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Regulatory Challenges and Public Health Implications of Adulterated Packaged Foods in India

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Abstract- The consumption of packaged foods has increased significantly in recent years, but so has the incidence of food adulteration. Adulterated packaged foods pose a significant risk to public health, as they can contain harmful substances and may lack necessary nutrients. In this paper, packaged foods have become integral part of the modern lifestyle, providing convenience and variety to consumers. However, the rise in the consumption of packaged foods has also led to an increase in cases of adulteration, posing a serious threat to public health. Adulterated packaged foods not only deceive consumers but also have long-term health consequences. This paper aims to analyze the regulatory challenges and public health implications of adulterated packaged foods in India.

Index Terms- Adulteration, Packaged foods, India, Food safety, FSSAI (Food Safety and Standards Authority of India)

I. INTRODUCTION

Food adulteration is a social evil and major problem of every society. In India as also in many other developing countries food accounts for a large part of the family budget. Every consumer wants to get the maximum quantity of a commodity for as low as prices as possible.

India is the country of farming. Food and water are not only the elixir of life, but these valuable products are worshipped as god in India. In spite of this, fact, the food adulteration has become rampant in India. Fruits, vegetables might be contaminated, soft drinks and dairy products too and all this so that producer scan save a few rupees.

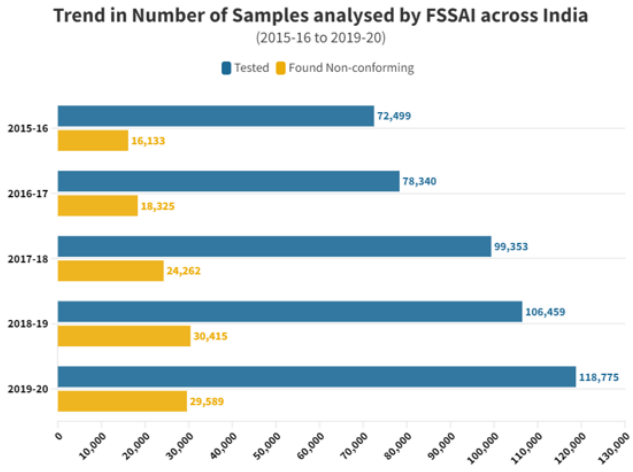

Figure: 1 Trends in the number of food samples analysed by FSSAI across India from 2015-16 to 2019-20.

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. But pesticide residues are not the only problem. Many products used in everyday cooking, such as cottage cheese and clarified butter, are adulterated. Further, Vanaspati is used as an adulterant for ghee. Ergot is used as an adulterant for cereals. Chalk-powder is used as an adulterant for flour. Chicory is used as an adulterant for coffee. Papaya seeds are used as an adulterant for pepper. Brick powder is used as an adulterant for chilly-powder. Tamarind seed powder is used as adulterant for coffee. Wood powder is adulterated for turmeric and dhaniya powder.

The trends in the number of food samples analyzed by FSSAI across India from 2015-16 to 2019-20. The data shows a general upward trend in the number of samples analyzed, with a significant increase from 72,499 in 2015-16 to 118,775 in 2019-20. This suggests that FSSAI is increasingly active in monitoring food safety across the country.

It is important to note that the data also shows a fluctuation in the percentage of samples found to be non-conforming to food safety standards. The percentage of non-conforming samples ranged from 22% in 2015-16 to 28.6% in 2018-19, before declining to 25% in 2019-20. This suggests that while FSSAI is analyzing more samples, the overall quality of food products may not be improving at the same rate

In the fiscal year 2019-20, over 1.18 lakh samples were tested, with nearly 18% of them originating from Uttar Pradesh. A significant number of samples were also analyzed from

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Madhya Pradesh, Gujarat, and Tamil Nadu, with respective totals of more than 15,000, 10,000, and 10,000. These four states collectively accounted for more than half of all the samples analyzed in India during this period. However, the number of samples tested varied across states. Uttar Pradesh has consistently taken the lead in sample analysis for the past five years, with over 10,000 samples being tested each year. Unfortunately, Uttar Pradesh also reported the highest percentage of non-conforming or adulterated samples, increasing from 42% in 2016-17 to approximately 59% in 2019-20.

