Microbiological Quality Of Sweetmeat With Special Reference To E. Coli

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Abstract

Respondents of a survey were drawn randomly for each category of Maker and Handler from the randomly selected shops for each sample (Sandesh and Kalakand) in both rural and urban areas. Following this methodology, 19 makers and 11 handlers in urban areas and 28 makers and 2 handlers in rural areas were selected. The study revealed that the respondents of urban areas are having more positive attitude towards hygienic sweet preparation and less adoption score about scientific sweet preparation than the respondents of rural areas. The study also revealed that Escherichia coli. (E. coli) has attracted much attention as indicator organism for unhygienic condition during production and processing. It is a potential pathogen isolated from milk products suspected to be associated with the outbreaks of gastroenteritis and food poisoning in human being.

INTRODUCTION

Sweetmeat prepared from milk is an integral part of the culinary habits of people all over India. But these products are extremely vulnerable to contamination with spoilage and pathogenic organisms as well as toxic metabolites of microbial origin if subjected to advertent and inadvertent abuse during their production and processing. More than 200 food born illness are now recognized and most of them require specific laboratory diagnosis (D.N. Prasad, 1998).

Safe food production in countries like India is based in the use of preventive measures such as the use of safe raw materials, application of good manufacturing practices, and application of Hazard Analysis Critical Control point (HACCP) procedures. Adequate consumer protection can be achieved by measuring the microbiological data of end product. To improve the microbiological quality of Sandesh and Kalakand, precaution against contamination must be taken at different Critical Control Points (Roy et al., 1998).

The microbiological safety and quality of foods are directly related to identify the number of microorganism present in the products. Coliforms have probably got more attention than most other groups of bacteria on account of their importance as indicator organisms for predicting unhygienic conditions during production and processing. Among Coliforms, Escherichia coli has attracted much attention recently as a potential pathogen since several strains of enteropathogenic E. coli have been isolated from raw and pasteurized milk and milk products suspected to be associated with outbreak of gastroenteritis and food poisoning in human being (Singh & Rangnathan, 1978). Considering the public health importance of sweetmeat consumers, it is needless to say that the product should be prepared hygienically reducing the microbial load present in it. Therefore, an attempt was made to know the hygienic measures adopted by the food handler and maker during sweetmeat preparation and their reflection in the microbiological quality of the sweetmeat.

MATERIALS AND METHODS

The present study was conducted from randomly selected shops for each sample (Sandesh & Kalakand) in both rural and urban areas for each category of maker and handler randomly. In this way, 19 makers and 11 handlers in urban areas and 28 makers and 2 handlers in rural areas were selected. The data was collected through personal interviews of the respondents by the researcher herself within the total target sample using a structured questionnaire. Morphological characterization, identification and biochemical characterization of E. coli. Species were done as per the method outlined by IS (1980) SP: 18(Part I) ISI, Handbook of Food analysis and dairy products. Adoption of scientific sweet preparation was measured with the help of adoption index method (Dasgupta, 1968). According to him adoption index is referred to as “Years of use of adopted applicable practices” i.e. it not only takes the number of

practices adopted by a sweet maker into consideration but also the number of years he/ she has been using each of the adopted practices. The adoption score, according to this index, is derived for each sweet maker by adding the number of years used each of the applicable practices. The figure so obtained is then divided by the number of applicable practices. For example, if a sweet maker adopted two out of six applicable practices and has been using one practice for ten years and the other for eight years, then he / she is assigned an adoption score of:

(10+8)/ 6 = 3

RESULTS AND DISCUSSION

Table 1 depicted that the attitude score towards hygienic sweetmeat preparation was more in young respondent (21.5) than that of adult (20) and old (0) in urban areas. On the other hand, the attitude score was higher among adult respondents (19.6) than that of old (19) and young (17.5) in rural area. It may be concluded from these findings that the respondents of young and adult age groups have a more positive attitude towards hygienic sweet making in urban and rural areas.

Figure 1

Table 1: Table showing the attitude score of the respondents in relation to different selected independent variables.

