Food poisoning in Saudi Arabia

Potential for prevention?

Yagob Y. Al-Mazrou, *PhD, FRCG.*

ABSTRACT

Food poisoning is becoming a very important health problem both internationally and in the Kingdom of Saudi Arabia (KSA). *Salmonella species* (spp) is the most important pathogen, but due to the extensive effort carried by the health authorities to prevent or eradicate communicable diseases, new pathogens are now emerging such as *Escherichia coli* (*E. coli*) and Norwalk like viruses. This review paper highlights the magnitude and determinants of food poisoning internationally and in KSA, and proposes some recommendations on its prevention. Clearly, there is a steady increase in the food poisoning accidents in KSA, especially during the summer months and Hajj season. These accidents are seen in other countries such as England, United States of America and Japan. Meat and chicken are the main items incriminated in these accidents. Knowledge on food safety in the food preparation process and the risk factors that can lead to food poisoning is low. Training and proper health education messages are needed to raise the awareness of food handlers as well as the public in general.

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Food poisoning is a group of illnesses acquired by consumption of foods contaminated with a variety of causes ranging from infective organisms or their toxins to chemical contaminants whether metallic or organic.[1] The broad spectrum of foodborne infections has changed dramatically over time, while established pathogens have been controlled or eliminated in certain areas, new ones have emerged.[2] Apart from the continuing high incidence of food poisoning accidents in developing world; public concerns on food safety have increased in developed world, in recent years, following a series of contaminations including dioxin contamination of European food products, emergence of Listeriosis as a foodborne disease of some significance, the reemergence of *Escherichia coli* (*E. coli*) infection and the development of antimicrobial resistance in *Salmonella* and other bacterial pathogens.[3] In 1996, appearance of transmissible spongiform encephalopathy of humans called "variant Creutzfeldt-Jakob Disease" (vCJD) strongly linked to the exposure to the Bovine Spongiform Encephalitis (BSE) agent (probably in contaminated bovine-based food products) has added a new dimension of chronicity in the group of diseases renowned for acute onset.[4] In addition, potential use of biological agents through food and water as bioterrorism agents; is an emerging public health and infection control threat.[5] This review is an attempt to describe the epidemiological pattern of food poisoning, at the national and international levels, with a focus on its preventability in the local setting. Food poisoning outbreaks constitutes a substantial component of foodborne illnesses in any community. However, it has been well documented that a large proportion of outbreaks and cases are not notified to the national or regional health authorities. There is a major variation

From the Department of Preventive Medicine, Ministry of Health, Riyadh, *Kingdom of Saudi Arabia*.

Address correspondence and reprint request to: Dr. Yagob Y. Al-Mazrou, Assistant Deputy Minister for Preventive Medicine, Ministry of Health, Riyadh 11176, *Kingdom of Saudi Arabia*. Fax +966 (1) 4028941. E-mail: yalmazrou@hotmail.com

in the notification system in different countries and even within one country, the proportion of notified cases varies with the type of pathogen involved, in addition to other surveillance system factors.[6] Although laboratory based reporting systems are not true representative of the true burden of disease in population, but still they are considered to be the most reliable indicators for trend of food poisoning, especially in countries with good surveillance mechanism. For example, in the United Kingdom (UK), the number of reported food poisoning cases steadily increased from 21,367 cases in 1985 to 105,579 cases in 1997, then it declined to 95,807 cases in 2001.[6] A similar trend has been observed in the United States of America (USA), where 533 food-poisoning outbreaks were reported in 1990, which gradually reached to 803 outbreaks in 1997. With the strengthening of surveillance mechanism, the number jumped to 1,314 in 1998 and reached to 1,414 outbreaks with 26,021 cases in 2000.[7] As compared to these small number of people involved per outbreak in USA, in 1988 an outbreak of hepatitis A, resulting from the consumption of contaminated clams, affected some 300,000 individuals in China.[8] *Campylobacter* and *Salmonella species* (*spp*) account for over 90% of all reported cases of bacteria related to food poisoning worldwide.[6,9] Same pattern has been observed in Japan, UK and USA.[6,10] Among the other bacteria, *E coli 0157* is an emerging food poisoning causative organism, and is now causing more and more food poisoning accidents.[6,11] Other bacteria frequently involved are *Clostridium botulinum*, *Bacillus ceres* and *Staphylococcus aureus*.[12]

