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CURRENT FOOD HANDLING AND STREET FOOD PREPARATION PRACTICES  
PARTICULARLY OF DAIRY PRODUCTS IN KATHMANDU

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## Preface and Acknowledgement

The street food selling practice in Nepal is an age old feature of life. However, in Kathmandu city, socio-economic changes have helped in the promotion of such trades during last 15 years. Some people prefer to do so. The street food sellers act as an essential caterer of cheap ready to - eat food for the community. These food sellers along with consumers of the community constitute a public health hazard. These street food sellers prepare food from ingredients of doubtful quality and cook or store it in cheap utensils and is often kept at a temperature that permits bacterial growth. Milk and milk products are more vulnerable to such circumstances and cause a number of diseases like diarrhoea, typhoid, jaundice, vomiting, pain, cholera, and other diseases.

There was no such authentic data or survey report on the street food published in Nepal. Therefore, this study on current food handling and street food preparation practices particularly of dairy products in Kathmandu Town Panchayat was carried out, for the first time in Nepal, with the technical guidance and financial support of Food and Agriculture Organization (FAO), Rome.

The objectives of this research project were to study the aspects on the type and quality of raw food materials, the equipment used, the technology and practices, adopted the type of personnel involved in the current food preparation and handling practices, food distribution system and socio-cultural habits of the people in preparation and consumption of street foods of dairy products.

This report has presented the overall picture of the current street food shops and their hygienic and sanitary conditions, water supply food preparation and handling, types of dairy products produced, types of consumers and opinions of panchayat leaders, local school teachers and finally an account of the bacterial contamination of food. Various recommendations have been made which have been forwarded to the concerned institutions of His Majesty's Government as well as panchayat leaders and consumers.

My sincere and foremost gratitude goes to Food and Agriculture Organization (FAO), UN, Rome for helping in this endeavor without which this study would not have been a reality. I am most grateful to Mr. S.S. Mahdi, FAO Representative to Nepal and also my special thanks owes to Mr. A.N. Rana, Secretary Ministry of Agriculture, HMG Nepal for their valuable guidance and supervision,

I am also thankful to all the members of the advisory committee for their continuous supervision. Finally, I would like to thank to the project staff who were involved both in the field work as well as in the analysis and completion of the report.

Lastly, I would like to express my gratitude to the Food Research Laboratory, Ministry of Agriculture and Central Quality Laboratory of Dairy Development Corporation, Nepal for providing their laboratory facilities for analysing food samples for chemical as well as bacterial analysis. Last but not the least I hope that the findings and recommendations made in this study will be helpful to Town panchayat leaders, planners and public health personnel for improving the hygienic and sanitary conditions of the street food in Kathmandu

Dr. D.D. Joshi  
Principal Investigator

## 1. BACKGROUND INFORMATION

### 1.1 Introduction

Nepal has been trying to improve the health of people since the last two decades. Although some progress has been made, much more needs to be done if the goal of health for all by the year 2000 is to be met. In particular, the impact of foodborne illness particularly milk borne diseases on health associated with contamination of the food supply has not been well recognized by national organizations. To a significant extent, the ubiquitous nature of the problem has made it less visible than the more dramatic but less significant outbreaks of other diseases, which have received greater attention and resources than food safety. Indeed, the Declaration of Alma-Ata' only implicitly considered food safety as an essential component of primary health care, rather than recognizing it explicitly as a major component contributing significantly to disease prevention and health promotion.

At the level of individual family units, foodborne disease particularly milk-borne disease can also be catastrophic insubstantial economy for the national. Debilitating illness at the time of planting or harvest may result in nearly total loss of crops, not only for sale but also for family use.

In the last 40 years, international organizations have produced a large number of reports on food safety, milk hygiene and sanitation and hereby initiated many programmes to deal with the problems. In spite of this effort, food borne and milk-borne illness continues to increase in the world. The reasons for this are not well known, but may be associated with the relatively fragmented nature of the programmes, the difficulty of convincing national governments of the importance of the problem, and most significantly, the lack of recognition that its solution requires a coordinated approach calling for a wide range of skills, including those practised in economics, sociology, and anthropology, as well as in the more traditional disciplines associated with food safety. It is therefore evident that international organizations must continue to intensify their efforts to cooperate with member countries in promoting food safety, particularly of dairy products taking into consideration their particular public health needs and the difficulties and constraints mentioned above.