Variables	Category	Urban	Rural
Age	Young	21.5	17.5
	Adult	20	19.6
	Old	0	19
Sex	Male	20.3	18.33
	Female	0	0
Education	Illiterate	13.6	18.5
	Primary	21.7	19.2
Family type	Nuclear	0	0
	Joint	20.3	18.33
Family size	Upto 5 members	0	0
	More than 5 members	20.3	18.33
Marital status	Married	19.7	18.44
	Unmarried	21.28	15
Monthly income	Upto Rs. 2000/-	19.38	18.41
	Rs. 2001 – 2500/-	21.87	18
	Rs. 2501 – 3000/-	21	0
	Rs. 3000/- and above	0	0

The table also showed that the male respondents of urban area are having more attitude score (22.3) than that of rural area (18.33) where as not a single female respondents was found as a sweet maker or handler in the sample of the study in both the rural and urban area.

It is also evident from the table that in both urban and rural areas primary educated respondents have greater attitude score than illiterate. But it is highest in case of urban area (21.7). It can be concluded that the primary educated people have more positive attitudes towards hygienic sweet preparation than illiterate. Kaferstein et al. (1993) opined the same findings.

A perusal of the table also depicted that the joint type of family of urban area have more attitude score (20.3) than rural (18.33). It is also found that not a single respondent came from nuclear family in both the areas. So it can be concluded that respondent who are involved in sweet preparation have come from joint family which is having more positive attitude.

In case of family size it is same. All the respondents came from family which was having more than 5 members. It can also be that urban respondents is having greater positive attitude score (20.3) than that rural respondents (18.33)

The table also revealed that unmarried respondents (21.28) have a more positive attitude towards hygienic measures in sweet preparation than that of married respondents (19.7) in urban areas. But in case of rural area it is just the reverse, where the attitude score of married respondents were 18.44 against the score of unmarried (15).

Respondents of urban area who were having monthly income Rs. 2001 – 2500 have the highest attitude score (21.87). But in case of rural areas, the respondents who earn monthly Rs. 2000 have the highest attitude score (18.41). It can be concluded that rural respondents are paid worse than urban respondents. Angelillo et al. (2000) have reported the behaviour of food handlers in Italy. They have also observed the attitude and other personal attributes of food handler, which are more or less same with the present findings.

A perusal of the table 2 revealed that in urban areas the adults have the highest adoption score about hygienic sweet preparation (9.583) and in rural areas it is highest amongst old age (19.66). It is also seen that old age people were not engaged in sweet preparation in urban areas. It is also evident from the table that male respondent of rural (13.03) have more adoption score than that of urban respondents (8). It is also found that not a single female respondent are involved in sweet preparation.

Figure 2

Table 2: Table showing the adoption scores of the respondents in relation to different selected independent variables.

Variables	Category	Urban	Rural
Age	Young	1.666	7.5
	Adult	9.583	12.16
	Old	0	19.66
Sex	Male	8	13.03
	Female	0	0
Education	Illiterate	8.66	14.25
	Primary	7.83	9.6
Family type	Nuclear	0	0
	Joint	8	13.03
Family size	Upto 5 members	0	0
	More than 5 members	8	13.03
Marital status	Married	9.782	12.55
	Unmarried	1.875	15
Monthly income	Upto Rs. 2000/-	7.863	13.13
	Rs. 2001 – 2500/-	7.428	10
	Rs. 2501 – 3000/-	15	0
	Rs. 3000/- and above	0	0

The table also depicted that in both the area we find the illiterate respondents have a higher adoption score than primary educated respondents which is 14.25 in rural areas and 8.66 in urban areas. It may be due to their age long practical experience of sweet preparation.

The respondents of joint family in rural areas have a higher adoption score (13.03) than the respondents of urban areas. There was not a single respondent of nuclear family involved in sweet preparation in both the areas. At the same time the respondents having family size more than 5 members in rural areas are having more adoption score (13.03) than the respondents of rural areas (8).

The table also depicted that in urban areas the married respondent have a higher adoption score (9.78) than unmarried. But it is reverse in case of rural areas. Here the unmarried have a higher adoption score (15).

In case of monthly income, the urban respondents have the highest adoption score. It is 15 in case of respondents having monthly income Rs. 2501 – 3000/-. But in rural areas the adoption score was highest (13.13) in the respondents having monthly income Rs. Up to 2000/-. It may be concluded from the findings that the comparatively high income group of people are more adopted in urban areas.

