ingredients should be checked. Purchase only organic foods, which are free from artificial additives. Although it may seem difficult to change habits and find substitutes for foods that one enjoys, remind yourself that you will be adding to your diet some new wholesome foods that you will come to enjoy even more. Look for foods that are not packaged and processed, but enjoy nature's own bounty of fresh fruits, vegetables, grains, beans, nuts and seeds. Find foods that resemble what they looked like when they were originally grown.

Impact of Food Processing on Environment

Author: G.T. Kroyer

[https://doi.org/10.1016/0023-6438\(95\)90000-4](https://doi.org/10.1016/0023-6438(95)90000-4)

Summary and Analysis: Every stage of the food industry – food production, processing, transportation, storage, marketing and distribution – has some impact on the environment, and environmental pollution is a concern. Due to the versatility of the food industry, different quality and quantity of waste is generated in different food processing, processing and packaging operations, which, if left untreated, can lead to increasing disposal problems and serious contamination problems. In addition, they represent a loss of valuable biomass and nutrients if not restored through appropriate remediation, bioconversion or recovery methods and techniques. Research should be improved to improve the efficiency of waste management and minimize waste in food processing and production through improved production practices and constructive utilization, which is inevitable due to the bioconversion of by-products and waste into edible food, feed or industrial chemicals. Reduce the environmental burden as a result of better integrated waste management. This review discusses the general characteristics and processing operations of by-products, waste and wastewater from different categories of the food industry and their impact on the environment.

Ultra Sonics in Food Processing

Authors: Jayani Chandrapala, Christine Oliver, Sandra Kentish and MuthupandianAshokkumar

<https://doi.org/10.1016/j.ultsonch.2012.01.010>

Summary and Analysis: In recent years, the physical and chemical effects of ultrasound in liquid and solid media have been widely used in food processing applications. The use of ultrasound-generated physical

forces in the absence and presence of cavitation in specific food processing applications such as emulsification, filtration, embrittlement and operation was emphasized. While some applications, such as filtration and emulsification, are “mature” industrial processes, other applications, such as operation, are still under development. However, several studies discussed suggest that sonication of food and dairy ingredients is a possible and feasible technology to be used by many food industries in the near future.

The beneficial effects of cavitation caused by ultrasonic or hydrodynamic sources led to many applications during the 20th century. American technology has been used for decades in various industries for cutting, spreading, welding, homogenizing, degassing, crushing, cleaning, drilling, greasing processes and flow measurement. Although sonochemistry has been researched and studied for several decades, it has not yet reached the same level of industrialization as other American technologies such as cutting, welding and cleaning. However, sonochemistry is still a very active and growing field of research, with many discoveries and applications under investigation, pointing to the future of RandD. Sonochemistry encompasses a wide range of applications, including polymerization, crystallization, cell disruption, atomization, nanomaterial synthesis, drug delivery enhancement, processing, extraction, synthetic chemistry, and water purification. These areas represent some of the most prominent and actively investigated research topics. The era of early discovery and research in sonochemistry in the 1980s and 1990s has now passed, and much knowledge has accumulated over several decades.

Determining the Safety of Enzymes Used in Food Processing

Authors: M.W. Pariza, E.M. Foster

<https://doi.org/10.4315/0362-028X-46.5.453>

Summary and Analysis: Enzymes are proteins that catalyze chemical reactions. They are very specific and only small amounts are needed. Certain enzymes have long been used to make certain foods, such as cheese. Today, they have many applications and are growing in commercial importance. There have never been any health problems in food processing using the enzyme as such. However, it is important to present scientific data showing that enzyme preparations, especially those that have not been used for a long time, are safe to consume. The purpose of this report is to propose guidelines for enzyme safety assessment. We conclude that the enzymes used or likely to be used in food processing in the future are not in themselves poisonous. The safety assessment should focus on potential contaminants that may be present. As long as current good manufacturing practices (CGMP) are followed, toxic contaminants can only come from the source of the enzyme itself (animal, plant or microbe). Therefore, the safety of the source organism should be a priority. Enzymes from animals or plants that are generally considered food do not need to be subjected to animal feeding studies. Some food plants produce toxins and in such cases chemical analyzes can be used to assess safety. Bacterial enzymes must prove to be free of antibiotics and acute orally active toxins (enterotoxins and certain neurotoxins). Certain fungi and actinomycetes can produce toxins of low molecular weight (andlt; 500 daltons). It must be shown that the enzymes of such organisms do not contain these substances. If a microbial culture is determined not to produce orally active antibiotics or toxins, enzymes produced by that culture using CGMP can be considered safe for food processing.

