DOI: https://doi.org/10.53350/pjmhs221651203

ORIGINAL ARTICLE

The Assessment of Forensic Disguising Markers for Food Poisoning and their Control Measures. A Health Awareness Study

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ABSTRACT

Aims and objectives: To uncover the disguising markers of food poising and their Control Measures to spread public awareness for betterment of human health through forensic applications.

Materials and Methods:

Study design: Present study was conducted from December 2021to June 2022 in Lahore.

Sample size and collections: Various food samples were collected from 10 different restaurants. 5 different food products were collected from each restaurant for analysis of biological markers while non-biological markers were observed on the location at a data collection Performa.

Chemical analysis: In case of food poising the forensic chemical analysis are based on biochemical and physiological tests such as bacterial Count in collected food samples through plate count method and spectrophotometric (turbid metric) analysis.

Determined Parameters: In this study both biological parameters, such as bacterial Count and non-biological parameters like, hygiene, quality of water, utensils quality, cooking style and cooking environment were considered.

Results presentations: Raw data of each parameter was represented bio-statistically with the applications of SPSS in which regressions of standard mean deviation and significant ($P<0.05$) were considered comparatively.

Results: It has seen that mostly all food samples taken from different restaurants have bacterial flora. These bacterial count may be so harmful for human life. It was concluded by considering non-biological parameters that the hygienic conditions, cooking place and way of cooking were not according to the standard health levels recommended by food authority. Especially quality of raw material and utensils were not standardized. All the results were significant as compared with the given standard levels of each parameter. A remarkable changes were noted in different parameters regarding food quality for further elaboration results are represented graphically in fig-1.

Conclusion: Infectious organisms including bacteria, viruses and parasites or their toxins are the most common causes of food poisoning. Infectious organisms or their toxins can contaminate food at any point of processing or production. Contamination can also occur at home if food is incorrectly handled or cooked.

Keywords: Bacteria, Viruses, Parasites, Contamination, Food Poisoning.

INTRODUCTION

Food poisoning, often known as a foodborne sickness, is an ailment brought on by consuming tainted food. The most frequent causes of food poisoning are infectious organisms, including bacteria, viruses, and parasites, or their toxins [9]. The majority of the time, acute food poisoning which manifests as an abrupt and transient illness occurs. The majority of persons with food poisoning recover on their own without medical intervention in less than a week. Food poisoning can occasionally continue longer or result in significant problems [8]. Food fraud is a serious offence that can take many different forms and is motivated by financial gain. Food items can be defrauded by being diluted with comparable, illegal bulk substances or above legal limits, having illegal chemicals added that have health-related effects, having undeclared ingredients added, or having illegal compounds added [1].

Consequently, consumers experience a loss of trust in the reliability of food products, labels, producers, and regulatory agencies that leads to changes in behavior and willing to buy frauded or related products [5]. Due to the significance of food fraud in the contemporary globalized and rapidly expanding food industry, this chapter explains the basic ideas, causes, and consumer-level effects of food frauds as well as the most popular and inventive ways to adulterate food for financial advantage [6]. The use of agrochemicals, insecticides, veterinary medications, unauthorized food additives and adulterants, environmental sources, or packaging materials are the most common causes of chemical contamination in foodstuffs. Pesticides, detergents, as well as metallic mercury, cyanides, nitrates (III), and caustic or oxidizing compounds, are nevertheless widespread in food today despite increased contamination with psychoactive substances, drugs of abuse, and medications [7].

At the same time that afflicted attendees of the event, any food handlers from the event who are exhibiting the same symptoms or have recently had an enteric infection should be questioned for a fecal sample [2]. Ask the workers and management if the food was freshly cooked for the event or if it had been premade and reheated. This data could show improper methods for managing food during preparation, storage, temperature management, and transportation. The inquiry must concentrate on whether food handling procedures may have contributed to the outbreak if an organism or pathogen has been discovered from food or feces samples [3]. Food Safety Forensics is a methodology that makes use of food safety concepts, detecting techniques, and processes to crack cases, as well as to confirm and record cases of food poisoning or adulteration for both people and animals [4].

