The Mysterious Domination of Food/Drinking Water Contaminants and Adulterants in Bangladesh

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Abstract

Food adulteration and contamination is nothing new in this age. It is the consequence of modern civilization, people moving from places with altered social value and ethics, industrialization and rapid progression of economic activities. It is highly prominent in urban areas of many developed or underdeveloped countries and so is with in Dhaka city. Commercialism and business mind drive people toward such unethical activities knowingly or unknowingly. Most of the cases it is done by uneducated or illiterate people, having least idea about what evil they are doing to mankind. People who are health conscious mostly avoid these but many of them have to go with this because of the busy life schedule or carelessness. By definition, safe food or drink means pollutants or adulterants presence within the limit of the standard such as pathogenic micro-organisms, natural toxins and potentially harmful chemicals that may cause health hazards beyond a certain limit, either deliberately added or naturally present in them. Again, the economic development of the country doesn't reveal basic literacy and awareness of general people. Necessary steps should be taken by the authority and mass people should change their mind set up and have to avoid those who create harm. Purpose of the Study: Brief review of chemical induced food and drinking contamination, their consequences and control. Healthcare providers/Policy makers have a major role play to concerned field. Findings: Both general people and the old system, are responsible for this unlivable condition of Bangladesh. Population is not the sole for this instance. A sense of poor rules and regulation is always found everywhere. Negligence is becoming a wide spread disease contaminating illiterate to well educated, all kind of people.

Keywords: Carcinogen, Chemical intoxication, Food poisoning, Health hazard, Pathogen, Adulterants.

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1. Introduction

Contamination is the presence of an unwanted substance where it should not be or at concentrations above recommended. Pollution is contamination that results in adverse biological effects to resident communities. Food contaminants and adulterants gave a new dimension in city life, together rest of the country. Rural people are less exposed to adulteration than urban people because of busy life, arrangement of food/spice item are mostly obtained from nearby grocery stores, chain shops and nearby open markets. Recent media reports on the malpractice in the food sector has revealed horrifying scenario leading to massive public outcry. Although there is no official statistics on food borne illness, it is perceived to be a major problem in urban areas of Bangladesh. Contaminated food, filthy and unhygienic environment of urban cities result in health hazard which may even cause deaths. The healthcare providers/policy makers’ role in environmental health is related primarily to being alert to the conditions prevailing in the community and of working with others to adequately control any of the attendant hazards.

2. Materials and Methods

Comprehensive literature search followed by consulting healthcare professionals, Hospital, clinic associates, newspaper journalists, NGO workers about adulteration and food contamination. A few high officials were asked help for necessary books, journal, and newsletters. A few local magazine and newspapers also observed to get the necessary concern. Projections were based on various types of adulteration in food served/sold to general people, contaminated drinking water supply from a variety of sources.

2.1. Gross Outcomes of Chemical Contamination

Food remains a significant vehicle of disease organisms. Foodborne disease, more commonly but often incorrectly called “food poisoning,” is grossly underreported. In most instances the illness produced by contaminated food is mild and of short duration, but more severe outbreaks (such as hepatitis A, most commonly seen in public restaurants) can occur. Epidemics of food-borne disease are dramatic and sudden, and most people become sick within 6 to 24 hours after consuming the contaminated foodstuffs. The epidemic pattern of food-borne disease presents differently from the gastrointestinal symptoms (e.g., nausea, vomiting, and diarrhea) induced by intestinal enteroviruses. The safety laws and regulations of Bangladesh are as given in Table 1. WHO published – chemical exposure to toxic level is suspected to be involved in causing –

- Carcinoma
- Cardiovascular disease
- Kidney, liver dysfunction Hormonal Imbalance
- Premature birth
- Suppression of Immune system
- Impaired development of nervous system
- Mental health problems and
- Learning disabilities/Cognitive dysfunction

| Table 1. Food Safety Laws and Regulations and Food Standards in Bangladesh |
|---------------------------------------------------------------|
| Agricultural Products Market Act, 1950 (revised in 1985) |
| Fish Protection & Conservation Act, 1930 (latest amendment in 1995) |
| The Food Grain Supply (Prevention of Prejudicial Activity) Ordinance, 1956 |
| The Bangladesh Pure Food Ordinance, 1959 (Bangladesh Ordinance No. LXVIII of 1959) |
| Agricultural Pest Ordinance 1962 |
| Agricultural Produce Markets Regulation Act, 1964 (revised in 1985) |
| The Cantonments Pure Food Act 1966 |
| Destructive Insects and Pests Rules, 1966 (Plant Quarantine) amended up to 1989 |
| The Bangladesh Pure Food Rules 1967 |
| The Special Powers Act, 1974 |
| The Animals Slaughter (Restriction) and Meat Control (Amendment) Ordinance, 1983 |
| Marine Fisheries Ordinance, 1983 and Marine Fisheries Rules, 1983 |
| Fish and Fish Products (Inspection and Quality Control) Ordinance, 1983 |
| The Pesticide Ordinance, 1971 and The Pesticide Rules, 1985 |
| Bangladesh Standards and Testing Institution Ordinance, 1985 (XXXVII of 1985) |
| The Radiation Protection Act, 1987 |
| The Iodine Deficiency Disorder Prevention Act, 1989 |
| The Essential Commodity Act, 1990 |
| National Food Policy 1996 |
| National Agriculture Policy 1996 |
| Fish and Fish Products (Inspection and Quality Control) Rules, 1997 |
| National Food and Nutrition Policy 1997 |
| National Fisheries Policy 1998 |
| National Policy for Safe Water and Sanitation 1998 |
| National Health Policy 2000 |
| Bangladesh Standards and Testing Institution (Amendment) Act, 2003 |
| The Bangladesh Pure Food (Amendment) Act, 2005 |
| Product Labeling Policy 2006 |
| National Livestock Policy 2007 |
| Fish Feed and Animal Feed Act 2010 |
| Export and Import Policy 2009-2012 |
| The Bangladesh Food Safety Act 2013 |
| BSTI Ordinance and many others |