Importance and health hazards of nanoparticles used in the food industry

Authors: Kaiser Younis, Assistant Professor, Department of Bioengineering, Integral University, Lucknow.

<https://www.degruyter.com/document/doi/10.1515/ntrev-2018-0076/html>

Summary and Analysis: Nanoparticles, or nanomaterials, have emerged as a powerful tool in various fields, including food science and technology. These materials contain particles, aggregates, or filaments of dimensions smaller than 100 nm, leading to the formation of various structures and systems such as nanoparticles, nano dispersions, nanolaminates, nanotubes, nanowires, buckyballs, and quantum dots. The unique properties of nanomaterials, such as their size, distribution, number of interfaces or grain boundaries, chemical composition, and interactions, make them “magic bullets” for various applications, including drug, textile, and food manufacturing.

Agriculture and food production are directly associated with human development, welfare, and ecosystem maintenance. With the constant rise in the world population, environmental hazards, global climatic change, shortage of energy sources, and shrinkage of arable land, modern technologies are essential for increasing and improving food production and food quality. The use of nanotechnology in food and feed processing is applicable at all stages of production, packaging, storage, transportation, and value addition.

Human health risk assessment of processing-related compounds in food

Author: Angelika M Tritscher

<https://www.sciencedirect.com/science/article/abs/pii/S0378427403004971>

Summary and Analysis: Food processing techniques have been used throughout human history to ensure food safety, improve palatability, and meet consumer demand for healthy, nutritious, and convenient food. The growing demand for healthy, nutritious, and convenient food has driven improvements and new developments in food processing. New processes or compounds, often identified due to improved analytical capabilities, require careful evaluation of potential human health impact. Risk assessments for processing-related contaminants, such as 3-monochloropropanediol (3-MCPD) and acrylamide, are discussed. 3-MCPD is considered a non-genotoxic carcinogen, while acrylamide is considered a genotoxic carcinogen.

Unavoidable substances considered genotoxic carcinogens are unwanted in foods and are usually dealt with via the ALARA principle. Quantitative risk assessment may provide useful advice to risk managers for appropriate actions. However, adequate dose-response relationships and mechanistic information regarding the carcinogenicity of acrylamide are lacking. Once this information becomes available, the health risk from acrylamide exposure through food can be assessed.

Review of health safety aspects of nanotechnologies in food production

Author: Hans Bouwmeester

<https://www.sciencedirect.com/science/article/abs/pii/S0273230008002468>

Summary and Analysis: The introduction of engineered nanoparticles (NPs) in the agro-food industry has led to the development of new consumer products with unique properties, such as disease treatment, food security, pathogen detection materials, packaging materials, and delivery systems. However, there is a lack of knowledge on the safety of the application of nanotechnologies in the agro-food sector. This review aims to address scientific issues that need to be addressed to improve the risk assessment for nano particles in food.

Research topics considered to contribute pivotally to risk assessment of nanotechnologies and nanoparticles in food products include setting a definition for NPs, developing analytical tools for characterization of nanoparticles in complex biological matrices like food, establishing relevant dose metrics for scientific studies and regulatory frameworks, searching for deviant behavior (kinetics) and novel effects (toxicity) of nanoparticles, and estimating consumer exposure to nanoparticles.

Nanotechnology is a rapidly emerging field that involves the manufacture, processing, and application of structures, devices, and systems by controlling shape and size at the nanometer scale. Nanoparticles are defined as discrete entities with three dimensions of the order of 100 nm or less, which gives them unique features and huge potential for applications. However, the potential toxicological effects and impacts of NPs have received little attention. The high speed of introduction of NP-based consumer products has prompted the need to generate a better understanding of the potential negative impacts that NPs may have on biological systems products. Discussions on safety issues of nanoparticles and nanotechnological products can almost entirely be brought back to product-related questions and fundamental scientific questions.

Impact of chemicals in the food industry

<https://scholar.google.com/scholar?start=10&q=Research+on+health+impacts+of+chemicals+in+food+pr+oduction>

Authors:- Kho Motoso, Muthosumo Masind, Nahid Tamanna and Nivas Mohammad

Summary and Analysis: Chemical contamination in food poses significant health risks due to the high concentration of toxins in consumables. This contamination can result from natural or human-introduced contaminants, as well as from food production, packaging, transportation, and storage processes. Chemical pollutants can cause minor gastroenteritis to deadly neurological, hepatic, and renal disorders. Although the government restricts certain chemicals in foods by establishing minimal standards, more research is needed to reduce the diseases and health hazards associated with chemical food. Chemical pollution can come from various sources, including soil, the environment, personal care products, air, water, and packaging. The Maillard reaction, a nonenzymatic browning reaction, is a crucial process in food processing and cooking that produces flavor and aroma during the cooking process. It is often used in the baking industry and everyday life to make food tasty. The formation of Maillard reaction products (MRPs) depends on the way food is processed, with both beneficial and toxic MRPs being produced. Some MRPs, such as melanoidins, have beneficial effects on health, such as antioxidative and antibiotic effects. However, some MRPs, such as high carboxymethyl lysine (CML), can promote diabetes and cardiovascular diseases. The Increasing preference for instant meals over traditional cooking has led to an increase in processed meat consumption, which can lead to insulin resistance and metabolic syndrome. MRPs that change during food processing may be important factors for disease