It specifies a sequential tracking and tracing of investigation stages, technologies, and detection techniques and is specialized to food microorganism poisoning [10]. It also provides a disciplined approach for determining the source and contributing factors of food poisoning. The approach of employing food science procedures and concepts to solve crimes or to confirm and record adulterated food poisoning in both people and animals is known as food science forensics. Life and general health are the biggest hazards to consumers in food safety instances, along with adulteration, mislabeling, a lack of regulatory control, and large-scale international economic fraud [11]. Acute toxicity tests are quick assessments of the results of exposure to substances at relatively high concentrations. In most cases, the measurement endpoint represents the level of lethality. On the other hand,

chronic toxicity studies are often longer-term assessments that assess the consequences of exposure to comparatively lower, less hazardous amounts. The measuring objective for a chronic toxicity test is either a sub- lethal effect or both a lethal and sub- lethal impact [12].

MATERIALS AND METHODS

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RESULTS

Table-1: Biological parameters of food samples collected from 10 different restaurants.

Bacteria	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10
Salmonella Enteritidis	–	–	–	–	–	–	+	–	–	–
Staphylococcus aureus	–	–	–	–	+	–	–	+	–	–
• Shigella	–	–	–	+	–	–	–	–	–	–
Hepatitis A	–	+	–	–	–	–	–	–	–	+
Bacillus cereus	–	–	–	+	–	–	–	–	+	–
E. coli	+	–	–	–	–	+	–	+	–	–

Table-2: Non-Biological parameters of food samples collected from 10 different restaurants.

Parameters	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10
Hygiene	x	x	✓	x	x	✓	x	x	x	x
Quality of water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
• Utensils quality	✓	✓	x	✓	✓	x	✓	x	✓	x
Cooking style	✓	✓	x	✓	x	✓	x	✓	x	✓
Cooking environment	x	x	x	✓	x	✓	x	✓	✓	x
Quality of raw food	x	✓	✓	x	✓	✓	✓	x	x	x

Table-3: Biological and Non-Biological parameters percentage mean standard deviations

Restaurants	Biological Parameters % Mean ± SD	Non-Biological parameters % Mean ± SD	P<0.05
R-1	1.0± 0.01	3.1± 0.03	0.03
R-2	2.0± 0.01	2.0± 0.01	0.01
R-3	0.0± 0.01	3.0± 0.02	0.02
R-4	2.0± 0.02	2.0± 0.01	0.01
R-5	1.0± 0.00	3.0± 0.01	0.01
R-6	1.0± 0.01	1.0± 0.01	0.01
R-7	1.0± 0.01	3.0± 0.03	0.03
R-8	2.0± 0.01	3.0± 0.02	0.02
R-9	1.0± 0.01	3.0± 0.03	0.03
R-10	1.0± 0.01	4.2± 0.04	0.04

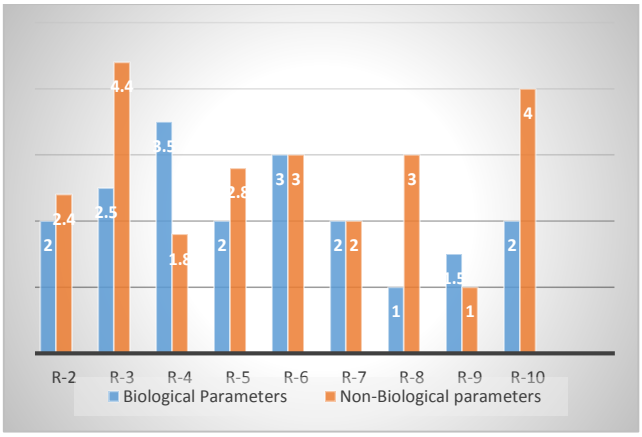

Fig-1: Graphically Biological and Non-Biological parameters percentage Mean standard deviations

In current study biological parameters, such as bacterial Count and non-biological parameters like, hygiene, quality of water, utensils quality, cooking style and cooking environment were considered for the Assessment of Forensic Disguising Markers for Food Poisoning and their Control. The percentage levels of mean standard deviations of Biological and Non-Biological parameters regarding bacterial Count, hygiene, quality of water, utensils quality, cooking style and cooking environment (1.0± 0.01, 2.0± 0.01, 0.0± 0.01, 2.0± 0.02, 1.0± 0.00, 1.0± 0.01, 1.0± 0.01, 2.0± 0.01, 1.0± 0.01, 1.0± 0.01), (3.1± 0.03, 2.0± 0.01, 3.0± 0.02, 2.0± 0.01, 3.0± 0.01, 1.0± 0.01, 3.0± 0.03, 1.0± 0.01, 3.0± 0.03, 3.0± 0.02) were measured for each food sample collected from different restaurants.