Source: Nasreen and Ahmed [1,2]
3. Results and Discussion

Food adulteration is the most notorious enemy of mankind. Civilization has its own drawback that even causing destruction of itself. Very few people raised voice on this but crippled by the facts of commercialism. The scope of this article is limited to chemical food contaminants and adulterants. A few discussions based on real life experience and recent studies or reports from various journals and news articles are summarized here.

3.1 Food and Supply Water Contamination

Dhaka city, among huge amount of solid wastes per day from industrial discharge, fertilizers, fossil fuels, sewage sludge and municipality wastes and they are the major sources of heavy metals in soils and subsequent uptake by crops, vegetables and other food items causing serious health hazards to human beings [2-4]. A significant transfer of arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, molybdenum and vanadium like heavy metals took place from soils to vegetables (spinach, tomato and cauliflower) grown in industrially polluted soils of Konabari at Gazipur and Keraniganj in Dhaka [5]. In the absence of efficient treatment plants (ETP), the factory wastes are drained out at will into the farmlands, and ultimately contaminate the farm produce. In our country we have allowed things like pollution and food contamination to run riot. Till now, no agency, either under the health ministry or the ministry of science and technology or the ministry of industries, has conducted any examination of the pesticide- residue levels or toxic chemicals in the foodstuff being marketed [6]. Apart from these, the slum areas are both populated and are in greatest risk of notorious pathogen found both in food sample and supplied water Table 2. According to Dhaka Water Supply and Sewerage Authority (DWASA), it can currently supply 75% of water demand, out of which 85% is from groundwater sources (Deep Tube wells). The presence of toxic metal lead in Elephant road, Dhaka University, Jatrabari, and Demra area and toxic Penta Chloro Phenol (PCP) and existing pathogenic bacterial load in the WASA supplied drinking water from different areas of Dhaka city were found to be unsuitable for human consumption Table 3.

3.2 Arsenic Issue of Drinking Water

Twenty million people in Bangladesh are still drinking water contaminated with arsenic, two decades after the potentially deadly toxin was discovered in the supply [7]. The Bangladesh government is failing to adequately respond to naturally occurring arsenic in drinking water across large areas of rural Bangladesh.

### Table 2. Detection of Foodborne Pathogens in Food and Household Water Samples Collected at Point of Use from Four Slums of Dhaka City, Bangladesh, December 2015 To May 2016 [8].

| Presence of organisms in food/water | Overall n = 56 | 95% CI |
|-----------------------------------|--------------|-------|
| A. Organisms present in Food       |              |       |
| Yeast and mould (>100 CFU/mg)     | 48.0 (85.7)  | 0.74–0.85 |
| Coliforms (>100 CFU/mg)           | 41.0 (73.4)  | 0.59–0.84 |
| B. cereus (>100 CFU/mg)           | 27.0 (48.2)  | 0.35–0.62 |
| E. coli (>100 CFU/mg)             | 17.0 (30.4)  | 0.19–0.34 |
| Staphylococcus (>100 CFU/mg)      | 8.0 (14.5)   | 0.08–0.27 |
| V. cholera                        | 2.0 (3.5)    | 0.01–0.14 |
| B. Organisms present in Water     | Overall n = 16 n (%) | 95% CI |
| Total coliforms                   | 16.0 (100)   |       |
| Fecal coliforms                   | 16.0 (100)   |       |
| Total aerobic bacterial count     | 16.0 (100)   |       |
| Yeast                             | 16.0 (100)   |       |
| Mould                             | 16.0 (100)   |       |
| Staphylococcus                    | 16.0 (100)   |       |
| E. coli                           | 16.0 (100)   |       |
| Fecal streptococci                | 9.0 (56.3)   | 0.29–0.79 |
| Pseudomonas                       | 7.0 (43.8)   | 0.21–0.71 |

Note: Total coliforms and fecal coliforms count (CFU/g).