progression or combating diseases. Soybean processing is crucial for maintaining nutritional quality and preventing the generation of harmful MRPs. Therefore, it is essential to process soybean before consumption to ensure its health benefits.

The Sources of Chemical Contaminants in Food and Their Health Implications

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5699236/>

Authors: Irfan A. Rather, Wee Yin Koh, Woon. K Paek and Jeongheui Lim

Summary and Analysis: Food contamination is a big concern because of the harmful health concerns posed by the high concentration of toxins contained in consumables. It has become difficult to protect the public from the various levels of food contamination danger. The causes, manifestations, and health effects of chemical contamination in food are highlighted in this article. Food contamination may result from environmental contaminants that occur naturally or from contaminants that humans have purposely introduced. Food contamination is also significantly influenced by the steps of food production, packaging, transportation, and storage. These chemical pollutants have serious effects on human health, causing everything from minor gastroenteritis to deadly cases of neurological, hepatic, and renal disorders. Even if the government controls the presence of these chemicals in food by establishing safe minimal levels, further steps must be done to completely prevent food contamination. As a result, it is necessary to check and measure a variety of foods for the presence of chemical pollutants. The precautionary measures in relation to the issues with food contamination are highlighted and explored in this paper.

3. Research Methodology

The research methodology used to complete this paper is Secondary Data analysis. Secondary data is the data that has been already collected by researchers using primary sources of data collection. The reason for choosing this research methodology is because secondary data is readily available. It makes the research work easier, less time consuming and more cost effective.

Sources of Information:

- Books, Magazines and Newspapers – Newspapers and magazines also conduct separate surveys and interviews on various aspects which were helpful for us.
- Reports
- Publications from renowned organizations – Organizations like WHO
- Research Articles – Some websites publish research articles written by scholars and scientists who are well versed in this field
- Government Data – Data published by the government

Objectives of the Research

Research objectives describe what your research is trying to achieve and explain why you are pursuing it. They summarize the approach and purpose of your project and help to focus on your research.

The objectives of a study on the “Effects of Chemicals Used in the Food Industry” can vary depending on the specific focus and scope of the research. However, here are some common objectives that researchers might have when conducting such a study:

- **Assessing Safety:** One primary objective is to evaluate the safety of chemicals used in the food industry. This involves examining potential health risks associated with the consumption of foods containing these chemicals.
- **Determining Health Impacts:** Researchers may aim to determine the health impacts of long-term exposure to specific food additives or preservatives. This could include studying their effects on various aspects of health, such as metabolism, organ function, and overall well-being.
- **Identifying Potential Hazards:** The study may aim to identify potential hazards associated with the use of certain chemicals in food processing, such as contamination risks, allergenicity, or carcinogenicity.
- **Evaluating Regulatory Compliance:** Researchers might investigate whether the use of these chemicals complies with regulatory standards and guidelines established by government agencies responsible for food safety.
- **Consumer Awareness:** Another objective could be to assess consumer awareness and perception of chemicals used in the food industry. This might involve studying consumer preferences, concerns, and attitudes toward food additives and preservatives.

Scope of the Research

Research on the health impacts of chemicals in food production is a critical and ongoing area of study. The scope of this research includes:

- **Toxicity Assessment:** Evaluating the toxicity of chemicals used in pesticides, herbicides, and fertilizers to understand their potential harm to humans when residues remain on food.
- **Dietary Exposure:** Studying how these chemicals enter the food supply and assessing the level of exposure through dietary intake.
- **Long-term Health Effects:** Investigating the potential links between chronic exposure to food-related chemicals and health issues such as cancer, reproductive problems, and developmental disorders.
- **Environmental Impact:** Assessing the environmental consequences of chemical use in agriculture, including effects on soil, water, and non-target organisms.
- **Regulatory Compliance:** Ensuring that food production practices adhere to safety regulations and standards set by government agencies.
- **Alternatives and Sustainable Practices:** Researching and promoting sustainable and eco-friendly alternatives to chemical-intensive food production.
- **Consumer Awareness:** Studying how consumers perceive and respond to information about chemicals in food, and how this impacts their food choices and health.

