Short Communication

Microbiological Quality Analysis of Popular Fluids and Drinks Sold in Bashundhara Residential Area, Dhaka

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The mass public health principally depends on types and qualities of a range of food items in any neighborhood. In this very study the microbiological analysis of the most sold bottled waters, fruit juices and dairy fluids consumed by the maximum children, carbonated soft drinks and the energy drinks especially consumed by young people was conducted with the simple isolation approach following the traditional microbiological methodology. Presence of *Staphylococcus* spp. was detected in 50% samples the results for the presence of enteric bacteria; fecal coliforms and *Vibrio* spp. were completely negative. On the basis of the quantification of total bacteria and of the staphylococcal species, more emphasis on the good manufacturing practice (GMP) as well as on the market complaints is suggested.

Key words: Microbiological quality, Bottled water, Fruit juices, Dairy fluids, Soft drinks, Energy drinks, Public health

For maintaining a sound state of public health over the country, one of the important steps is to well regulate the quality of different food items. Food safety has now become a major health issue since lots of cases have been found so far round the globe whereby mass people suffer from various disease outbreaks only due to microbiologically contaminated foods[1-3]. A range of microbiological study on different food items by different research groups round the globe revealed the association of food borne microorganisms with the studied samples. The predominant bacteria within the food samples has been reported to be *Staphylococcus* spp., the enteric bacteria, *Vibrio* spp., *Aeromonas* spp., *Pseudomonas* spp., *Acinetobacter* spp., *Streptococcus* spp., *Bacillus* spp., *Listeria* spp., *Brucella* spp., *Campylobacter* spp., *Arcobacter* spp., and *Cronobacter* spp., which were responsible for the food borne infection, intoxication and the toxi-coinfection[2,4].

Bangladesh is a highly populated country with the general lacking of knowledge on food safety within the mass people. The absence of awareness on general hygiene, lack of proper legislative bodies regulating the quality (detecting the microbial prevalence) of foods especially the newly launched items are the important barriers for the manufacturing and sales of quality food items in our country. In different foods bring about vital information on food safety as well as may envisage on the further intoxication caused by the prevailing microorganisms. Although to a few extent of food inspection is apparently being conducted; however, there are lots of evidences of food borne disease outbreaks including the enteric diseases especially diarrhea and bacteremia[1-2].

Our previous works on the commercially localized food items including a range of street foods, fruit juices, milk and milk products, bottled waters and others showed a significant fraction of the studied items to be deleterious for public health[5-9]. Foods especially the liquid items including the bottled waters are good source for microbial growth and survival possibly due to the high water activity along with the nutrient exposure[10]. In this context, current study attempted to identify the present microbiological status of the commonly consumed liquid food items.

Materials and Methods

Sample collection: Five categories of samples of the commercialized products of bottled waters, fruit juices, dairy fluids, carbonated soft drinks and the energy drinks were collected from several shops in Bashundhara area of Dhaka city during the mid-August 2019. Representative and popular brands were chosen from each category. Products were transported to the Microbiology Laboratory of the School of Life Sciences (SLS) of Independent University, Bangladesh (IUB).

Microbiological analysis: Conventional microbiological methods were applied for the enumeration of bacteria within the chosen samples[11-12]. For the hetertrophic plate count (HPC) representing the total bacterial count (TBC), Luria-Bertani (LB) agar was used while for the detection of the specific bacterial species, different selective agar media were used[6-8]. As all the samples were liquids, 100 ml from each sample was spread on the corresponding selective agar medium. Mannitol salt agar (MSA) was used for the isolation of *Staphylococcus* spp., MacConkey agar for *Escherichia coli*, *Salmonella-Shigella* (SS) agar for the detection of *Shigella* spp. and *Salmonella* spp., mFC agar plates for the detection of the fecal coliforms; and thiosulfate citrate bile salts sucrose (TCBS) agar for the isolation and enumeration of *Vibrio*

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spp.[13]. The mFC plates were incubated at 44.5°C while the other plates were incubated at 37°C. For the fungal enumeration, potato dextrose agar (PDA) was used; and the incubation temperature was set at 25°C[11-13]. As a supporting way of measuring the microbial load, the membrane filtration method was also applied for examining all the samples.

Both the spread plate method and the membrane filtration method showed the similar results for all of the samples studied. Out of five brands of bottled waters, at least three were completely free from microorganisms while two brands were populated with staphylococcal species indicating the possible defect during the manufacturing of these items (Table 1). All the juice samples harbored heterotrophic bacteria with the abundance of only *Staphylococcus* spp. Abundance of microorganisms in juice samples is not unlikely possibly due to their high nutrient contents. Our previous work also showed such proliferation of staphylococci and even pointed the presence of coliforms[6]. However, in the current study, no sample was detected with coliforms. All the milk samples studied were dominated only by the staphylococcal species which is similarly indicative of defective handling during processing or packaging.

Around 40% of the carbonated soft drinks samples showed the prevalence of *Staphylococcus* spp.; and other specific bacteria were completely absent. Interestingly the branded "7 Up" sample showed no other bacterial presence except *Azotobacter vinelandii*

(Figure 1). Chalking out the possible sources of *A. vinelandii* would be of further interest. Besides, testing more samples for the detection of such bacterial presence is required. Around 50% of the energy drinks showed the presence of *Staphylococcus* spp.; nevertheless, all were within the microbial limit[14].