It has seen that mostly all food sample taken from different restaurants have bacterial flora. These bacterial count may be so harmful for human life. It was concluded by considering non-biological parameters that the hygienic conditions, cooking place and way of cooking were not according to the standard health levels recommended by food authority. Especially quality of raw material and utensils were not standardized. All the results were significant as compared with the given standard levels of each parameter. A remarkable changes were noted in different parameters regarding food quality for further elaboration results are represented graphically in fig-1.

DISCUSSION

Food Safety Forensics is a methodology that makes use of food safety concepts, detecting techniques, and processes to crack cases, as well as to confirm and record cases of food poisoning or adulteration for both people and animals [13]. It is specialized to food microorganism poisoning, and it provides a disciplined approach for determining the source and aggravating factors of food poisoning. It also specifies a series of "tracking and tracing" investigation techniques, technologies, and detection instruments.

The use of strong food science and safety concepts along with a structured technique employed in the forensic professions today, however, may swiftly and effectively identify the underlying issue and offer a thorough audit trail of evidence [14].

Recent food scares, food producer malfeasance, religious concerns, food allergies, and GMOS have greatly increased public knowledge of the ingredients used to make food items. Update and difficulties in food and forensic molecular identification [6]. Additionally, food poisoning and other foodborne illnesses are among the biggest global public health issues. One in ten individuals, or 600 million people worldwide, acquire an illness each year as a result of eating tainted food, according the WHO. Bacteria that can cause disease among the microorganisms include those with a variety of virulence factors, which include toxins that can be created in food or after the pathogen has colonized the digestive system [9].

Endotoxins, also known as lipopolysaccharides, are molecules that make up the outer membrane of Gram-negative bacteria. They are thought to be the bacteria's most significant antigens, and they are released into the medium as a result of several activities such cell lysis and division [5]. Endotoxin shock and tissue damage are also possible outcomes of this endotoxin. Type I toxins like the super antigens generated by Staphylococcus aureus and Streptococcus pyogenes, alter the host's cells without internalizing in the cells. Type II toxins i.e. Hemolysis and phospholipases are included in this class of toxins; they are known to produce pores in the host cell membranes or to completely destroy them. The pathogen is able to enter the host cell thanks to this virulence factor [10].

III kind of toxins because of their binary form, are referred to as A/B. Fraction B serves as the unit that binds to the cell's receptor, whereas fraction A is the unit that contains enzymatic activity, which, depending on the toxin and its mode of action, causes cell harm [3]. Microorganisms have nutritional needs; the majority of them require external supplies of nitrogen, energy, minerals, vitamins, and associated growth factors. If the correct conditions are present for their development, they will meet these needs in our diet. Amino acids are the main sources of nitrogen utilized by heterotrophic bacteria. Numerous additional nitrogen molecules might fulfil this purpose for different sorts of organisms [2].

The temperature range in which microorganisms may grow has a minimum and maximum. Therefore, in addition to influencing the pace of growth, ambient temperature also affects the genera of microorganisms that will emerge and the level of detected microbial activity [9]. Poisoning and infection are two categories for foodborne illnesses. Toxins created by pathogens, which can be detected in food even if the disease is not present, can induce poisoning when consumed [1]. These toxins can be chemical, biological, or pathogen-made. The consumption of food containing live germs results in infection. Furthermore, consuming food contaminated with bacteria that multiply and create a toxin within the body can result in a toxic illness, formerly known as a toxin-mediated infection [12]. In present study all results were significant as compared with the given standard levels of each parameter. A remarkable changes were noted in different parameters regarding food quality for further elaboration results are represented graphically in fig-1. The findings of this study have correlations with the previous studies conducted by different researchers. Further research and findings are required on this topic for the health awareness of people.

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