Research in this field is essential for ensuring food safety, protecting public health, and promoting sustainable agricultural practices.

Problems Faced during the Research:

Secondary sources are very useful in research, but there are some problems associated with using these sources. The real and simplest question is always the veracity and reliability of the source from which the information is taken. Primary sources like research are very reliable and valid compared to secondary sources. These problems can be eliminated to some extent if possible

- **Validity and reliability**

Validity and reliability are very important issues in research and cannot be given. Some secondary sources are as reliable as primary sources, such as the census, because it covers the entire population.

Other sources may not be as reliable and should only be used when no other information is available. Valid means that the data represent original and valid results and were collected using scientific methods. When using secondary sources of information, care should be taken to ensure that the content is genuine and authentic

- **Personal bias**

Secondary sources are more likely to be biased than primary sources. Some secondary sources, such as personal data, may or may not be highly biased. Personal diaries and other records such as newspapers, mass media can be biased. Newspapers, magazines and websites do not use strict and well-controlled methods for documentation. Most often such writings are based on opinions and are far from facts. In these publications, writers can distort the facts to make the situation better or worse.

- **Availability of information/ Data availability**

Is another problem when using secondary sources. You have to try hard to get very accurate, scientific and valid information from secondary sources, because you hardly get such information from secondary sources. In research, secondary sources are generally preferred because of their easy availability, if it is difficult to collect information from secondary sources, the researcher should not use it.

- **Data format**

Secondary sources should also see the form of information before using it in research. The format of the data may be completely different and the researcher cannot use it in his research. Using a different format to collect data that is not relevant to the research format can produce biased and incorrect results

- **Data quality**

The quality of information is related to its accuracy, and accuracy comes from the accuracy of data collection. It depends on the source you use for your research; books and magazines can provide you with

quality information. Some secondary sources can provide quality information. Again, newspapers and magazines cannot provide good research information and should be avoided.

- **Outdated information**

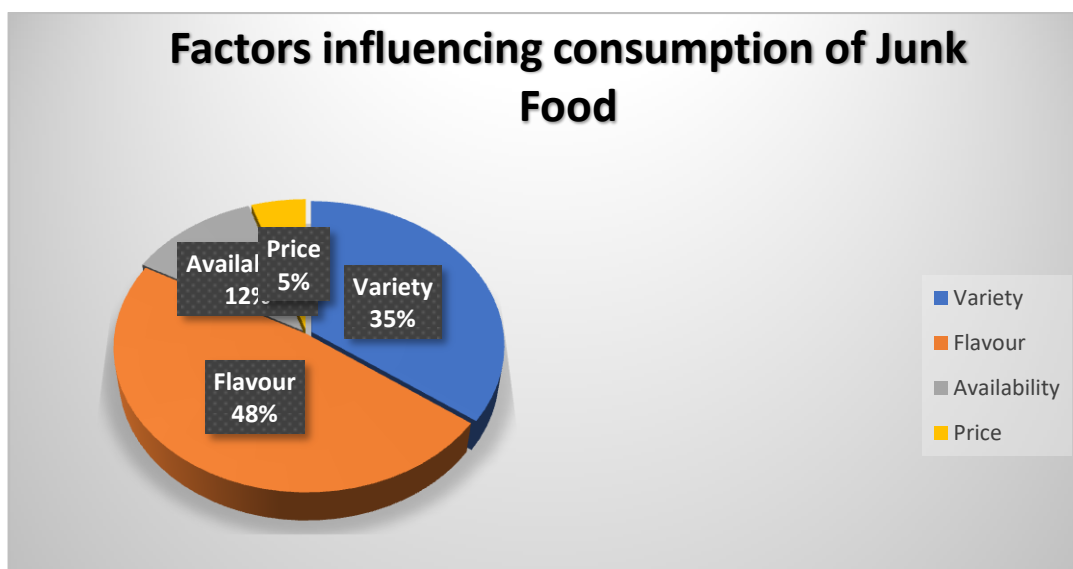
Sometimes secondary sources are available for research but they are very old. Old data is not useful in research. You cannot use a book that was written 20 years ago because the information in the book was valid and reliable at the time it was written, but is out of date in today's situation. Libraries are full of books that contain information related to your research, but you need to check the publication date to know if you can use it or not. As a university researcher, you should know how old data your university allows you to research. In most cases, a maximum of 5 years of data can be used in the study. Only historical information can be used forever, because it represents history that cannot be studied in any other way.