Human Rights Watch said in a report. Approximately 20 years after initially coming to international attention, an estimated 20 million people in Bangladesh – mostly rural poor – still drink water contaminated over the national standard [12]. Bangladesh’s health system largely ignores the impact of exposure to arsenic on people’s health. An estimated 43,000 people die each year from arsenic-related illness in Bangladesh, according to one study [13]. The government identifies people with arsenic-related illnesses primarily via skin lesions, although the vast majority of those with arsenic-related illnesses don’t develop them. Those exposed are at significant risk of cancer, cardiovascular disease, and lung disease as a result, but many receive no health care at all [14].
therefore most sweetened condensed milks out there do not contain milk at all. In our country about 400 tons formalin is used in cooking is an example of a worst case false. Most sweetened condensed milk products sold in the market actually contains palm oil which is used in the saffron. The consumption of such foods might lead to serious diseases. Ironically even food color is being adulterated. 3.3. Food Adulterants Important food hazards include microbial hazards, pesticide residues, misuse of additives, chemical contaminants, including biological toxins and adulteration. Although microbiological contamination and chemical hazards have received most attention, it is recognized that food adulteration and food fraud should not be neglected considering their role in public health. Food adulteration includes various forms of practices, such as mixing, substituting, concealing the quality of food by mis-labelling, putting up decomposed or expired food, and adding toxic substances. About the proportion of adulterated food items in the market varied between 70% to 90%. More than 76 percent food items in the market were found adulterated in a random survey by public health laboratory of Dhaka City Corporation in 2004. According to the International Centre for Diarrheal Disease & Research, Bangladesh (ICDDR, B), there is approximately 150 food items in the country. A study by the Institute of Public Health (IPH) revealed that more than 50% of the food samples they tested were adulterated. Textile dyes, which are highly injurious to health, are being randomly used to color many types of food. Cooking oil that is so commonly used to deep fry items should only be used once but many food vendors and restaurants recycle burnt oil. Once the oil is used for cooking, it becomes oxidised. The more the oxidized oil is used, the more pre-oxyde is created which is really harmful for the body. Table 4. Lead, Cadmium, Chromium and Arsenic content in first 14 water samples. In bananas, another chemical called calcium carbide is used that becomes a spray Acetyl-gas to generate heat. Dalda (hydrogenated vegetable oil/ fat popular in South Asia) used in cooking is an example of a worst case false. Our stomach temperature is 37 degrees Celsius and the melting point is 54 degrees Celsius Dalda. So, there is no way that Dalda can be absorbed by the body. Most sweetened condensed milk products sold in the market actually contains palm oil which is used in substitute for cow's milk and therefore most sweetened condensed milks out there do not contain milk at all. Fish is considered to be an essential protein for people of all ages. Many fish sellers spray fish with formalin in an indiscriminate manner, it makes the fish or fruits stiff and keeps them looking fresh for longer. Table 5. Undoubtedly human health is now under the possession of formalin, in our country about 400 tons formalin is being imported which is used to human stomach, creates deadly m...
### Table 4. Adulterants Used in Different Food Items of Vegetable Origin as Reported in Lay Press Reports (*22*, *23*).

| Food category and food item | Adulterant                                                                 |
|-----------------------------|---------------------------------------------------------------------------|
| Edible oil                  | Argenome oil, mineral oil and Rancid oil given commonly**                  |
| Soybean oil                 | Palm oil, chemical*, color*, Burnt Mobi† from rail locomotives, Burnt oil from electric transformer Chemicals |
| Mustard oil                 |                                                                           |
| Food grain and grain products |                                                                                   |
| Lentils, mungdal, chola, mosaludal, dali, mashkolai, buter dal (lentil types) | Toxic coloring agents*, imported low-quality inedible lentils mixed with textile dye* and have fungal growth; less expensive Mashkolai dal powdered with champa color* and sold as mugal dal |
| Rice                        | Urea added to make it whiter                                                |
| Dholkhata chal(husked rice), ata (course flour) | Red toxic color* mixed with rice and ata to sell as husked rice, red ata |
| Muri (puffed rice)          | Urea fertiliser to make it whiter and puffier                             |
| Wheat, corn                 | Animal feed packaged as human food                                         |
| Semai (vermicelli)         | Dalda made with rotten potato, cow intestine, low-quality palm oil          |
| Vegetables and tubers       |                                                                           |
| Vegetables                  | Organophosphorus compounds and other pesticides                           |
| Tomato                     | Calcium carbide for artificial ripening                                    |
| Potol (pointed gourd), peas | Textile dye*                                                               |
| Eggplant                   | Pesticide*                                                                |
| Green peas                 | Chemically colored* Dahi                                                  |
| Potato                     | Red toxic color*                                                          |
| Spices                     |                                                                           |
| Mixed spices (powder)       | Brick dust, saw dust, chaler kura (dust from outer layer of rice)          |
| Turmeric powder            | Brick dust, buter dal, kheshari dal (lentil), artificial powder, color    |
| Chili powder               | Powder with color                                                         |
| Coriander powder           | Chaler kura (dust from outer layer of rice), toxic color*                  |
| Zeera (cumin) powder       | Brick dust, toxic color*, powder                                          |
| Pepper                     | Papaya seed                                                               |
| Salt                       | No iodine                                                                 |
| Bakery products            |                                                                           |
| Cake‡                      | Textile dye, chemicals*, inedible date expired ata/maida, fertiliser urea, substandard inedible dalda, rotten egg |
| Biscuit‡                   | Ammonium bicarbonate, sodium cyclamate, fertiliser urea, toxic coloring agents*, palm oil, burnt oil, outdated inedible ata/maida |
| Bread‡                     | Rotten egg, outdated ata/maida                                            |
| Fruit and fruit products    | (Lead arsenite, Calcium carbide, Ethephon, Formalin, Injection of dye in general) |
| Mango, banana, pineapple   | Calcium carbide for artificial ripening                                   |
| Berry                      |                                                                           |
| Orange and lychee juice    | Water, flavor, textile dyes, sweet pumpkin, and color                     |
| Imported juices            | Substandard, date expired with new sticker                                |
| Snacks                     |                                                                           |
| Noodles‡                   | Dholkhata chal, lai ata (course wheat flour), red potato                   |
| Charchar                   | Fried in burnt mobil†, no potato, imported powder, and color              |
| Peyaju, beguni             | Toxic dye*                                                                |
| Chocolate, sugar, and honey |                                                                           |
| Chocolate                  | Powder, sugar, color*, chemical                                           |
| Sugar                      | Soda used instead of sugar in food                                        |
| Honey                      | Sugar syrup                                                               |
| Others                     |                                                                           |
| Pickle                     | Inedible ingredients                                                     |
| Jorda (smokeless tobacco)   | Wood dust, chemical                                                      |
| Mineral water and drinking-water‡ | Lap-water, arsenic contaminated, contaminated with bacteria, no mineral |