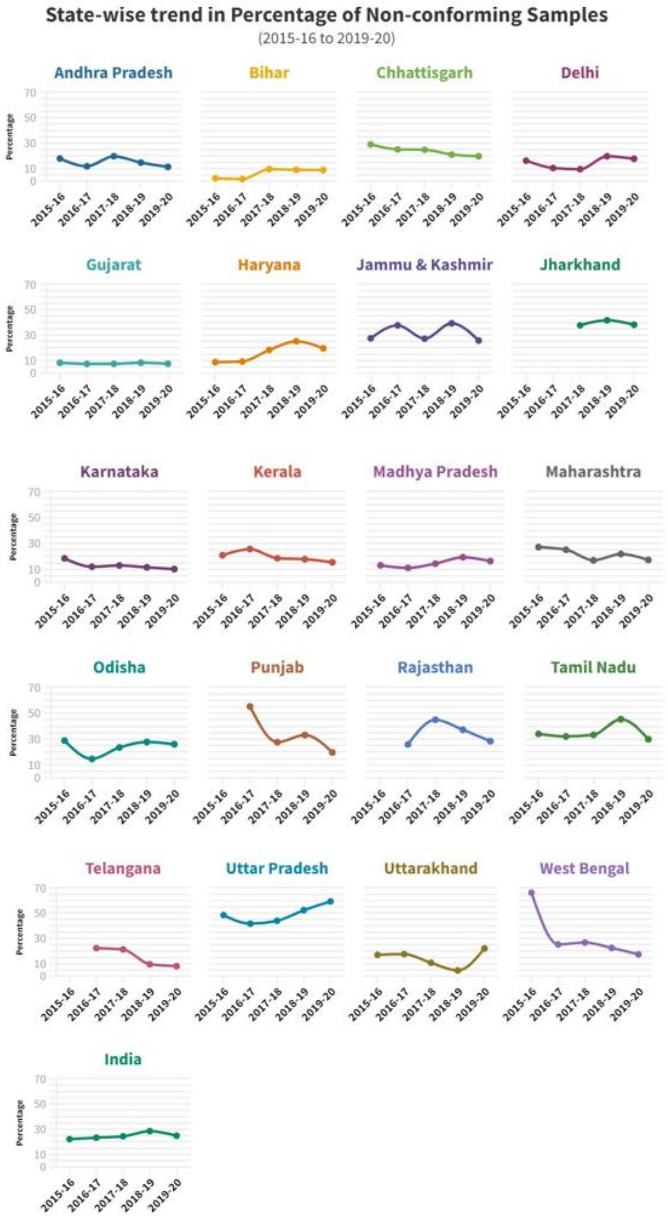

Figure: 2 State wise Percentage of non-confirming samples which doesn't meet the fssai standards

Over the past five years, there has been a gradual decrease in the percentage of non-conforming samples in Telangana, Kerala, Karnataka, and Chhattisgarh. These states, along with the rest of the country, have been actively increasing the scale of sample analysis, with the exception of Maharashtra and Andhra Pradesh. In contrast, Rajasthan, Jharkhand, and Jammu and Kashmir have consistently reported more than a quarter of their samples to be non-conforming, while Punjab and Odisha have also had a high percentage (over 20%) of non-conforming samples throughout the same time period (2015-16 to 2019-20).

