

Prevalence of *Bacillus cereus* in Mutton Tikka and Chutney Samples in Different Seasons in Kashmir Valley

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The present study describes the prevalence of *Bacillus cereus* isolated from mutton tikka and chutney samples in different seasons in Kashmir valley. A total of 100 street vended food samples comprising of 60 mutton tikka and 40 chutney samples were tested. *Bacillus cereus* strains were isolated from 27 of the mutton tikka and 13 of the chutney samples resulting in overall prevalence of 45% and 32.5%, respectively. The field isolates and the standard strains of *Bacillus cereus* had similar cultural, morphological and biochemical characteristics.

Key Words: *Bacillus cereus*, Prevalence, Mutton Tikka, Chutney, Kashmir Valley.

Street foods are ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers on the street from pushcarts or baskets or balance pole, or from stalls or shops having fewer than four permanent Walls (FAO, 1989). Street vended food types differ greatly between countries and cultures and the industry plays an important role in meeting the food requirements of urban dwellers in many cities and towns of developing countries (Muinde and Kuria, 2005). However, food borne illnesses of microbial origin pose a major health problem with street vended foods (WHO, 2002).

Street foods are frequently associated with diarrhoeal diseases and occur due to improper use of additives, presence of pathogenic bacteria, environmental contaminants and disregard of good manufacturing practices (GMPs) and good hygienic practices (GHPs). Foodborne bacterial pathogens commonly detected in street-vended foods are *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Escherchia coli* and *Salmonella* spp. (Bryan *et al.*, 1997; Umoh and Odoba, 1999). *Bacillus cereus* is widely spread in the environment (soil, water and dust) from where it easily contaminates foods of both plant and animal origin such as pulses, vegetables, milk, meat and their products. (Larsen and Jorgensen, 1997). It possesses a diversified animal pathogenicity and produces two distinct types of enterotoxins, one of which is highly heat stable, withstanding the temperature of 126°C for 90 minutes. *Bacillus cereus* is an important cause of foodborne illness in man

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and is frequently involved in a number of foodborne outbreaks worldwide (Lund *et al.*, 2000).

Kashmir is famous for its non-vegetarian cuisines and most of these preparations are also sold in the market as vended foods. Common non-vegetarian street foods of Kashmir include Ristas, Kababs, Kantis, Roganjosh, Fried fish and Mutton tikka, the latter being most common and widely accepted street vended food of Kashmir particularly of Srinagar city. Therefore, present study was conducted to know the prevalence of *Bacillus cereus* in mutton tikka and chutney samples in different seasons in Kashmir valley of Jammu and Kashmir State, India.

MATERIALS AND METHODS

100 street vended food samples comprising 60 Mutton tikka samples and 40 chutney samples collected randomly from vendors of five zones of Srinagar city viz. East, West, North, South and Central was studied in two subsequent seasons viz. autumn and winter. For this purpose, 6 samples of mutton tikka and 4 samples of chutney per zone per season were brought to veterinary public health laboratory in ice and processed within 2-3hr for estimation of total viable counts and isolation and identification of *Bacillus cereus* using standard bacteriological techniques. The nature and the zone wise sampling pattern are presented in Table 1. Determination of total viable bacterial count was done according to American Public Health Association (1992) using the pour plate method. Mannitol egg-yolk polymyxin-B sulfate agar (MEYPA) was used for isolation of *Bacillus cereus*. The samples were processed as per the method of Shinagawa (1990) with slight modifications.

RESULTS

Prevalence of *Bacillus cereus* in Mutton tikka Samples in autumn and winter season

Of the 60 mutton tikka samples analyzed, 27 were found positive for *Bacillus cereus* with an overall prevalence of 45.00%, of which 30 Mutton tikka samples screened in autumn season for the presence of *Bacillus cereus*, 18 were found positive, with an overall prevalence of 60.00%. The prevalence varied with respect to different zones

of Srinagar city. The Central zone had the highest prevalence, with 5 (83.33%) samples positive followed by north zone having 3 samples positive (50.00%). In west and south zones, 4 (66.00%) samples each were positive, while the lowest prevalence was recorded in the East zone with 2 (33.00%) samples contaminated with *Bacillus cereus*. In the winter season, however, out of 30 samples tested, 9 turned out positive for *Bacillus cereus* making an overall prevalence of 30.00%. There was variation regarding the prevalence of *Bacillus cereus* from different zones of Srinagar city. The central zone had the highest prevalence, having 3 (50.00%) samples positive. In west and south zones, 2 (33.00%) samples each were positive, while the lowest prevalence was recorded in the East and north zone with each having 1 (33.00%) sample contaminated with *Bacillus cereus*. The results are depicted in Table 2.