4. Data Collection and Interpretation

The survey was conducted online with the help of a questionnaire. The population sample includes students, working professionals. In simpler terms it includes people from various age groups and occupations. The questionnaire was circulated online through different social media platforms. This ensured quick collection of data. The questionnaire contained a set of 12 multiple choice questions which was very carefully articulated to collect the apt information which would support this research. The responses were collected and counted based on the choices specified for each question framed. The results of the same are mentioned below:

- **Which factor influences you to consume processed food?**

When people were asked which factor influenced them to consume processed food, out of 31 people who answered the questionnaire 35% of them consumed it because of the variety, 48% of them consumed it because of its flavour, 12% of them due to easy availability and a mere 5% due to its reasonable price.



- **Are you aware about the chemicals present in processed foods?**

When people were asked if they knew about the presence of chemicals in processed food 80% knew about the presence of chemicals in processed food, 9% of people were unaware of this and another 11% of people knew about this but don't care about the health effects.

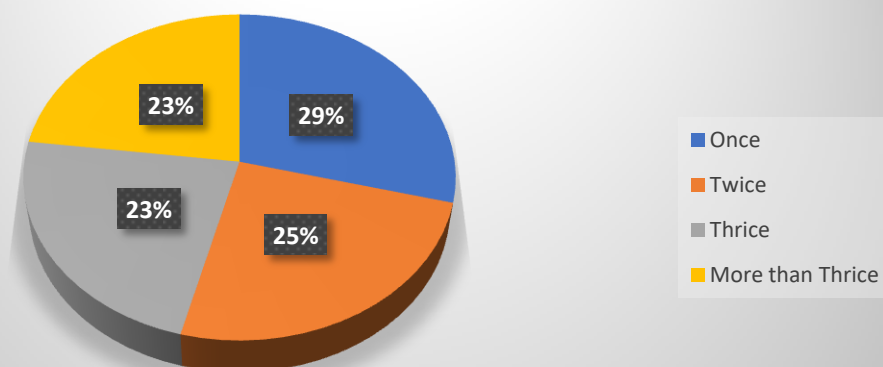
Awareness of Chemicals in Processed Foods



- **How often do you opt to consume junk/ultra processed food in a week ?**

When people were asked how often they consume junk/processed food, 29% of them consumed it once a week, 25% of them consumed junk twice a week, 23% of them consumed it thrice a week and another 23% of them consumed it more than thrice a week.

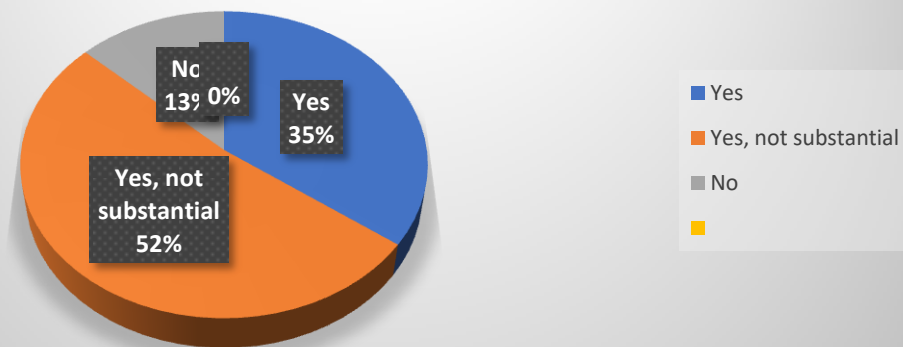
Consumption Frequency/ week



- **Have you noticed any adverse impact on your health due to junk food?**

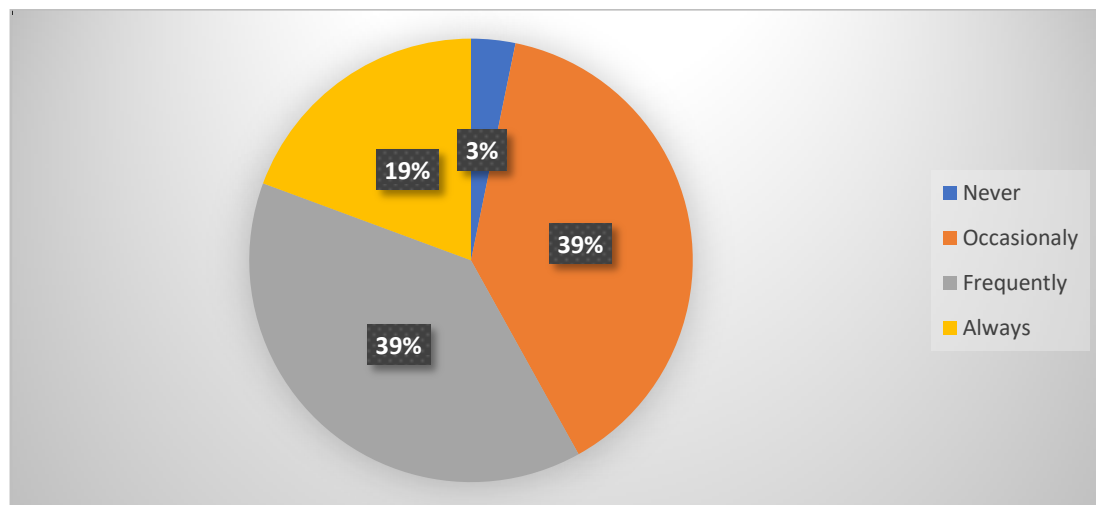
When people were asked whether they noticed any adverse impact on their health due to junk/processed food 35% of them told they noticed adverse reactions, 52% of them noticed adverse impacts but not substantial ones, and remaining 13% did not notice any adverse effects.