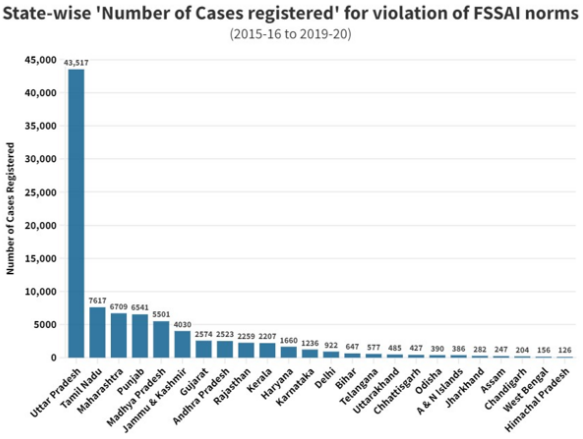

Figure: 3 State wise Cases registered for Violation of fssai norms

A staggering total of 91,636 cases have been filed in the country for violating the standards set by the FSSAI, encompassing both civil and criminal matters. These cases have arisen from rigorous sample analyses and thorough inspections. Remarkably, an overwhelming majority of these cases, comprising an astounding 47.5%, took place in Uttar Pradesh, amounting to a staggering 43,517. Additionally, the states of Tamil Nadu, Maharashtra, Punjab, and Madhya Pradesh each saw upwards of 5,000 cases registered, accounting for nearly a third of all cases over this five-year period.

1. What is Adulteration?

Adulteration of food cheats the consumer and poses a serious risk to health. Adulterant means any material which is or could be employed for making the food unsafe or substandard or misbranded or containing extraneous matter. Adulterated food is dangerous because it may be toxic and can affect health and it could deprive nutrients essential for proper growth and development.

Adulterants can broadly be classified into three categories:

Intentional Adulterants

The adulterants are added as a deliberate act with intention to increase profit. They add sand, marble, stones, mud, etc.

Incidental Adulterants
Adulterants are found in food due to negligence, ignorance or lack of proper facilities. It includes pesticide residues, droppings of rodents, etc.

Metallic Contaminants
When the metallic substances are added intentionally or accidentally such as Arsenic, Lead, etc.

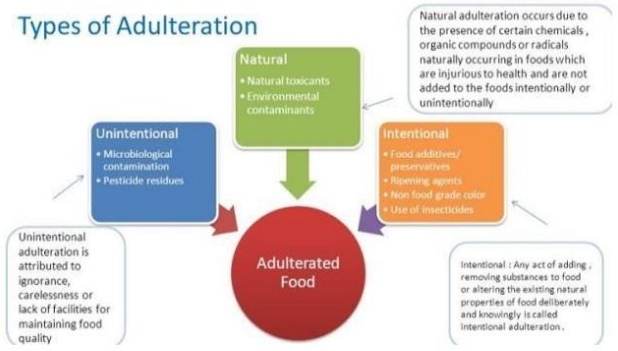

Figure: 4 Types of Adulterants - Intentional Adulterants, Incidental Adulterants, and Natural Contaminants.

India is one of the largest consumers of packaged foods, with a market size of over $50 billion. The Food Safety and Standards Authority of India (FSSAI) is the regulatory body responsible for ensuring the safety and quality of packaged foods in the country. However, despite strict regulations, cases of adulteration in packaged foods continue to rise, leading to serious health implications for consumers.

Food adulteration is the act of intentionally adding inferior or harmful substances to food products for economic gain. The practice of food adulteration has been prevalent for centuries, but with the rise in demand for packaged foods, it has become more widespread. Packaged foods, which include a variety of processed, preserved, and ready-to-eat foods, have become an integral part of modern diets. However, the increase in consumption of packaged foods has also led to an increase in the incidence of food adulteration, posing a significant threat to public health Due to reasons including hectic schedules, greater disposable incomes, and increased exposure to global culinary trends, India's packaged food business has grown significantly. But this expansion has also raised a number of questions about nutrition, food quality, and dishonest marketing techniques.

Adulterated packaged foods are a global problem, affecting both developed and developing countries. The World Health Organization (WHO) estimates that one in ten people falls ill every year from consuming contaminated food, leading to approximately 420,000 deaths annually. Adulterated packaged foods can contain substances such as chemicals, toxins, and pathogens, which can cause acute or chronic health problems. Additionally, the lack of necessary nutrients in adulterated foods can also lead to malnutrition and other health issues.