**Note:** Chemical nature/composition not mentioned/specified;

**Adulterant**

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### Table 5. Underlying Reasons behind Adulteration Issue in Fish Supply Chain of Bangladesh (*24*, *25*).

| Reasons                | Details                                                                 |
|------------------------|-------------------------------------------------------------------------|
| A cheap method to prevent Post harvest Loss | To prevent this post-harvest loss one of the cheap methods is to use formalin and other toxic chemical which helps to keep this fish fresh for a long time. |
| Lack of technical knowledge | Lack of proper technical knowledge contributes in use of waste material in fish culture, improper handling after post-harvest and use of formalin and other toxic elements. |
| Lack of ice box, unavailability of ice, high price of ice, lack of cold store to keep unsold fish. | Ice/foxbes is expensive. Main problem in the market of Bangladesh is there is lack of cold storage in the market place. As a result, there is no proper way to preserve unsold fish. |
| Lack of awareness       | Most of the traders do not aware of the danger of using these harmful chemicals. On the other hand, customers are also not properly aware of this issue. |
| Lack of government initiative | Co-ordination between authorities is a major issue, does not appear to be any cohesive view regarding procedures and penalties for the same offence by officials from same organisation. |
| Lack of policy framework | Food laws and regulations are mostly outdated and fragmented. Even the new Safe Food Act 2013 is not free from this as it is basically modeled on the Pure Food Ordinance of 1955. |
| Inadequate Penalties    | Considering the extent of harmfulness of food adulteration, penalties mentioned in law is insufficient. For an example, the penalty for food adulteration is maximum term of six months of imprisonment or up to a maximum fine of BDT 1000 which is equivalent to EUR 10.77. Considering the gravity of the offences this punishment is not hard enough. |

Source: Fatema and Moslah (*22*, *23*).
The chance of declining immunological responses and can oiler meat and liver from different farms and local markets for the presence of residues of screws, which made them rice and orders and many other diseases especially the incidence of renal failure, liver damage and cancer which are increasing alarmingly in Bangladesh. Heavy metals, such as lead, chromium and arsenic accumulate in the body that might cause kidney and liver damage and develop abnormality amo.

Consumption of adulterated food items may cause asthma, sore throat, larynx constriction, bronchitis, skin infections, allergic reactions, diarrhea, hematuria, circulatory failure, numbness, dizziness, kidney failure, stomach cancer, liver cancer, nervous disorders and many other diseases Table 8. After consumption of adulterated food items, thousands of people are becoming sick. Children are the worst victims. About three million people suffered from diarrhea during 2005-2009 and about 15% of children died in 2011 as reported by the Directorate General of Health Services \[27\]. The long-term effects are also very severe especially the incidence of renal failure, liver damage and cancer which are increasing alarmingly in Bangladesh. Heavy metals, such as lead, chromium and arsenic accumulate in the body that might cause kidney and liver damage and develop abnormality among children. Indiscriminate and irrational use of antibiotics in poultry without following withdrawal period may result in unexpected residues in animal food and could cause serious health hazards to consumers. Research reports on antibiotic residues in broiler meat and liver from different farms and local markets for the presence of residues of ciprofloxacin, enrofloxacin, oxytetracycline and florfenicol in high level. "Chemical nature/composition not mentioned/specified; Polychlorinated biphenyl (PCB) used as coolant in automobiles and transformers.

### Table 6: Effect of Formalin Treated Food Consumption on Health \[24\].

| Exposure routes | Effect on human |
|----------------|-----------------|
| Carcinogenicity | Formalin has the potential effect to cause cancer, repeated and prolonged exposure increases the risk of cancers of the lung, nasopharynx, oropharynx and nasal passage |
| Reproductive health | It has a harmful effect on reproduction system by inducing oxidative stress. |
| Skin (dermal) | Prolonged and repeated contact with formalin could cause numbness (lack of feeling) and a hardening or tanning of the skin |
| Eye contact | Formalin solution splashed in the eye can cause injuries from transient discomfort to severe such as loss of vision |