Illness due to contaminated food of dairy products is perhaps the most widespread health problem in Nepal and particularly in Kathmandu. It is also an important cause of reduced economic productivity. The solution to this problem must be one of the major priorities of national and international health agencies and can only be handled successfully if the primary health care approach is utilized. It is believed that its report would help policy-makers in developing appropriate national and international programmes.

1.2 Human population of Kathmandu town panchayat by age and sex is given in table 1. Male and female population ratio is 55% and 45% respectively. Major population distribution by age and sex is between 1 to 45 years. The highest percent of population in both sexes is between 5-9 years of age.

Table 1 : Population distribution of Kathmandu town panchayat by age and sex

Age groups	Total		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
Under 1 years	4499	1.9	2361	1.8	2138	2.0
1-4	25669	10.8	14158	10.9	11511	11.0
5-9	26270	11.3	14149	10.9	12121	11.3
10-14	25899	11.0	14453	11.2	11446	10.9
15-19	25908	11.1	14645	11.3	11263	10.8
20-24	26574	11.4	14571	11.2	12053	11.4
25-29	20617	8.8	11102	8.6	9515	9.0
30-34	16543	7.0	8943	7.0	7600	7.3

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35-39	14725	6.2	8044	6.3	6681	6.3
40-44	11514	4.9	6284	4.9	5230	4.9
45-49	9440	4.1	5205	4.0	4235	4.0
50-54	8272	3.5	4689	3.6	3573	3.5
55-59	5440	2.4	3240	2.5	2200	2.1
60-64	5158	2.3	2838	2.2	2320	2.2
65-69	3394	1.5	1921	1.5	1473	1.4
70-74	2490	1.0	1449	1.1	1041	1.0
75-79	1307	0.5	733	0.6	574	0.5
80-84	886	0.3	477	0.3	409	0.3
85-89	336	0.1	194	0.1	142	0.1
90-94	127	-	68	-	59	-
above 95	102	-	52	-	50	-
Total	235160	100.0	129526	100.0	105634	100.0

Source : CBS, Population census, 1981.

**Table 2 : Meteorological Data Recorded at Kathmandu Airport**

Years	Mean. air temperature °C		Relative humidity (%) observed at		Total annual rainfall in mm
	Maximum	Minimu	0840 hrs.	1740 hrs.	
1981	23.9	12.1	88	68	1370
1982	24.6	11.5	85	66	1168
1983	24.5	11.2	86	71	1449
1984	25.1	11.7	85	66	1313
1985	24.9	12.1	84	66	1786
1986	24.6	11.5	87	67	1495
Average	24.6	11.7	86	67	1430

Source : Department of Meteorology 1981-1986

### 1.3 Climate

According to the meteorological data recorded at Tribhuvan International Airport Kathmandu, the average (1981-1986) for the last six years mean maximum and minimum air temperature is 24.6°C and 11.7°C respectively. Relative humidity observed in the morning and at evening is 86% and 67% respectively. Annual rainfall is 1430 mm (see table 2).

### 1.4 Food Service

Most reported food borne particularly milk borne diseases are caused by foods prepared and mistreated or mishandled in food-service establishments. Economic factors and employment patterns have led to an increase in the consumption of meals outside the home. "Fast-Food" and "take-away" restaurants have proliferated to satisfy popular demand. The foods kept in shops and restaurants or sold in streets are often prepared early in the day in large quantities and held for hours until they are sold. The unsold foods, sometimes in large quantities, are reheated the next day. Mishandling of food in such food-service establishment can contribute significantly to outbreaks of food borne diseases. Small catering establishments which cannot often afford the facilities required for the safe storage of cooked foods prepare them traditionally in response to individual orders and are eaten almost immediately, in such cases foodborne and particularly milk borne diseases are unlikely.

The food either hot or cold prepared for selling in the retail premises frequently fail to maintain adequate temperature control. Normally, the rapid sale of foods keeps the holding period short, but any delay will allow the growth of micro-organisms in them. Temperature control of such foods is

particularly difficult to maintain whenever they are transported to remote serving outlets and while they are stored and handled in these outlets.