A couple of years back an estimation by the Taskforce on Food Adulteration (NTFS) in our country revealed that approximately thirty millions of Bangladeshi people suffer from the food borne complications[1]. Indeed the adulterated foodstuffs are highly responsible for casting the food borne enteric illnesses, leading to the dreadful fatality. Most of the food manufacturing companies utilize the good manufacturing practice (GMP) during production of any food items; however, the in process check (IPC), the quality control (QC) of the finished products; and most importantly handling the market complaints are also important to fully ensure the food quality[10,14]. There are two unfortunate reasons behind the food insecurity in mass aspect: (1) the insufficient microbiological analysis by the Governmental regulatory bodies like the "*Bangladesh* Standards and Testing Institution" (*BSTI*); and (2) understanding at customer level about the requirement of microbial analyses of foods. Such situations lead to the food borne disease outbreaks including food borne infections, intoxications and toxi-coinfections which actually remains unnoticed both by the sellers and the consumers. Therefore, researchers especially the microbiologists must focus on the

Table 1: *Microbial enumeration of fluids and drinks sold in Bashundhara Residential Area*

Samples		HPC	Fungi	Enteric Bacteria	Fecal Coliform	*Vibrio* spp.	*Staphylococcus aureus*
	Mum (n = 10)	3.0×10^4	0	0	0	0	3.5×10^3
Bottled water	Rangdhonu	2.0×10^3	0	0	0	0	2.0×10^2
	Spa (n = 10)	0	0	0	0	0	0
	Aquafina (n = 10)	0	0	0	0	0	0
	Kinley (n = 10)	0	0	0	0	0	0
	Frutika (n = 10)	1.0×10^4	0	0	0	0	8.0×10^2
	Shezan (n = 10)	2.6×10^4	0	0	0	0	6.0×10^2
Fruit juices	Pran Mango (n = 10)	7.0×10^2	0	0	0	0	6.0×10^2
	Tropicana Apple (n = 10)	1.0×10^2	0	0	0	0	0
	Tropicana Mango (n = 10)	1.0×10^2	0	0	0	0	0
	Pran Lassi (n = 10)	1.0×10^3	0	0	0	0	3.0×10^2
Dairy products	Arrong Mango Milk (n = 10)	1.0×10^4	0	0	0	0	2.0×10^3
	Milkman Chocolate (n = 10)	1.0×10^3	0	0	0	0	1.0×10^3
	7 Up (n = 10)	0^1	0	0	0	0	0
Carbonated soft drinks	Coke (n=10)	2.0×10^2	0	0	0	0	0
	Mountain Dew (n = 10)	0	0	0	0	0	0
	Pepsi (n = 10)	0	0	0	0	0	0
	Zeera Pani (n = 10)	2.0×10^3	0	0	0	0	7.0×10^2
	Current Energy (n = 10)	2.1×10^4	0	0	0	0	9.0×10^2
Energy drinks	Royal Tiger Energy (n = 10)	5.0×10^3	0	0	0	0	0

HPC = Heterotrophic Plate Count; n = number of samples.
[1]Two samples showed the presence of *Azotobacter vinelandii*
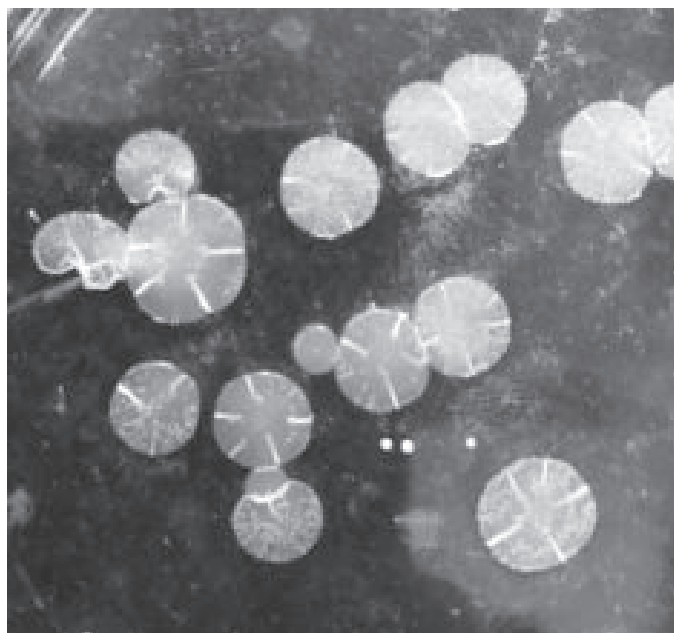
Figure 1. *Azotobacter vinelandii isolated from two out ten samples of 7 Up carbonated soft drinks.*

concept and application of HACCP (Hazard Analysis: Critical Control Points) in large scale during the manufacturing and packaging of the food items.

Conclusion

Current study on the liquid food items revealed more or less satisfactory results. However, the presence of staphylococcal spp. in 50% of the samples refers to the stringent adherence to GMP and QC during manufacturing and packaging of the commercial food items used by the mass people. Thus the effective management of quality from the microbiological perspective would be achieved which is vital for ensuring the consumer safety. The exceptional presence of *A. vinelandii* in some of the 7 Up samples raised further interest to continue the study.

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