As observed in Centers for Disease Control and Preventation (Atlanta, USA) food poisoning data,[7] viruses are responsible for a large proportion of cases of food poisoning outbreaks. Aside from hepatitis A, Norwalk virus has been isolated in some outbreak investigations in India, Japan, Andorra and USA.[13-17] However, it has to be kept in mind that in distinction with many bacterial organisms, viruses do not multiply in food or produce toxins, thus, food acts as vehicles for their passive transfer only.[18] As observed in other countries, a large proportion of food poisoning outbreaks are never reported to the health system in the Kingdom of Saudi Arabia (KSA). However, on the basis of reported outbreaks, it can be seen that number of reported food poisoning outbreaks has increased steadily during the period 1411-1422 Hijra from 186-482 accidents (**Figure 1**).[19] However, as the reported cases are dependant both on the occurrence of cases and the efficiency of reporting system, it is difficult to assert that the observed trend is a result of real increase in the food poisoning outbreaks and not merely a reflection of improved reporting system. Over the years, a seasonal variation has also been observed in the occurrence of food poisoning outbreaks, with the peak of these accidents occurring during the hot summer months of June to August.[19] This period

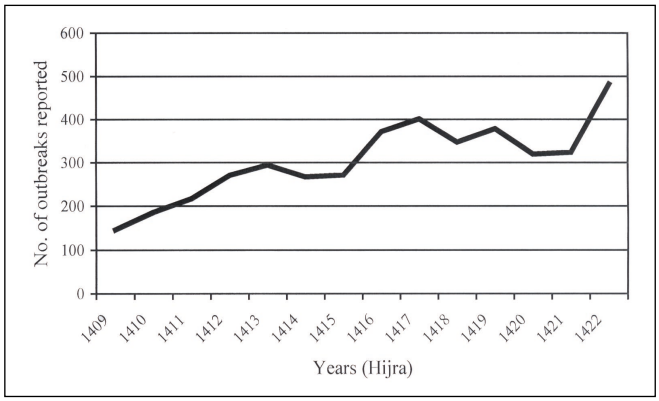

Figure 1 - Food poisoning accidents in the Kingdom of Saudi Arabia (1409-1422 Hijra).

coincides with the summer school holidays; a period during which families spend a substantial amount of time out of their homes and take their food mainly from restaurants, canteens or other fast food outlets. The increasing demand may lead to food preparation under poor hygienic conditions in the small food outlets in the extremely hot weather, thus increasing the risk of food contamination.[20]

Another setting with high number of reported outbreaks is Hajj and Umrah seasons in Makkah, KSA. During the last 12 years, number of reported cases of food poisoning has ranged from 44-132 in each Hajj season. This clustering of cases can be attributed to the fact that people coming from different countries with different cultures, socio-economic status and life style are exposed to crowded food outlets with compromised food hygiene standards and foodborne pathogens that may be rare in their countries in an alien environment with restricted monetary resources.[4,21]

In a review of 781 events of foodborne diseases reported to the Ministry of Health, Riyadh, KSA involving 6,052 cases, Kurdi et al[20] reported that *Staphylococcus aureus* was responsible for 41% of events followed by *Salmonella* during the period 1411 to 1413 Hijra.[22] *Salmonella* has been reported as an agent of food poisoning way back in 1985.[23] In another review, it was found that *Salmonella spp*. was the causative organism in 33% of the food poisoning outbreaks in the Eastern province during the period 1991-1996.[24] *Salmonella spp*. has been found responsible for 12 outbreaks out of 15 published in the Saudi Epidemiology Bulletin from 1995 to 2002. Although these studies may not be considered representative of the food poisoning outbreaks in the community, but this large preponderance of salmonellosis cannot be ignored summarily.[25-39]