### 1.5 Street vending of food of dairy based products

The street vending of food of dairy based products is an age-old feature of life in a great number of countries. In many developing countries, socio-economic changes have significantly contributed combined to the promotion of such trades. Some people prefer to eat out, while others are forced by circumstances to do so. The street food vendor acts as an essential caterer of cheap ready-to-eat food for the community.

Important as these food vendors are to the community they serve, they also constitute a health hazard, especially in Kathmandu. It is generally agreed that unbalanced diets and contaminated food and water contribute significantly to mortality in the developing countries and particularly in Nepal, today, these street food vendors contribute to this situation. Even where the local authority attempts to register street vendors, it is difficult to monitor them because of their mobility.

In many cases street vendors prepare the food of dairy products from ingredients of doubtful quality and cook or store it in cheap utensils from which toxic metals might be leached into it. Moreover, since the food usually needs to be made quickly available for most of the day, it is often held at a temperature that will permit bacterial growth.

In many locations, a safe water supply is either not readily available or is inadequate for washing utensils or for washing hands, after soiling them e.g., when handling raw meat or raw milk or raw poultry or after defecation. Take-away food items are sometimes wrapped in leaves (traditionally used for the purpose), newsprint, or other packaging materials that are not of food grade quality. The practice of street food vendors of freshening up raw vegetables with a polluted water supply is also widespread.

The insanitary condition of the environment where milk and milk products are prepared or exposed for display often encourages the breeding of pests that contaminate food. In order to ward off flies, the "affluent" vendor sprays insecticidal aerosols while the food is displayed or being served to consumers, and in doing so may contaminate the food.

In spite of these shortcomings, the itinerant vending of food has become institutionalized in many countries. Therefore, efforts must be made (a) to educate the personnel involved in it; (b) to improve the environmental conditions in which the trade is practised; and (c) to provide the essential utility services to aid the itinerant food vendor in preparing safe and nutritious food. Either a short holding time or temperature control both of which are difficult to achieve is essential for food safety.

### 1.6 Travel and Tourism

In recent times, travel has ceased to be the exclusive domain of the affluent. In addition to business travel, tourism has become a major industry featuring package tourists alone, 500 million persons may travel every year. Other factors contributing to the increase in the number of travellers are the mass travel of pilgrims to holy places and the international migrations of millions of workers in search of employment. To this can be added the unfortunate millions who become political refugees.

Travellers diarrhoea is now a widespread phenomenon, affecting about 20-50% of all travellers. Caused by enterotoxigenic *Escherichia coli* and other organisms and transmitted through contaminated food prepared in milk and milk products and water (including ice), this condition seems to afflict tourists selectively, perhaps because they lack the immunity to the local strains and because they are obliged to eat in establishments that often prepare large volumes of food in order to cater for the influx of visitors.



## 1.7 Nutritional Factors

Maintaining and improving the nutritional quality of dairy based food supplies and diets are basic components of food safety. Deterioration of nutritional quality must be avoided whenever possible in the food chain, not only to maintain a healthy nutritional state person, but also to minimize the adverse effects of intercurrent diseases, particularly diarrhoeal disease or microbial origin.

The points in the food chain where degradation of nutritional quality are most likely to occur are during processing, storing and preparing of food for consumption. Generally, the basic problems are vitamin destruction, protein quality deterioration and changes in the physio-chemical state of essential minerals, cars in countries with high day time temperatures. In these circumstances, the food may be exposed to temperatures of around 60°C for many hours a day certainly sufficient to cause marked deterioration of nutritional quality if such conditions are maintained for any significant period of time.

## 2. OBJECTIVES

To study the following aspects :

- 2.1 The type and quality of raw food materials based on dairy products used.
- 2.2 The equipments used
- 2.3 The technology and practices in current food handling and food preparation practices of dairy based food products.
- 2.4 Food distribution systems
- 2.5 Type of personnel involved in the preparation of street foods of dairy products
- 2.6 Socio-cultural habits of the people in preparation and consumption of street foods of dairy products.

## 3. RATIONALE OF THE OBJECTIVE

Kathmandu city is getting more and more urbanized. There is a continuous migration of both rich and poor people into the Kathmandu valley. This is because rich people come to build houses and poor people, mostly unskilled ones come to work as a seasonal or temporary labour. As the street dairy based food preparation and selling practices are very common in India and many other developing and developed countries, Nepal is not an exception to it. Many labourers and temporary visitors who come by bus for a day or a couple of days' works are the main consumers of street food.