### Table 7: Adulterants Used in Different Food Items of Animal Origin as Reported in Lay Press Reports \[29\].

| Food category and food item | Hen egg** | Fish | Dry fish | Mutton | Beef | Halim* | Sweetmeats and dairy products | Butter | Ghee, dalda (hydrogenated vegetable oil) | Sweetened curd* | Jilapi (coil-like juicy sweet) | Ice-cream* | Jilapi powder | Fast food and restaurant food† |
|-----------------------------|----------|------|----------|--------|------|--------|--------------------------------|--------|-----------------------------------|----------------|------------------|------------------------|-----------------|----------------------|
| Hen egg**                   | White eggs of farm hens colored red with textile dye* to sell as local hen eggs. Tortoise eggs sold as hen eggs |
| Fish                       | Inject formalin through the gills or dip fishes in water treated with chemicals, such as chloro-fluoro-carbon (CFC); DDTP powder to prevent rotting; add red color* to give fresh look; sell rotten fish |
| Dry fish                   | DDTP+ |
| Mutton                     | Buffalo, sheep and beef meat sold as mutton |
| Beef                       | Buffalo meat sold as beef |
| Halim*                     | Left over bones, intestine |
| Sweetmeats and dairy products | Butter: Cow’s intestine, dalda mixed with color*, powder* |
| Ghee, dalda (hydrogenated vegetable oil) | Jilapi (coil-like juicy sweet): Fried with Mobil |
| Sweetened curd*            | Textile dye* |
| Jilapi powder              | Unsold foul-smelling ice-cream refined and re-packaged, almost no milk, palm oil for soap manufacturing, textile dye*, low-quality milk powder, sodium cyclamate |
| Jilapi (coil-like juicy sweet) | Jilapi powder: Adulterated, low-quality, date expired, without BSTI approval |
| Fast food and restaurant food† | Jelly, sauce: Toxic coloring agents*, chemicals*, spirit |
| Chicken**                  | Dead chicken; cooked and raw meat refrigerated together |
| Shrimp                     | Sold rotten |
| Fish                       | Fried and raw fish refrigerated together |

**BLRI also showed that broiler meat and egg showed presence of antibiotic residue of Ciprofloxacin, Sulphonamide, Oxytetracycline and Enrofloxacin in high level. **Chemical nature/composition not mentioned/specified; Polychlorinated biphenyl (PCB) used as coolant in automobiles and transformers.

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any examination of the pesticide-residue levels or toxic chemicals in the foodstuff being marketed. These merchants and traders are the enemy not only of the nation and their own children but of the entire mankind. He said “The adulterator is not one of us” [31].

### Table 8. Toxic Elements in Noxious Addition of Food/Additives with Possible Outcomes [17], [22], [29], [16, 32-44]

| Contaminants                  | Food/Additives                          | Possible Outcome                                      |
|-------------------------------|-----------------------------------------|-------------------------------------------------------|
| Coloring agents, chrome, tartarine, and erythrosine | Spices, sauces, juices, lentils and oils | Cancer in kidney, liver, skin, prostate and lungs     |
| Rye flour (ibid)              | Barley, bread and wheat flour           | Convulsion and miscarriage                             |
| Hormone (ibid)                | Cauliflower                             | Infertility of women                                    |
| Coal tar and industrial Dyes  | Sweets, Sauce, Pastry cream, powders spices | Carcinogenic                                           |
| Burnt oil                    | Crispy snack                             | Food poisoning, reflux, heartburn                      |
| Agenomato or monosodium glutamte (ibid) | Chinese restaurant food items | Nervous system disorder and depression                  |
| Flour                         | Chalk Powder                            | GI problems                                            |
| Soap                          | Glue/Butter                             | GI problems                                            |
| Calcium Carbide/Ethylene dioxide | Leafing of fruits                     | Cancer in kidney, liver, skin prostate and lung        |
| Urea (ibid)                   | For whiten rice and pulped rice         | Damage of kidney & nervous system, Respiratory problem |
| Brick Dust                    | Chili powder                            | Respiratory problem                                    |
| Sulfuric acid and palm oil    | Condensed milk                          | Cardiac function problem                               |
| Saw dust, Used and exhausted tea leaves | Loose Tea                      | Respiratory problem                                    |
| Sodium cyclamate              | Sweet meat                              | Cancer, Fetal abnormality                              |
| Metanil Yellow Aniline dyes   | Turmeric powder                         | Carcinogenic                                           |
| Melamine                      | Milk Products                           | Kidney malfunction                                     |
| Oleomargarine or Jard         | Butter                                  | Asthma and weakened kidney function                    |
| Yellow and Sudan Red colors (ibid) | Chili powder                    | Tumors in liver and bladder and finally for cancer    |
| DDT                           | Dried fish (Shutki)                     | Cancer especially breast cancer, liver cancer and pancreatic cancer, reproductive damage (Weaken semen, early menopause, exposure of teratogen and birth defects) and some neurological damage reported. |
| Bottle and Jar water          | Bottle and Jar water                    | Bottle and Jar water                                   |
| Formalin                      | Preservation of fish, meat, fruit and milk | Throat cancer, blood cancer, childhood asthma and skin-diseases |
| Poisonous coloring agents like auramine, rhodanine b, malachite green, yellow G, Allura red, and Sudan red | Applied on food items for coloring, brightness and freshness | Damage liver and kidney and cause stomach cancer, asthma and bladder cancer |

Source: Motinuddin [42].