Table 3 revealed that total 19 samples were positive for E. coli which is isolated from both sandesh and kalakand. Table 3 also indicates that 31.66% of samples were positive for E. coli among total samples, whereas Singh & Ranganathan (1978) analyzed 100 various samples in which 47% were positive for E. coli. Table 3 also revealed more number of E. coli in Sandesh than kalakand and it is highest in sandesh of urban area (46.66%) and lowest in kalakand (20%) of rural area. This variation of present study may be due to difference in storage, handling transportation, packaging and product variability. Bhat et. al. (1948) observed that even fresh sample of khoa without added sugar contained large number of bacteria as E. coli. Similarly, Garg & Mandokhot (1984) reported 5% pare contaminated with E. coli. According to Sen & Rajarhia (1986) the percentage of getting E. coli positive sample is highest. They studied that the corresponding microbial load in hard grade was minimum. Low microbial count in hardgrade sandesh are expected to be lower moisture and high sugar content as compared to sandesh. Coliforms in hard grade sandesh were almost negligible, on the contrary, highest proportion of moisture and low amount of sugar tremendously accelerate the growth of microbes in soft grade. Several other factors like unsanitary method of production, handling, storage and transportation are also responsible for such high microbial load.

Figure 3

Table 3: Table showing isolates of from Sandesh & Kalakand

Sl. No.	Source of Sample		No of sample examined	No of Sample positive for *E. coli*	Percentage (%)
1	Sandesh	Urban	15	7	46.66
		Rural	15	6	40.0
2	Kalakand	Urban	15	6	20.0
		Rural	15	3	20.00
			60	19	31.66

The result of various biochemical studies of isolates is given in table 4. On observation of colony characters it was found that all positive isolates give typical metallic sheen of E. coli strain on Eosine Methylene Blue Agar media and after gram staining they showed gram negativeness of the organism, which are rod shaped morphologically. From the colony characters on Eosine Methylene Blue Agar, Gram staining character and biochemical character it is evident that the organism is E. coli.

Figure 4

Table 4: Table showing biochemical characterization of isolated from Sandesh and Kalakand

Sl. No	Biochemical reaction	No of *E. coli* isolates	Positive for *E. coli*	Percentage (%)
1	Motility	19	19	100
2	Acid Butt & acid slant On TSI agar	19	19	100
3	Indole at 37^{0}C	19	19	100
4	Methyl red	19	19	100
5	Voges proskaur	19	0	0
6	Citrate utilization	19	0	0
7	Nitrate reduction	19	19	100
8	H_2S production	19	0	0
9	Sucrose	19	11	57.89
10	Mannose	19	18	94.73
11	Inositol	19	0	0
12	Mannitol	19	19	100
13	Maltose	19	19	100
14	Lactose	19	19	100

Table 5 revealed the results of four isolates, which were taken randomly, one from urban sandesh, one from urban kalakand, one rural sandesh and one from rural kalakand to test the pathogenesis of E. coli in rabbit ligated ileal loop. The results depicted that two isolates were enteropathogenic as their dilation index is over 0.4 (Mukhopadhya, 1989).

Figure 5

Table 5: Table showing results of the enterotoxic activity of four randomly selected isolates of in rabbit ligated illeal loop

E. coli isolates	Detection of intestinal loop observed for accumulation of fluid	Characters of accumulated fluid				Length of intestinal loop	Dilation indole
		Volume (ml)	Colour	Consistency	PH		
Isolates-I	+++	7.2	Brownish red	Liquid	3.7	7.2	0.79
Isolates-II	+++	6.8	Brownish red	Liquid	5.5	8.0	0.85
Isolates-III	++	2.4	Straw coloured	Liquid	6.5	8.0	0.30
Isolates-IV	++	2.1	Straw coloured	Liquid	6.3	7.0	0.30
Control	- -	0.5	Yellow	Liquid	8.0	3.0	0.16

CONCLUSION

From the above study we can conclude that E. coli has attracted much attention recently as indicator organism for predicting unhygienic condition during preparation and processing. It is a potential pathogen since several strain of enteropathogenic E. coli have been isolated from milk products suspected to be associated with outbreaks of gastroenteritis and food poisoning in human being. This fact is also supported by Singh & Ranganathan (1978).

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