There is a problem of milk hygiene and sanitation in the street food sector and thereby the temporary non-resistant people suffer from diarrhoeas, and other gastrointestinal problems.

Therefore, it is essential to study the status of current food handling and street food preparation practices particularly dairy based food products in Kathmandu city. It is also equally essential to know the types of raw materials used, for cooking foods, equipment and utensils for cooking and serving, technology and practices of food distribution system, preserving, and selling systems and type of personnel involved in the preparation and selling of street foods, their health, cleanliness, habits, know-how about food hygiene and sanitation, food borne diseases etc.

This type of study has not been carried out so far not only in Kathmandu but also in Nepal. Therefore it is urgently needed to carry out this type of research study.

### 3.1 Quality of street food particularly dairy products

Quality is very important but what does it mean ? when we consider the food and food of dairy products' quality, one of the main factors is the quality of raw food or raw milk which can not be improved just by processing. Therefore the raw milk quality is very important.

In milk production we need above all

- healthy cows and buffaloes with good under health
- hygienic and nutritional food feed
- good production environment and good milk management

The general requirements of raw milk are as follows :

Raw milk must have

- normal composition
- normal look, odour and taste
- free from pathogen microorganisms
- a minimum of product destroying microorganisms
- a minimum of somatic cell contents without risk for dairy products quality.
- a minimum of substance not belonging to normal milk composition from environment or milk management

Dairy Production

Distribution of Dairy Products

Quality Control

Dairy Products on the Market

Dairy Products at Home

Consumption

Quality control of dairy products is being carried out on the basis of the country's regulation and general food legislation based on the Nepal Food Act.

#### 4. METHODOLOGY

The following different factors were studied at field level

- Role of street foods particularly of dairy products in urban food supplies.  
This item includes historical background, volume of street goods, number of persons engaged, populations served, and their economic strata, nutritional and historical contribution by street foods.
- Socio-cultural aspect of street foods particularly of dairy products.
- Status of current food handling and street food preparation practices particularly of dairy based food products.

This item covers the following aspects : Type and quality of raw materials used, equipment, technology and practices; distribution systems and type of personnel involved in the preparation of street foods.

- Problem of milk hygiene and sanitation in the street food sector.
- Contamination and potential hazards of food poisoning and food-borne, milk-borne diseases, Data presented are based on case studies regarding potential hazards of street foods, including types of targeting population eg, school children, factory workers etc.
- Current regulatory practices and their effectiveness for ensuring safety and nutritional values of street foods particularly of dairy products.
- Strategies to be developed for future action
- Improvement of technologies : process of preparation, use of equipment-utensils, holding arrangements, distributing and serving facilities.
- Increasing capabilities of food handlers physical infrastructure and training activities.
- strengthening of regulatory infrastructure with recommendations for possible fiscal options.
- Consumer education
- General recommendations

#### **4.1 Sampling Plan**

The following sampling design has been devised for this study :

##### **4.1.1 The target population**

The target population for this survey purpose was the total number of street shop-keepers, milk vendors, ice-cream sellers and yoghurt sellers in one side and total number of consumers visiting these shops on the other side. This study prepared an inventory of such shops, sellers and vendors. Apart from such vendors, sellers and consumers, the survey also attended to collect views from the local panchayat leaders and school teachers located in Kathmandu city. For determining the bacterial and chemical composition, the present study collected two hundred various samples of preparation of milk and milk food and analysed them in the Food Research Laboratory of HMG Nepal.

##### **4.1.2 Sampling Unit and Frame**

As usual this study has also pre set a sampling unit and sampling frame. For the group of teachers, the sampling units are considered to be an individual teacher, leader and consumer visiting street shops. And the name lists of teachers and the local leaders are being used as sampling frame. The sampling frame for consumers was visitors of such street shops. Sampling unit for street shops, milk vendors, Yoghurt sellers and Ice-cream sellers has been taken as a individual seller or the sellers prepared by the study group is the sampling frame given in Annex-1. The table in the Annex shows sampling frame for selection of supplement of food item.

##### **4.1.3 Sampling Technique**

The sample selection procedure adopted in this study for interview as well as laboratory analysis has remained complete random within the wards. Shopkeepers for interview were selected out of the shops located in each wards of the city. Likewise, the milk vendors, Ice-cream sellers and yoghurt sellers were also selected randomly from each of the wards. Also visitors of such street shops were selected in the same way. School teachers for interview were selected at least two from each wards and one panchayat leader was taken on the same basis.