Food adulteration is a serious public health problem connected with food safety problems in the market. That is to say, food with the addition of useless substances harmful or unnecessary to human beings results in a decrease in quality. Chemicals, poor-quality products or physical and inert agents are some of the common adulterants added to foods some of the chemicals that are used as adulterants in food have serious consequences for consumer health, including cancer.

The quality of ingredients used in packaged foods is one of the main issues. Products frequently have high quantities of sodium, bad fats, added sugars, and toxic additives and preservatives in excess. These substances have been linked to a number of health problems, such as diabetes, obesity, and cardio vascular dis orders. Inadequate labeling and deceptive claims can make it more difficult for customers to make wise decisions.

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food related issues in various Ministries and Departments. FSSAI has been created for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption

2. Establishment of the Authority
Ministry of Health & Family Welfare, Government of India is the Administrative Ministry for the implementation of FSSAI. The Chairperson and Chief Executive Officer of Food Safety and Standards Authority of India (FSSAI) have already been appointed by Government of India. The Chairperson is in the rank of Secretary to Government of India.

According to the FSS Act, 2006, one of the primary responsibilities of FSSAI is to fulfill the following duties:

- Develop Regulations to establish standards and guidelines for food products, as well as specify an effective enforcement system for these standards.
- Establish mechanisms and guidelines for accrediting certification bodies that certify the food safety management systems of food businesses.
- Lay out procedures and guidelines for accrediting laboratories and announcing the list of accredited labs.
- Offer scientific advice and technical assistance to the Central and State Governments in the development of policies and regulations related to food safety, regardless of direct or indirect impact

Some companies adulterate food as a consequence of intentional actions, often designed to increase profitability or cut corners. Others end up adulterating food unintentionally because of lack standards and regulations. Either way, adulterated food costs the Indian economy around 1.17 lakh crore and comes with some significant risks for human consumption

Figure: 5 Food Contamination diseases

Food Impurity
First, food may end up being "impure" or may contain ingredients it wasn't intended to contain. This could be anything from residue of pesticides to metal or glass, or even a completely different substance.

Contamination
Adulterated food may have a higher likelihood of becoming contaminated at a later date, such as decomposing or becoming infected with bacteria.

Allergens
Mis labeled or misrepresented products may contain allergens that consumers aren't aware of. If the wrong person consumes one of these products, they may suffer a severe allergic reaction.

Nutritional Needs
Adulterated food may also lead people to believe they're getting nutritional needs when they aren't. This is especially important for infants, children, and adolescents, who need adequate intake and sufficient vitamins and minerals for healthy growth

Worldwide, 57% of individuals have had health issues as a result of consuming adulterated food. About 22% of foods are adulterated annually, according to estimates. Human health is adversely affected by these adulterants, and when food products are tampered with, consumers lose faith in the product's quality and safety, which lowers demand and slashes sales

Cases on Food Adulteration
Hyderabad tops the list
According to the National Crime Records Bureau (NCRB) data for 2022, Hyderabad reported the highest number of food adulteration cases amongst 19 major Indian cities, with a staggering 246 cases. This highlights a concerning trend in food safety within the city.

Spices and dairy under scrutiny: Adulteration of spices like garlic paste, chili powder, and turmeric, along with dairy products like milk and paneer, seem to be common concerns across various regions.

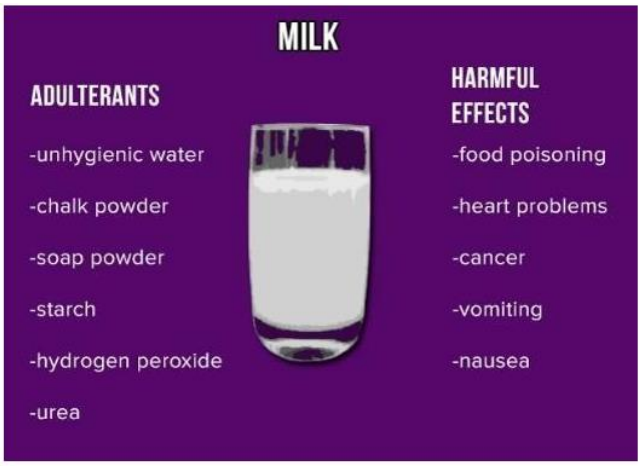

Figure: 6 Harmful effects due to milk adulterants

Ice Cream Adulteration Racket Busted in Hyderabad
Authorities in Hyderabad dealt a blow to a major ice cream adulteration racket in November 2023. The racketeers were using synthetic flavours and stabilizers in their products, posing potential health risks to consumers