### 3.4. Energy Drinks Vs Carbonated Drinks

The government has decided to ban the production, marketing and import of energy drinks under the guise of carbonated beverages with immediate effect [35]. The Bangladesh Standard and Testing Institution (BSTI) at a council meeting on also resolved to take legal action against the companies that have been advertising their products as energy drinks after having them listed as carbonated beverages with BSTI. The move came after the Bangladesh Food Safety Authority (BFSA) wrote to BSTI to say the production of energy drinks in the name of products as energy drinks further. Initially, the government fixed standard for energy drinks in the country, Industries Minister told parliament once. Authority received complaints about the use of various highly addictive substances, including caffeine and opium, in energy drinks [41]. In 2012, a Department of Narcotics Control test conducted on energy drinks from several local and foreign companies had found excessive amount of artificial caffeine, Viagra (sildenafil citrate), beer and alcohol as ingredients [42]. The manufacture and advertising of energy drinks under a license for carbonated beverage is fraud, punishable under several laws including the BSTI Act and the Food Safety Act. Initially, the government will write to the companies to instruct them to discontinue their production and marketing of energy drinks. Punitive actions will follow if they do not comply, said the official. The government will also amend the import policy in order to blacklist the foreign energy drinks with harmful ingredients [46].

### 3.5. Safety Issues of Bottled Water

So-called mineral water supplied to houses and offices in jars are not tested. In most cases, the water is filled in the jars right away from the tap and sometimes in the empty bottles of some of the well-known mineral bottle brands [47]. The Bangladesh Agricultural Research Council (BARC) has of late made a sensational revelation regarding the quality of water different companies supply for drinking in and around Dhaka. According to the findings of the government study, ‘coliform bacteria’ (pathogens from feces of humans and animals) has been found in 97% of so-called filtered water supplied to houses in jars to households, shops and offices in the capital city of Bangladesh. A team of BARC researchers determined the ‘horrifying’ data while studying the level of minerals in jars and bottled water marketed in Dhaka city. The researchers sampled 250 jars from across the city’s Farmgate, Karwan Bazar, Elephant Road, New Market, Chawk Bazar, Sadarghat, Keraniganj, Jatrabari, Motijheel, Basabo, Malibagh, Rampura, Mohakhali, Gulshan, Banani, Uttar, Airport, Dhammond, Mohammadpur, Mirpur, Gabtoli, and on the city’s outskirts at Aminbazar, Savar and Ashulia. The level of ‘coliform bacteria’ in the samples collected from...
Elephant Road, Chowk Bazar, Basabo, Gulshan and Banani areas was found significantly high in the research \[51\]; \[58\]. A few months ago, a mobile court busted six fake mineral water plants in Bosila area of Dhaka’s Mohammadpur and sentenced six staffers to different terms of jail. The team also seized 2000 jars of water and destroyed those later \[50\].

3.6. Food Adulteration during Ramadan

The crime of those selling adulterated and unhygienic food items is very serious and strict action needs to be taken as per law against such guilty persons. According to media reports some 600 field-level sanitary inspectors are working across the country to ensure food safety for all during the holy month of Ramadan. This is welcome news but if previous records are anything to go by people should not get their hopes up too high. Even more unabated drives maintain a well-choreographed pattern as this nefarious practice increases during the month of Ramadan. It was found that coloring agents are used in spices, sauces, juices, lentils and oils. Formalin and carbide used in fish, fruit, meat and milk \[59\]. The shopkeepers and the merchants many of them with a pious fade try to earn a large amount of profit by this unethical practice, and so they play with the life and health of the people. They mix dangerous things in the daily eatables.

3.7. Sub-Standard Vermicelli (Shemai) and Cow Fattening Ahead of Eid

Adulterated vermicelli flooded different markets in the capital ahead of Eid-ul-Fitr, one of the biggest religious festivals of the Muslims, posing a serious threat to public health. A section of unscrupulous businessmen is busy in manufacturing sub-standard vermicelli in the port city ahead of Eid-ul-Fitr as the food item has a high demand in the day. According to local sources, some of the factories are using unrefined palm oil and animal fat to produce Laccha vermicelli while hazardous chemicals and toxic color were also used to make the food items. Bangla vermicelli is produced using flour and water and Laccha is produced with oil, flour sugar and water. Most cases, the vermicelli was being dried in unhygienic condition in the rooftop of the factories \[51\]. Seeking anonymity, a seasonal vermicelli maker said a section of businessmen in the city bought the adulterated vermicelli and sell them tagging labels of renowned companies. BSTI personnel left a comment as Bangla vermicelli is used to make by seasonal factory for a certain time, it is not mandatory to take license from BSTI, however, the factory should take health and hygienic certificate issued by the Sanitary Inspector \[32, 53\]. With Eid-ul-Azha around the corner, the Poribesh Bachao Andolom (Poba) has recently urged the government to monitor how cattle is being reared and fattened in the farms in the country \[54\]. Knowingly causing such damage to public health in order to hike up the price of cows is a crime, and must be dealt with swiftly. The use of antibiotics, growth hormones, harmful chemicals, and steroids is prohibited by the Animal Feed Act 2010. Violators may be faced with a year in prison, a Tk 50,000 fine, or both. A large number of farmers involved in bull fattening just before 3 or 4 months of Eid-Ul-Azha (Muslim festival), when they sell the animals with profitable price. Visiting different villages in Bera, Santia and Ataikula upazilas of Pabna, and Shahjadpur and Baghabari areas in Sirajganj, these correspondents found that almost every household was using steroids, antibiotics and other chemicals for months in blatant violation of law. Everyone -- from cattle farm owners to landless farmers -- wanted to take full advantage of this. These cattle-fattening drugs are also widely used in Chudanga, Jhenidah, Nilphamari, Barisal, Faridpur, Manikganj and some other districts. Consumption of meat of these animals poses serious health risks for humans, according to experts \[55\]. The changes to the cow caused by these injections are not merely cosmetic -- severe health damage is done to humans by the consumption of this meat. While most traders would still claim that the fattening supplements were not harmful, there is reason to believe these chemicals may cause cancer, kidney disease, and infertility in women \[56\].