Sample or specimen collection for laboratory analysis was decided on the basis of distribution pattern of such shops as given in the annex. Thus overall sampling selection plan, based on the principle of stratified random sampling, used in this study has made the sample most representative.

#### 4.1.4 Sample Size

As mentioned in the proposal, the sample size for the study, chosen arbitrarily, is as follows :

S.N.	Types of population	Sample size
1.	Street shop keepers	201
2.	Milk vendors	100
3.	Yoghurt sellers	50
4.	Ice-cream sellers	50
5.	Consumers	200
6.	Food stuff specimens	200

#### 4.1.5 Data Collection

The information has been collected on different variable by using semi-structured questionnaires prepared and pretested by an investigation team. For laboratory analysis, the process has been mentioned separately. The questionnaires have been presented in Annex -

#### 4.1.6 Analysis and data Processing

All the information collected through the interviews and results of laboratory examinations have been tabulated manually. For the analysis and interpretation of the data proportion and percentage techniques have been used.

#### 4.2 Types of analysis carried out in the Laboratory

The following analysis were carried out.

##### 4.2.1 Microbiological analysis

Bacteriological analysis of street food samples based on dairy products like milk and milk products mixed with cereal food, fruits and vegetables procedures :

- Sampling of dairy products aseptically
- Direct microscopic examination
- Tests (culture) for coliform organisms
- Total count

##### 4.2.2 Chemical Analysis

- Determination of fat in milk, cream dahi (Yoghurt), cheese, evaporated and condensed milk by Gerber method.
- Determination of density and specific gravity of milk using lactometers and calculation of total solids and solids not-fat (SNF) of other dairy products.
- Determination of acidity of milk, cheese, dahi, and PH of milk.
- Detection of preservatives in milk and other dairy products.
- Determination of added water in milk
- Analysis of ghee (cooked butter), khova, milk powder.

Table 3 : Statistics of street shops of Dairy Products in Kathmandu City (Sampling plan)

S.N.	Types and Number of Shops					
	Milk	Yoghurt	Sweet	Tea	Ice	Total
1.	2 (1)	1 -	28 (5)	6 (1)	14 (2)	51 (9)
2.	1 -	-	8 (2)	2 -	6 (1)	17 (3)
3.	3 (1)	1 -	9 (2)	2 -	3 -	18 (3)
4.	-	-	3 (1)	-	2 -	5 (1)
5.	1 -	-	5 (1)	-	1 -	7 (1)
6.	2 -	4 (1)	22 (5)	9 (1)	6 (1)	43 (8)
7.	2 -	3 (1)	11 (2)	4 (1)	2 -	22 (4)
8.	4 (1)	2 -	21 (4)	7 (1)	5 (1)	39 (7)
9.	4 (1)	4 (1)	10 (1)	12 (2)	4 (1)	34 (6)
10.	16 (3)	11 (2)	27 (5)	13 (2)	12 (2)	79 (14)
11.	-	1 -	4 (1)	-	2 -	7 (1)
12.	-	-	8 (1)	1 -	4 (1)	13 (2)
13.	-	2 -	6 (1)	2 -	9 (2)	19 (3)
14.	2	1 -	4 (1)	2 -	3 (1)	12 (2)
15.	6 (1)	10 (2)	55 (9)	30 (5)	10 (2)	109 (19)
16.	10 (2)	10 (2)	37 (6)	25 (4)	21 (4)	103 (18)
17.	-	1 -	25 (4)	6 (1)	8 (2)	40 (7)
18.	1 -	-	3 (1)	4 (1)	1 -	9 (2)
19.	1 -	-	5 (1)	1 -	3 (1)	10 (2)
20.	-	3 (1)	17 (4)	-	7 (1)	37 (6)
21.	7 (1)	-	31 (5)	9 (2)	6 (1)	53 (9)
22.	-	3 (1)	23 (3)	10 (2)	3 (1)	39 (7)
23.	-	-	-	5 (1)	-	5 (1)
24.	-	-	-	3 (1)	6 (1)	9 (2)
25.	1 -	-	4 (1)	1 -	4 (1)	10 (2)
26.	-	-	7 (1)	3 (1)	-	10 (2)
27.	-	-	16 (3)	-	-	16 (3)
28.	3 (1)	1 -	4 (1)	5 (1)	1 -	14 (3)
29.	-	-	9 (2)	9 (2)	3 (1)	21 (4)
30.	-	-	16 (2)	-	3 (1)	19 (3)
31.	13 (2)	25 (4)	65 (12)	76 (13)	23 (4)	202 (35)
32.	2 -	7 (1)	30 (6)	2 (1)	2 -	43 (8)
33.	-	-	9 (1)	3 (1)	7 (1)	19 (3)
	81 (14)	90 (16)	530 (94)	252 (44)	151 (32)	1134 (200)