Man Arrested for Milk Adulteration in Delhi
In December 2023, a man in Delhi was arrested for allegedly diluting buffalo milk with water and selling it as pure milk. This incident underscores the need for stricter vigilance against milk adulteration, a persistent issue in India.

Ice Cream Adulteration Racket Busted in Hyderabad
In November 2023, authorities in Hyderabad busted a racket manufacturing and selling adulterated ice cream using synthetic flavours and stabilizers. This case highlights the vulnerability of processed food products to adulteration.

Tea Powder Adulteration in Tamil Nadu
In October 2023, officials in Tamil Nadu seized over 500 kg of adulterated tea powder containing harmful chemicals and artificial colouring.

This incident emphasizes the need for consumer awareness and vigilance when purchasing everyday food items.

Spurious Honey Seized in Maharashtra
Food inspectors in Maharashtra seized over 500 liters of spurious honey, raising concerns about adulteration in this popular natural sweetener. The fake honey was reportedly mixed with sugar syrup and artificial colouring, posing potential health risks to consumers. This incident underscores the need for stricter quality control checks throughout the honey supply chain.

Forms of food fraud: Food fraud encompasses many scams, each with unique characteristics and effects.

Substitution
Food fraud substitution involves replacing valuable ingredients with a more valuable or inferior substitute, often without disclosure. This practice is driven by a desire to reduce costs while maintaining the appearance of quality. For example, in the seafood industry, expensive species such assnapper or wild salmon can be replaced by cheaper farmed alternatives. The risk here is broader than financial fraud; substituted ingredients may have different nutritional value or may cause allergens, posing a risk to consumers with dietary restrictions or allergies. Identifying these substitutes is a challenge for both regulators and consumers, as their identification often requires sophisticated testing methods.

Tampering
Tampering refers to the deliberate alteration of a product in a way that is deceptive and often harmful. This can include adding unauthorized substances to enhance a product's weight, appearance, or flavor. For instance, the illegal addition of dyes to spices to make them appear fresher or more potent is a form of tampering. These additives can be harmful if they are not food-grade or approved for consumption.

Tampering can also involve removing beneficial components from a product, such as extracting high- quality ingredients and replacing them with cheaper, lower-quality ones. Such practices not only deceive the consumer but can also result in health hazards if the tampering involves toxic or harmful substances.

Misbranding
Misbranding in food fraud occurs when a product is falsely labeled to misrepresent its origin, in gredients, or nutritional content. This can range from inaccuracies in listing the source of the product, such as mis labeling the country of origin, to claiming false health benefits or organic status. Misbranding can mislead consumers seeking products that align with their ethical, dietary, or health preferences. For example, a product labeled as "gluten-free" that contains gluten can pose serious health risks to individuals with celiac disease. Misbranding undermines the integrity of food labeling standards and canerode consumer trust in food labeling and certification systems.

Counterfeiting
Counterfeiting in the food industry involves the replication of popular or high-value food products and packaging to deceive consumers into thinking they are purchasing authentic goods. This practice capitalizes on the brand value and reputation of established products but often falls short in quality, safety, and nutritional value. Counterfeit products may contain inferior or harmful ingredients and are typically produced without adherence to safety regulations. This not only poses significant health risks to consumers but also damages the brand reputation of the original manufacturers and leads to financial losses for both consumers and legitimate producers. Counterfeiting in the food sector is a global issue, requiring coordinated efforts for detection and enforcement across international boundaries.