3.8. Penalty Imposed on Famous Eateries

Isn’t it surprising that like many occasional drives against various crimes, the fight against unsafe food, too, has assumed the character of a seasonal activity? While this should have been a continuous and unrelenting activity round the year across the country, sporadic and infrequent moves here and there, leave no permanent impact on the sellers and producers of spurious food items of all varieties. Newspaper reports say that the drive against food adulteration is currently on in the capital, launched last week. The Bangladesh Food Safety Authority (BFSA), the state watchdog to regulate the sector is reportedly monitoring the capital’s food markets under the supervision of an executive magistrate. One has reasons to question the rationale behind the drive in the capital alone, that too with just one magistrate. The effectiveness of the drive is bound to cause nothing more than a ripple with mobile courts punishing a few sweetmeat shops, and if at all, some kitchen market sellers. The fact that such drives, sporadic and half-hearted, failed to bring any discipline in the country's food market cannot be disputed. However, famous eateries/food chains are not devoid of these cases of adulteration and substandard food staffs. Penalty imposed on these famous shops/food chain should at least give an idea to the general people that paying high price is not always an indicator of good quality. Even a few of them were penalise more than once or twice for the same reason but substandard food serves never ended Table 9. For a better view references regards are attached in this table with date published.

Government officials monitoring food markets in capital Dhaka fined businesses millions of BDT only after finding that their food items contained ingredients harmful to human health. Inadequate monitoring of food markets may have exposed people’s health to serious hazards from consumption of substandard and adulterated foods. In the absence of corrective measures, punishing the offenders-at times by way of hefty monetary penalties-is not an appropriate method of dealing with the problem. A properly institutionalized mechanism with sufficient manpower and regular monitoring round the year can only bring things to some semblance of order. In this regard, it is important that the BFSA and other agencies such as the BSTI and the city corporations which also run occasional drives maintain a well-coordinated plan of action. It is also important that punitive actions should be backed by actions to improve the quality and standard of food of all varieties. To monitor the situation, inspection and sudden raids are welcome, but it must not be forgotten that inspection is just one of the many ways to rein in food adulteration.
While contamination of food may be due to negligence, deliberate adulteration by toxic chemicals or harmful ammonia for making biscuits and toasts without BSTI license. Preserving date-expired and stale food items in an unhygienic manner. For not taking BSTI license for manufacturing cake and sweetmeat. Date-expired, rotten and stale foods. Selling expired, rotten and stale items. Selling products at hiked up prices and dirty environment. Using harmful chemicals to color sauces without the BSTI approval. Selling date-expired and stale food items in an unhygienic environment. For not writing manufacturing and expiry dates on their packets. Falsifying or altering the expiry dates on their packets. For keeping date-expired and stale food items in an unhygienic environment. Selling expired, rotten and stale items. Making vermicelli in an unhygienic environment. For keeping expired and stale food items in an unhygienic environment. Selling expired, rotten and stale food items. For selling low grade packed products. Using chemicals in two of its popular products.
food-related illness at least once a year. Taking care of the situation thus calls for a whole package of initiatives. In advanced countries this involves producing, handling, storing and preparing foods in such a way as to prevent infection and contamination in the entire chain. However, in situations prevailing in this country, it is not merely about maintaining a clean chain but putting in strong deterrents so that criminality in the business could be stopped. Sources of harmful stuffs must be plugged, if necessary, by way of ban on imports or local production. Strong advocacy on the detrimental effects of consumption should be routinely done. At the same time, training on safe and scientific methods of preservation of food products should also be a high priority in an attempt to curb adulteration. Adulteration and contaminant control are a never ending, on the other hand a continuous process. It will increase with time as the civilization go ahead. Pharmacists should be aware of the local occupations, companies, and factories and to be cognizant of the initial symptoms of disease. Again, pharmacists should become acquainted with the local community and to adapt the principles of health and medical care to the particular situations encountered. The pharmacist’s continuing education requirements should include watching the local pattern of society and its diseases, and changing the emphasis toward evolving disease patterns and their control. Government and regulatory authorities are to play strong role in controlling food contaminants and adulteration.