\* Numbers in parenthesis are the samples drawn from each curd and items calculated according to the proportionality of number of shops.

## 5. MICROBIOLOGICAL STANDARDS OF DAIRY PRODUCTS

Milk was the first food product for which microbiological standards were adopted in the United States of America (USA) and other organizations like National Canners Association, Association of Food & Drug Officials of the US, Food and Agricultural Organization and World Health Organization. The category of foods most likely to come first under microbiological standards, whether nationwide and or the worldwide, are the precooked foods, especially the frozen ones. Microbiological standards of milk and other dairy products are presented below :

**5.1 Grade A raw milk for pasteurization**

- (a) Bacterial count not to exceed 1,00,000 bacteria per milliliter.
- (b) Coliform colony count not exceeding 10 coliforms per milliliter.

**5.2 Grade A Pasteurized milk and milk products**

- (a) Bacterial count not to exceed 20,000 bacteria per milliliter.
- (b) Coliform colony count not exceeding 10 coliforms per milliliter.

**5.3 Certified raw milk**

- (a) Bacterial plate count not exceeding.
- (b) 10,000 colonies/ml coliform colony count not exceeding 10/m

**5.4 Certified pasteurized milk**

- (a) Pasteurized certified milk - Bacterial plate count exceeding 500/ml
- (b) Coliform colonies count not exceeding one/ml.

**5.5. Dry milk**

- (a) Grade A - standard plate count over 30,000/gm
- (b) Coliform count over 10/gm

**5.6 Frozen desserts**

- (a) Bacterial standard count ranges from 50,000-1,00,000/ml. or gm.
- (b) Coliform not exceeding 1/ml.

**5.7 Ice-cream**

- (a) Mesophilic aerobic bacterial count not exceeding  $2.5 \times 10^5$ /gm (2,50,000 bacterial count/gm).
- (b) Coliform bacteria count not exceeding  $10^3$  (10,000 bacteria (gm or ml.)
- (c) Staphylococcus Aureus should not be exceeded 100/gm. minimum 10/gm.
- (d) Salmonella should be "Zero" in all milk and milk products.
- (e) Yeast not more than 10/10 gm or 1/gm
- (f) Molds not more than 10/10 gm or 1/gm.

**5.8 Hygienic Standard of Evaporated Skimmed Milk**

- (a) Bacteria must not be found in Evaporated Milk and shall be found in amounts not exceeding 0.1 ml.,
- (b) Free of pathogenic micro-organism
- (c) Free of toxic substance produced by micro-organism in amounts which may be hazardous to health.

**5.9 Hygienic standard of condensed milk**

- (a) Bacterial count shall not exceed 10,000 in 1 gm. at sample.
- (b) Coliform bacteria shall not be found and shall be found in amounts not exceeding 0.1 gram.
- (c) Yeast and mould count altogether should not exceed 10 in 1 gm.
- (d) Free of pathogenic micro-organism

- (e) Free of toxic substance produced by micro-organism in the amount which may be hazardous to health.

#### 5.10 Hygienic standard of whole milk powder

- (a) Bacterial count shall not exceed 100,000 in 1 gm. of sample.
- (b) Free of pathogenic micro-organism
- (c) Free of toxic substance produced by micro-organism in the amount which may be hazardous to health.

### 6. PUBLIC HEALTH HAZARDS

Pathogens causing brucellosis, scarlet fever, typhoid fever, diphtheria and other milk-borne diseases are common in unpasteurized milk and milk products. Zoonotic diseases of animals transmissible to man, such as tuberculosis, brucellosis and so on are also common in meats.