Long Term Implications

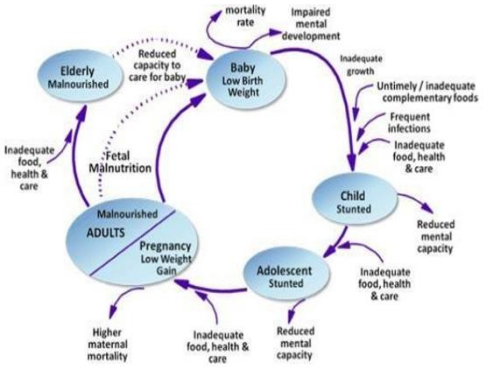

Figure: 7 Long term problems due to food adulterants

II. LITERATURE REVIEW

Recent studies have shed light on the pervasive issue of adulteration in packaged food products, particularly within the context of India. Agarwal et al. (2019) conducted a comprehensive investigation, revealing that a staggering one-third of packaged food items in India exhibited signs of adulteration. The most commonly adulterated products were identified as milk and dairy products, followed closely by edible oils and spices. This alarming prevalence underscores the urgent need for a thorough understanding of the dynamics contributing to this issue.

The study conducted by Kaur and Singh (2018) delved into the challenges faced by the Food Safety and Standards Authority of India (FSSAI) in its regulatory efforts against adulteration in packaged foods. The findings highlighted several critical hurdles, including inadequate infrastructure, a shortage of trained personnel, and the complex involvement of multiple agencies. These challenges not only impede effective regulation but also raise concerns about the overall integrity of the food supply chain.

The high incidence of adulteration in milk and dairy products, as identified by Agarwal et al. (2019), is particularly troubling given the central role of these items in the daily diet of millions. Adulterants in such essential products pose serious threats to public health and necessitate urgent intervention strategies. The study emphasizes the importance of targeted regulatory measures and heightened surveillance to safeguard the quality of these staple food items.

Additionally, the focus on edible oils and spices as commonly adulterated products underscores the breadth of this issue across diverse food categories. These findings raise questions about the adequacy of current quality control measures and necessitate a deeper exploration of the specific challenges associated with these product types.

The research collectively points to a multifaceted problem that demands a holistic approach for effective mitigation. Addressing the identified challenges, such as enhancing infrastructure, training personnel, and streamlining regulatory processes, is imperative for the FSSAI to fortify its role in ensuring the safety and authenticity of packaged foods.
As the prevalence of adulteration in packaged foods continues to pose risks to public health, there is anevident need for ongoing research to uncover the root causes, assess the efficacy of current regulatory frameworks, and propose targeted solutions to safeguard the integrity of the food supply chain in India and beyond.

III. METHODOLOGY

This paper is based on a review of existing literature and reports on adulteration in packaged foods in India. The data is gathered from various sources, including government reports, research articles, and news articles. The paper also includes an analysis of the regulatory framework and its effectiveness in addressing the issue of adulteration in packaged foods.

The Objectives

- To examine the regulatory framework and challenges faced by the FSSAI in ensuring food safety in India.
- To assess the public health implications of consuming adulterated packaged foods, including short-term and long-term health consequences.
- To identify potential solutions and strategies for mitigating the issue of food adulteration in packaged foods in India

IV. ANALYSIS FINDINGS & DISCUSSION

The Food Safety and Standards Authority of India (FSSAI) is the regulatory body responsible for ensuring the safety and quality of food products in India. However, the implementation of food safety regulations and the detection of adulteration in packaged foods have been challenging for the FSSAI. The lack of proper infrastructure, limited resources, and corruption have hindered the effective implementation of regulations. This has allowed unscrupulous manufacturers and traders to continue adulterating packaged foods without fear of consequences. The public health implications of adulterated packaged foods are significant. Consumption of these foods can lead to various health issues such as food poisoning, allergies, and long-term health effects. The most vulnerable groups are children, pregnant women, and the elderly, who are more susceptible to the harmful effects of adulterants.