Adverse Impact on Health due to Junk Food



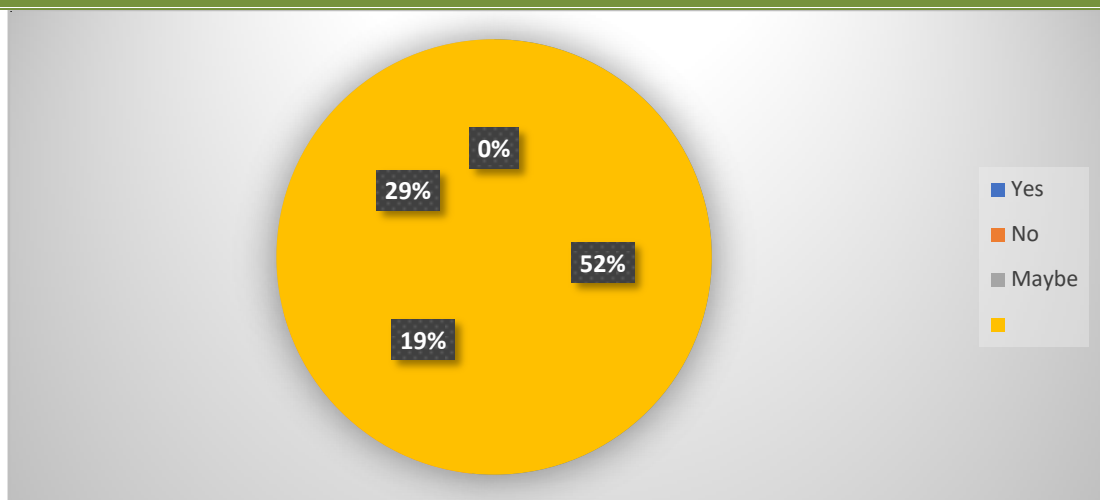
- **How often do you consider the potential health impacts of chemicals used in food production when making food choices?**

When people were asked as to how often do they consider the potential health impacts of the chemicals used in the food of their choices, out of 100%, 3% of them opt to never consider the health impacts caused due to the chemicals in the food while 39% of them choose to occasionally consider about the health impacts of the chemicals, another 39% of them frequently consider the health impacts of the chemicals and the rest 19% always do consider about the health impacts.



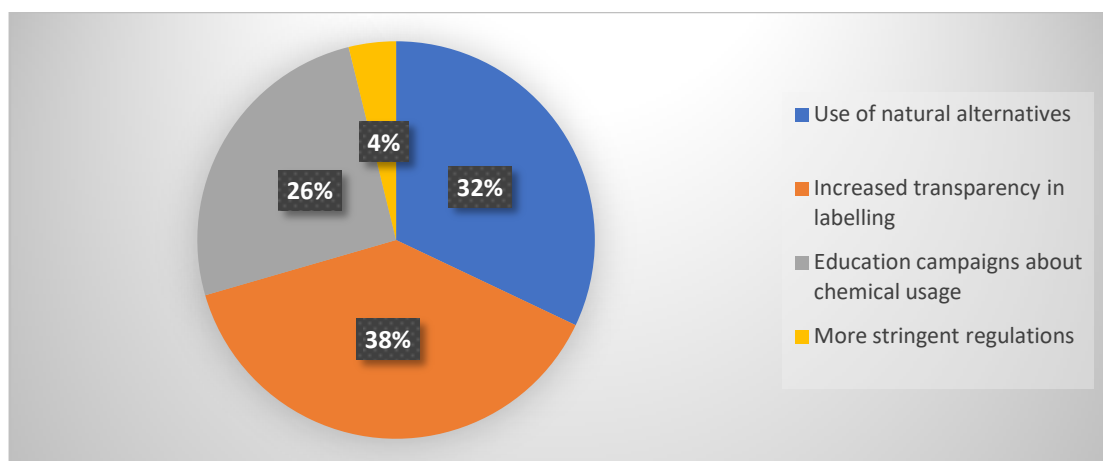
- **Would you be willing to pay a premium for food products certified to have minimal chemical residues or additives?**

When people were asked whether they willing to pay a premium for food products certified to have minimal chemical residues or additives out of 100%, 52% were willing to pay and 19% were not willing to pay premium and the rest 29% weren't sure of paying or not paying.