5. Conclusion
With constant change to the physical, biological, cultural, social, and economic environment, both healthcare providers and citizens should cultivate an informed awareness of these changes, and health providers should adapt their methods of health education, disease prevention, and disease control to the changes in each community. This is especially true food daily consumed, which require concerted community action for their control, but providers may play a much more fundamental and personal role in controlling food-borne diseases; often, the first indication of an outbreak of food-borne disease is time-limited, with an unusually large number of people seeking relief from health hazards. The necessary role in environmental health is related primarily to being alert to the conditions prevailing in the community and of working with others to adequately control any of the attendant government related authorities, NGOs and other private organizations (e.g. Pharmaceutical companies) should take initiatives further to ameliorate food and drinking water situation which is worst among all other previous times. General people should be aware of these facts of mischiefs and take necessary steps on their own. A year-round campaign regarding these issues in public places, electronic media and even in rural areas can bring a change as brought by diarrhea, Vitamin A campaigns back in 70's and 80's.

Abbreviations
BDL (Below Detection Limit); BSTI (Bangladesh Standards and Testing Institution); BCISR (Bangladesh Council of Scientific and Industrial Research); ICDDR, B (International Centre for Diarrheal Disease Research, Bangladesh); ETP (Effluent Treatment Plants); IPH (Institute of Public Health); DDT (Dichloro-Diphenyl-Trichloroethane); BFSA (The Bangladesh Food Safety Authority); BARC (Bangladesh Agricultural Research Council).

References
S. Naureen and T. Ahmed, "Food adulteration and consumer awareness in Dhaka City, 1995-2011," Journal of Health, Population, and Nutrition, vol. 32, pp. 452-464, 2014.
M. Hashem, M. Nur-A-Tomal, M. Alawid, and S. Boshra, "Heavy metal assessment of polluted soil around Hatirjheel Lake of Dhaka city, Bangladesh," Bangladesh Journal of Scientific and Industrial Research, vol. 52, pp. 61-68, 2017. Available at: https://doi.org/10.3259/bjsir.v52i1.32084.
I. Mahmudul, Toxicity of heavy metals in soils and crops and its phyto-remediation dissertation for PhD department of soil. Dhaka-1000:
Wajed, F. (2015) Government University of Dhaka, 2015.
R. Ashiqur, J. S. Afroze, K. Bashar, M. F. Ali, and M. R. Hosen, "A comparative study of heavy metal concentration in different layers of tannery waste soil and near agricultural soil," American Journal of Analytical Chemistry, vol. 7, pp. 880-883, 2016. Available at: https://doi.org/10.4236/ajac.2016.710075.
M. R. Islam, "Consumption of unsafe foods. Evidence from heavy metal, mineral and trace element contamination," Doctoral Dissertation, Bangladesh Agricultural University, Mymensingh, 2013.
M. K. Asadullah, "Bitter truth rampant adulteration still a havoc," The Daily Star, 2011.
O. J. Eres, "World water day taking responsibility for our future," The Daily Star, 2017.
M. Ishita, N. N. Nailing, M. Mahdieh, M. Roy, A. S. Faraque, and T. Ahmed, "Children living in the slums of Bangladesh face risks from unsafe food and water and stunted growth is common," Acta Paediatrica, vol. 107, pp. 1250-1259, 2018. Available at: https://doi.org/10.1111/apa.14421.
S. Murshed, A. Hasan, F. M. Omor, and C. Subhagata, "Analysis of WASA supplied drinking water around Dhaka City from laboratory analysis perspective," International Journal of Chemical & Physical Sciences, vol. 2, pp. 20-27, 2013.
M. Sabrina, A. Hasan, F. M. Omor, and C. Subhagata, "Analysis of WASA supplied drinking water around Dhaka City from laboratory analysis perspective," International Journal of Chemical & Physical Sciences, vol. 2, pp. 20-27, 2013.
F. Richard, "The politics of arsenic-free water," Dhaka Tribune, 2017.
H. Jahan, "Arsenic in Bangladesh: how to protect 20 million from the world's largest poisoning," Guardian, 18 October 2016, 2016.
Human Rights Watch, "Nepotism and neglect the failing response to arsenic in the drinking water of Bangladesh's rural poor," Human Rights Watch, 2016.
FAO/WHO experts canverify. Food protection for urban consumers. Rome: Food and Agriculture Organization, 1986.
K. Park, Park's textbook of preventive and social medicine, 18th ed. Jabalpur: Banarsidas Bhanot, 2005.
Staff Correspondent, "Food adulteration rings alarm bell STAR-RDRS roundtable told most food items adulterated, pose lethal risks to public health," The Daily Star, 2011.
F. M. Miah, Evaluating position of Bangladesh to combat ‘adulterated food/crisis in light of human rights," IOSR Journal of Humanities and Social Science, vol. 19, pp. 45-54, 2014. Available at: https://doi.org/10.9790/0837-1906455.
OP-ED, "OP-ED. Public health issues in Bangladesh the independent" 2018.
M. A. Aasha and S. R. Avik, "Eating away our health cover story star weekend magazine," vol. 4, 2004.
N. Oviedo, "Who reveals that condensed milk contains more sugar than actual milk? Web goodtimes," 2017.
K. H. Zubair, "Time to end food adulteration," The Daily Star, 2016.
S. Sharida and T. Ahmed, "Food adulteration and consumer awareness in Dhaka City, 1995-2011," Journal of Health, Population and Nutrition, vol. 32, pp. 452-464, 2014.
T. Fatema and M. Moslah, "Economic reasons behind adulteration issues in fish supply chain in Bangladesh," Journal of Business Studies, vol. 37, pp. 143-157, 2016.
S. I. Ash, "Govt: There's no such thing as fake eggs in market Dhakatribune," 2017.