The findings from this paper highlight the need for stricter regulations and better enforcement to address the issue of adulteration in packaged foods in India. The FSSAI needs to work closely with state governments to improve the infrastructure and resources for food safety inspections. There should also bea focus on creating awareness among consumers about the risks of consuming adulterated food. Consumers' health, it is crucial to regularly check foods for the presence of various adulterants. While adulteration makes money for sellers quite easily, it also has the potential to ruin countless lives. These incidences of food quality degradation, which result in gradual poisoning and, in severe circumstances, can result in death, are incredibly widespread these days. Therefore, combating the scourge of food adulteration calls for a comprehensive strategy to protect our food supply, including government agencies, food producers, and consumers as well.
To address the complexity of supply chains, a sense of transparency needs to be incorporated into them. Appropriate documentation and standardized procedures can help with this. Additionally, consumers must be taught about the risks of food adulteration and given the power to make wise decisions. Campaigns to spread knowledge about the value of reading labels and purchasing from reliable sources can be effective. By being watchful and knowledgeable about the food they eat, consumers may prevent food adulteration The two most popular methods of wireless power transfer are far field and near field. Magnetic fields are used in near field, also known as non-radiative techniques, to transmit energy over small distances. When two metal electrodes interact capacitively, an inductive field is produced between the coils. Radiative or far field technologies include those like power beaming [9] that use highly concentrated beams of electromagnetic radiation.

Awareness Campaign

Figure: 8 Digital Campaign by fssai

V. CONCLUSION

The consumption of packaged foods has become an integral part of the modern lifestyle in India, but the rise in the consumption of packaged foods has also led to an increase in cases of adulteration, posing a serious threat to public health. The food safety and standards authority of India (fssai) is the regulatory body responsible for ensuring the safety and quality of packaged foods in the country, but the implementation of food safety regulations and the detection of adulteration in packaged foods have been challenging for the fssai. The lack of proper infrastructure, limited resources, and corruption have hindered the effective implementation of regulations. The public health implications of adulterated packaged foods are significant, and consumption of these foods can lead to various health issues such as food poisoning, allergies, and long-term health effects. The most vulnerable groups are children, pregnant women, and the elderly, who are more susceptible to the harmful effects of adulterants.

To address these challenges, the objectives of this document were to examine the regulatory framework and challenges faced by the fssai in ensuring food safety in India, assess the public health implications of consuming adulterated packaged foods, and identify potential solutions and strategies for mitigating the issue of food adulteration in packaged foods in India. The findings highlight the need for stricter regulations and better enforcement to address the issue of adulteration in packaged foods in India. The fssai needs to work closely with state governments to improve the infrastructure and resources for food safety inspections. There should also be a focus on creating awareness among consumers about the risks of consuming adulterated food.

In conclusion, combating the scourge of food adulteration calls for a comprehensive strategy to protect our food supply, including government agencies, food producers, and consumers as well. Ongoing research is needed to uncover the root causes, assess the efficacy of current regulatory frameworks, and propose targeted solutions to safeguard the integrity of the food supply chain in india and beyond.

Recommendations

Strengthen the Regulatory Framework

The FSSAI needs to enhance its regulatory framework to ensuret hat food safety regulations are effectively implemented and enforced. This includes improving the infrastructure and resources for food safety inspections, training personnel, and streamlining regulatory processes

Increase Awareness among Consumers

Consumers need to be educated about the risks of consuming adulterated food and given the power to make wise decisions. Campaigns to spread knowledge about the value of reading labels and purchasing from reliable sources can help consumers make informed choices

Improve Supply Chain Transparency

To address the complexity of supply chains, a sense of transparency needs to be incorporated into them. Appropriate documentation and standardized procedure.

Increase Penalties for Adulteration

The government needs to increase penalties for adulteration to deter unscrupulous manufacturers and traders from continuing to adulterate packaged foods without fear of consequences

Encourage Industry Self-Regulation

The food industry needs to take responsibility for ensuring the safety and quality of their products. Encouraging industry self-regulation can help to prevent adulteration and improve food safety. By implementing these recommendations, India can take significant steps towards mitigating the issue of food adulteration in packaged foods and ensuring the safety and health of its citizens.

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