Prevalence of *Bacillus cereus* in chutney samples in Autumn and Winter season

Among the 40 chutney samples supplied with mutton tikka, 13 (32.5%) were positive for *Bacillus cereus*, of which *Bacillus cereus* in the autumn season, was isolated from 9 of the 20 samples with an overall prevalence of 45.00%. The Central zone showed highest prevalence of 75.00%, with 3 samples positive. In West and South zones, 2 samples each were contaminated with *Bacillus cereus* with a prevalence of 50.00% each. The north and east zones had least prevalence of 25.00% with each having 1 sample positive for *Bacillus cereus*. Similarly, of the total 20 chutney samples screened in winter season for the presence of *Bacillus cereus*, 4 turned out to be contaminated, making an overall prevalence of 20.00%. There was variation in the prevalence of *Bacillus cereus* with respect to different zones of Srinagar city. The Central zone had the highest prevalence, having 2 (50.00%) samples positive. In west and south zones, 1 (25.00%) sample each was positive for presence of *Bacillus cereus*. However, none of the chutney samples from east and the north zones revealed the presence of *Bacillus cereus*. The results are depicted in Table 3.

DISCUSSION

Food-borne illness of microbial origin is a major international health problem associated

Table 1. Zone wise sampling pattern of Mutton tikka and the Chutney supplied with it.

Sample Type	Season	East zone				West zone		North zone		South zone		Central zone	Total
		Nishat/ Shalimar	Qamarwari/ Bemina	Hazratbal/ Zakura	Rambagh/ Jawahar nagar	Khayam/ Fateh Kadal							
Mutton tikka	Autumn	6	6	6	6	6	6	30					
	Winter	6	6	6	6	6	6	30					
Chutney	Autumn	4	4	4	4	4	4	20					
	Winter	4	4	4	4	4	4	20					

Table 2: Prevalence of *Bacillus cereus* in Mutton tikka from different zones.

Sample	Seasons	Zones					Total
		Central	North	East	West	South	
Mutton tikka	Autumn	6 (83.33%)	6 (50.00%)	6 (33.33%)	6 (66.66%)	6 (66.66%)	30 (60.00%)
	Winter	3 (50.00%)	1 (16.66%)	1 (16.66%)	2 (33.33%)	2 (33.33%)	9 (30.00%)

Table 3. Prevalence of *Bacillus cereus* in Chutney samples from different zones.

Sample	Seasons	Zones					Total	
		Central	North	East	West	South		
Chutney	Autumn	Sample Tested	4	4	4	4	4	20
		Sample Positive	3 (75.00%)	1 (25.00%)	1 (25.00%)	2 (50.00%)	2 (50.00%)	9 (45.00%)
	Winter	Sample Tested	4	4	4	4	4	20
		Sample Positive	2 (50.00%)	0 (0%)	0 (0%)	1 (25.00%)	1 (25.00%)	4 (20.00%)

with food safety and an important cause of mortality in the developing countries (WHO, 2002a). The street food industry plays an important role in developing countries as it feeds millions of people daily with a variety of ready-to-eat foods and beverages sold and sometimes prepared in the streets or public places at relatively cheaper rates (Mensah *et al.*, 2002).

The incidence of *Bacillus cereus* is higher in cooked and processed meat than in raw meat samples owing to its resistance to heat treatment (Mosupye & Von Holy, 2000). The results of our study are in accordance with the findings of Sharma *et al.* (2003), Fang *et al.* (2003), Smith *et al.* (2004), and Rather (2009) who reported a prevalence of 47.1% in meat products, 49.8% in ready to eat food samples, 45.00% in chicken products, and 51.85% in meat products respectively. The higher prevalence of *Bacillus cereus* in mutton tikka compared to chutney samples may possibly be due to heat resistance of the spores of *Bacillus cereus* which subsequently multiply at an appropriate temperature following cooking in absence of competitive microflora, whileas higher prevalence of *Bacillus cereus* in both mutton tikka and chutney samples in autumn season could be due to higher ambient temperature in the autumn season, allowing better growth of microorganisms like *Bacillus cereus*.

In the present study, the prevalence of *Bacillus cereus* in mutton tikka and chutney samples varied in different zones of the Srinagar city. The variation in the occurrence of *Bacillus cereus* in different zones of the Srinagar could be due to difference in hygienic conditions of the vendors. Heavy vehicular traffic, crowded market place and increased human activity could also have been a contributing factor for the increased incidence of *Bacillus cereus* in these zones.

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