Among the requirements for foods to be of good sanitary quality, they must be shown to be free of public health hazardous micro organisms or those present should be at a safe low level. The practice should be continued to determine the sanitary quality of foods by their content of certain indicator organisms. The indicators of sanitary quality now employed for foods consist of two groups of bacteria which are coliforms and enterococci.

#### 6.1 Coliform presence in Foods

The presence of large numbers of coliform in foods is highly undesirable, however, it would be virtually impossible to eliminate all of these organisms from fresh and frozen foods. Coliform standards for dairy products should not be over 10/ml for Grade A pasteurized milk products, not over 10/ml for certified raw and not over 1/ml for certified pasteurized milk.

#### 6.2 Enterococci presence in foods

The enterococci are members of the genus *Streptococcus* which consists of gram-positive cocci that produce long or short chains. *S. faecalis* and *S. faecium* constitute the enterococcus group.

These enterococci are primarily of fecal origin. These are being associated more with the human intestinal canal and also animals. The enterococcus counts are more closely related to the total counts of coliform counts.

#### 6.3 E. Coli Gastroenteritis

The *Escherichia coli* gastroenteritis syndrome is caused by the ingestion of  $10^{10}$  viable cells/g. that must colonize the small intestines and produce enterotoxin (s). *E. Coli* food borne infection recorded in a variety of dairy based food products are : Brie cheese, imported cheese, locally produced cheeses, cream pie, mashed potatoes, cream puffs, creamed fish and others.

Common symptoms recorded in different outbreaks were cramps, diarrhoea, fever, nausea, chills, vomiting, aches, and headaches. *E. Coli* is considered to be one of the leading causes of acute watery diarrhoea that often occurs among new arrivals in most of the developing countries.

#### 6.4 Staphylococcal Gastroenteritis

The staphylococcal food-poisoning/food intoxication syndrome was recorded and observed in 1894, 1914 and 1930 (Dack et. al. ) by consuming milk that had been contaminated with a culture of

staphylococcus aureus and the illness had been designated staphylococcal aureus and the illness had been designated staphylococcal gastroenteritis.

In general staphylococci may be expected to exist, at least in low numbers, in any or all food products that are of animal origin; or in those that are handled directly by man, unless heat processing steps are applied to effect their destruction. With regard to vehicle foods for staphylococcal enteritis, a large number has been incriminated in outbreaks usually products made by hand and improperly refrigerated after being prepared.

Factors identified -

1. Inadequate refrigeration
2. Preparing foods far in advance of planned service.
3. Infected persons practising poor personal hygiene.
4. Inadequate cooking or heat processing
5. Holding food in warming devices at bacterial growth temperatures.

### 6.5 Milk-borne Gastroenteritis Caused by Salmonella

The *Salmonellae* are small, gram-negative nonsporing rods. *Salmonella* gastroenteritis, typhoid fever (enteric fever) are the three main diseases. The primary habitat of *Salmonella* spp. is the intestinal tract of animals such as birds, reptiles, farm animals, man and occasionally insects. As intestinal flora, these organisms excreted in feces may also be found in polluted water. When polluted water and foods (milk and milk products), that have been contaminated by insects or by other means, are consumed by man or other animals, these organisms are once again shed through fecal matter with a continuation of cycle. The augmentation of this cycle through the international shipment of animal products and feeds is in large parts responsible for the present worldwide distribution of salmonellosis and its consequent problems. The most common food vehicles involved in 12,836 cases of salmonellosis from 37 states of United States of America in 1967 were beef, turkey, eggs and eggs products and milk for 7,907 salmonellae isolations made by Centre for Communicable Diseases (CDC) of USA in 1966, 70% were from raw and processed food sources.

Among the leading causes of outbreaks of food-borne Salmonellosis are :

- Improper cooling of cooked foods
- Lapse of a day or more between preparation and serving of foods
- Inadequate cooking and heatings
- Ingestion of contaminated or raw ingredients
- Cross contamination
- The increase in mass food preparation
- Inappropriate methods of storing foods
- The increasing habit of eating raw or insufficiently heated foods.
- Increasing international food trade and
- Improper handling of foods.

## 7. FINDINGS

### 7.1 Field Survey Results

The results of the present study are based on the interview of various sellers of different types of milk-food products and their consumers. The types of respondents included in the survey and their size is given below :

Types of respondents

Number