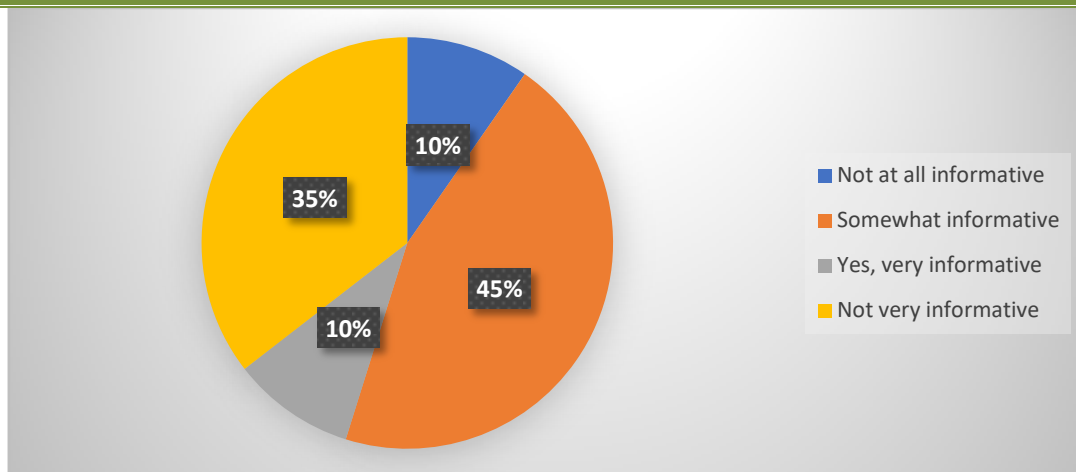
• **What improvements would you like to see regarding the use of chemicals in the food industry?**

When people were asked about the improvements they would like to see regarding the use of chemicals in the food industry out of 100%, 32% prefer improvements with the use of natural alternatives, 38% choose improvements with increased transparency in labelling, 26% of them opted improvements in the form of education campaigns about chemical usage and the rest 4% choose with going more stringent regulations.



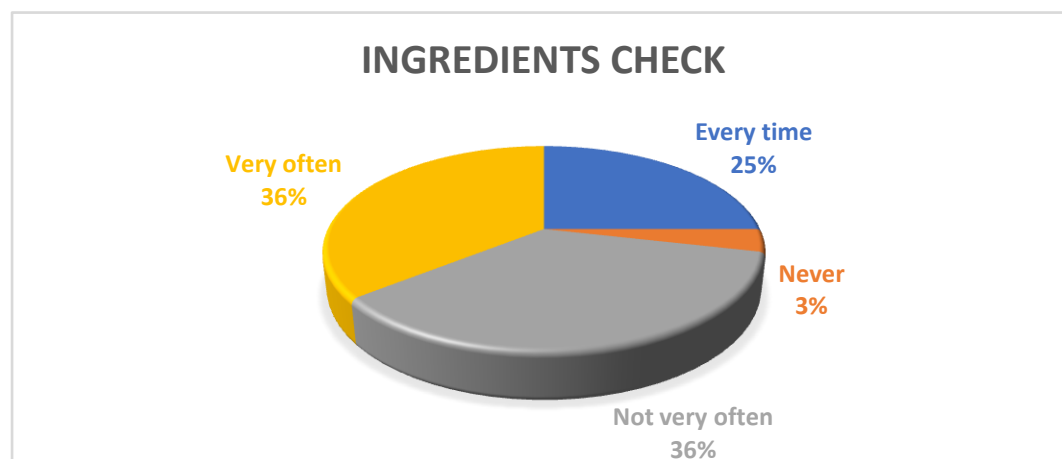
• **Do you find food labels informative enough about the chemicals used in food production?**

When people were asked whether they find the food labels informative enough about the chemicals used in the food product out 100%, 10% of them feel that food labels are not at all informative, 45% of them find it somewhat informative, 10% of them find it very informative and the rest 35% of them feel that food labels are not very informative.