The main source of *Salmonella* infection in a large number of outbreaks was found in the chicken meat and eggs. In USA, one out of every 4 chickens has been found to be infected with *Salmonella*, and in KSA

situation is not expected to be better.[9] In the local studies a popular local fast food, has been found responsible in a large number of salmonellosis outbreaks due to chicken shawarma. It has a great potential for food poisoning, because the meat is cooked very slowly by direct heat from a distance which does not raise its temperature to an extent that can kill the bacteria present in the chicken.[25,40] Inadequate storage, cross contamination and use of raw ingredients in the preparation of food might have been the additional risk factors associated with these outbreaks.[41] Global increased incidence of foodborne diseases and food poisoning outbreaks can be attributed to a multifactorial model of increase in the international travel, microbial,[6] adaptation and mutations, changes in the food production system, as well as human demographics and behavior. Greater numbers of people spend their meals in restaurants, canteens, food chains and by street food vendors. In many countries, food service establishments is not matched by effective food safety education and control. Unhygienic preparation of food provides ample opportunities for contamination, growth, or survival of foodborne pathogens.[4] In KSA, during the last 3 decades, due to rapid socio-economic development and urbanization, expansion of fast food business brought by poorly educated personnel from some developing countries, which were involved in food processing and service without adequate training.[4] Although difficult to calculate, the economic impact of food poisoning is large and it includes the cost of morbidity, mortality, and management costs of cases, in addition to the working hours loss. While evaluating the economic impact of an *E. coli* outbreak in Japan in 1996, research estimated an overall cost of 82,686,000 Yen, out of which the laboratory cost alone was approximately 26%.[42]

Prevention of food poisoning accidents is a multi-pronged activity, which involves the implementation of coordinated control measures to eliminate the agents at source, arrest the agent transmission, and protection of the susceptible host. In KSA, a set of general and specific measures can be taken to reduce the food poisoning outbreaks in future. The general measures are mostly targeted the food handlers who may act as source for infections such as *Salmonella* typhoid, *Staphylococcus aureus*, and *E. coli,* or act as the mean to propagate the causative agents by poor food handling practices. Food handlers should be asked to thoroughly wash their hands after defecation; wash the hands frequently before, during and after handling the food; use clean gloves or utensils while handling food; maintain a sanitary kitchen; thoroughly cook the meats; avoid cross contamination between raw and cooked food; protect prepared foods against rodent and insect contamination; reduce time between food handling and service; maintain proper temperature of cooked food for example hot foods should be stored at above 60°C and cold foods below 4-10°C.[1,43,44] This should be supplemented by regular medical examination of all food handlers and exclusion of food handlers suffering from diarrhea.[1] The specific additional measures for prevention of Salmonellosis outbreak include improved hygienic practices in poultry farms and abattoirs, avoidance of eating raw eggs, avoidance of using cracked eggs, and effective chemotherapy of food handlers infected with *Salmonella* while discouraging them to handle food while shedding the organism. Additional measures for *Staphylococcus aureus* infection include temporary exclusion of people with boils, abscesses and other purulent lesions on hands, face and nose from food handling while treating them with effective antibiotics; reducing the food handling time from preparation to service on a maximum of 4 hours at ambient temperatures. For prevention of *Bacillus cereus* and *Clostridium perfringens* infection, it should be stressed that food should not be kept at ambient temperature for long and left over food should be promptly refrigerated and then thoroughly reheated before consumption. It is obvious that all these measures involve to some extent legislation and improved supervisory mechanisms but mainly rely on the health education of the food handlers and consumers. To decrease food poisoning risks, health education programs targeting the general community using television, radio, newspapers and other educational channels are very important, while for Hajjis pamphlets, posters and mobile health education teams can be a good source of information.[45] However, the mainstay of the prevention program is the proper training of food handlers in food hygiene with an aim to change behaviors that might lead to foodborne illnesses.[46,47] In this regard, it may be important to implement the Hazard Analysis and Critical Control Points (HACCP) system recommended by World Health Organization in the large food organizations and develops local adaptations for implementation in a small scale food industry.[48] Hazard Analysis and Critical Control Points is a system, which includes identification of potential hazards in the food processing, identification of critical control points, setting preventive measures with critical limits for each control point, establishment of procedure to monitor these points, and corrective actions when monitoring system identifies a defect. Lastly, the establishment of effective record keeping and procedures to verify the system.[48] However, all these measures need a coordinated effort of local municipalities and health departments to strengthen the surveillance mechanism for early identification of breach in the food safety procedures. However, handling the intentional use of food toxicants, as bioterrorism agents require training of the epidemiologists and primary health care physicians, to establish strong surveillance and response capacity.[49]

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