- **How often do you check the ingredient list of the food products you purchase?**

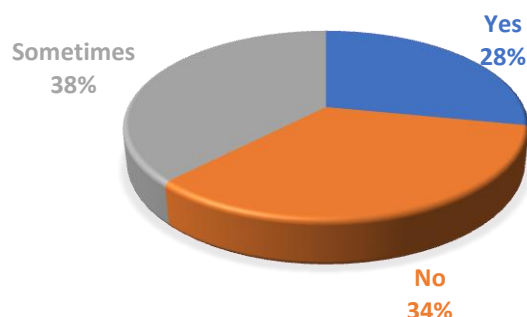
When the people were asked how often they check the ingredients list of the food products while purchasing, 25% responded with every time, 36% of the people chose that they check the ingredients very often, 36% of them chose that they do not check- not very often and only 4% of them never check the ingredients.



- **Ready to cook/ ready to eat foods will almost certainly have preservative chemicals in them. Do you check the nature of such chemicals before buying the product?**

When the respondents were asked this question, we got the response as only 28% of them always check for preservative chemicals used in the food while 34% of them doesn't check and 38% of them sometimes check for chemicals.

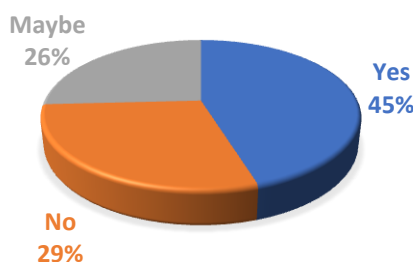
DO YOU CHECK THE NATURE OF SUCH CHEMICALS BEFORE BUYING THE PRODUCT?



- Does the presence of chemicals in an established product impact your decision to buy it?**

According to the response we got, chemicals affect the purchasing decision of 45% of the respondents while 29% of the respondents does not get influenced by the chemicals used in food while purchasing the food and 26% of the respondents can be influenced by the chemicals used in food while purchasing.

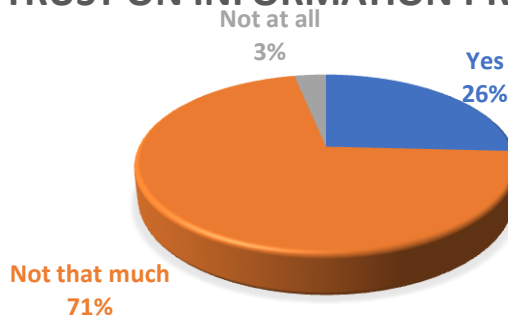
PRESENCE OF CHEMICALS IN A PRODUCT IMPACTS YOUR DECISION TO BUY IT?



- Do you trust information provided by food manufacturers regarding the safety of their products?**

According to the response we got, only 26% of the people trust the information provided the food companies while 3% of them does not believe them at all while the majority i.e., 71% of them does not have full confidence in the brands and companies provided information.

TRUST ON INFORMATION PROVIDED



The focus of this analysis was to obtain an understanding of the views of various individuals from a diverse background regarding the consumption of heavily processed food, reasons for their inclination towards processed food and the consequences or after effects on health due to over-consumption of such food.

5. Conclusion

In conclusion, chemicals play a significant role in the food industry, serving various purposes such as preservation, flavour enhancement, and texture improvement. While some chemicals are essential for food safety and quality, there are concerns regarding the excessive use of additives and preservatives, which can lead to health risks. Many of these chemicals are safe when used appropriately and in accordance with regulatory guidelines. Striking a balance between food safety, consumer preferences, and health concerns is crucial in ensuring the responsible use of chemicals in the food industry. Additionally, increased transparency and regulation are necessary to address consumer concerns and promote informed choices about food products. Ultimately, the food industry must prioritize consumer health and well-being while maintaining the quality and safety of their products.

It's essential for the food industry to prioritize consumer safety and well-being by adhering to strict regulatory standards, promoting transparency in labelling, and exploring alternative, more natural ingredients where feasible. By fostering a balance between innovation, safety, and consumer trust, the food industry can continue to provide high-quality products that meet both regulatory requirements and consumer preferences.

The research on the health impacts of chemicals in food production underscores the critical importance of stringent regulations and comprehensive monitoring systems. From pesticides to additives, these chemicals can potentially pose significant risks to human health, ranging from acute poisoning to long-term chronic diseases. Moreover, the findings emphasize the necessity of promoting sustainable and organic farming practices that prioritize the health and well-being of consumers and the environment.

To sum it up, policymakers, food producers, and consumers alike must work collaboratively to mitigate the adverse effects of chemical use in food production. This entails implementing stricter regulations, investing in research for safer alternatives, and fostering consumer awareness about the potential risks associated with chemical-laden foods. By prioritizing health and sustainability in food production, we can safeguard both present and future generations from the harmful impacts of chemical exposure.

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