NUTRITIONAL AND HYGIENIC ASSESSMENT OF FOODS SOLD BY SMALL VENDORS IN RAJKOT CITY

THESIS

SUBMITTED TO
SAURASHTRA UNIVERSITY
FOR THE DEGREE OF

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STATEMENT UNDER UNIVERSITY Ph.D. RULES ORDI. Ph. 10

I hereby declare that,

- The research work presented in this thesis entitle ***"Nutritional and Hygienic Assessment of Foods Sold by Small Vendors in Rajkot City"*** has not been submitted for my other degree of this or any other university on any occasion.

- To the best of my knowledge no work of this type has been reported on the above subject.

- All the work presented in this thesis is original and wherever references have been made, it has been clearly indicated.

Countersign by Guide

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CERTIFICATE OF APPROVAL

This thesis directed and supervised by the candidate's guide has been accepted by the Smt. S. B. Gardi Institute of Home Science, Saurashtra University, Rajkot in the fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

(HOME SCIENCE)

Title: Nutritional and Hygienic Assessment of Foods Sold By Small Vendors in Rajkot City

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Chapter - 1
INTRODUCTION

1.1 FOOD

All living things need food. Plants require soil, nutrients, water, air and sunlight in order to thrive. Food is the "fuel" which supplies chemical energy to the body to support daily activities and synthesis of necessary chemicals within the body. Food is a prime necessity of life. Even a religious book such as “The Gita” recognizes the basic dictum "of food are beings made". Human’s basic drive for food is to satisfy his hunger. Food is intimately woven into the physical economic psychological, intellectual and social life of man. It is a part of his culture and is filled with many different meaning and symbols for all individuals at various ages and stages of their maturity (Manay, 1996 and Sabarwala, 1999).

Food is also source of power. Food is much more than a substance supplying nutrients for health. Food is a symbol of hospitality and friendship throughout the world. Food is a status symbol. It is an outlet of emotion. It is a source of security people feel reasonably secure when they have enough food stored up to take care of them during periods of scarcity. Familiar foods also give a sense of security when one has to eat away from home.

Food is a more basic need of man than shelter and clothing. It provides adequate nutrition for the body's growth, maintenance, repair and reproduction. Food furnishes the body with the energy required for all human activities. It provides materials required for the building and renewal of body tissues and the substances that act to regulate body processes (Peckhan, 1974 and Sabarwala, 1999).

All through the history show that food has played important roles besides that of nutrition. Wars have been fought for food. People have been known to steal, rob and kill for it, explorers have searched the world for new foods. Sciences have been built on food and food related discoveries have

been rewarded; fortunes have been made and lost in foodstuffs. Food has helped in creating history (Potter, 1995).

1.2 NUTRITION

The importance of nutrition is simply brought out in the title “food becomes you.” We should perhaps add, “If you eat the wrong food, you become the wrong person.” In nutrition related work we are often concerned with making and assessment of the nutritional status of the individual or a group (Kinder, 1956).

Nutrition is the science of food the nutrients and other substances in it. It deals with their action, interaction and balance in relationship to health and disease. Nutrition is also concerned with socioeconomic, cultural and psychological implication of food. Energy is required for all human activities; it provides materials required for the building and renewal of body tissues and the substances that act to regulate body processes. An individual food such as milk may fulfill all these functions or as in the case of sugar any one functions. However, all the above functions of food must be served by the diet in order to maintain the body in good health. Most foods fulfill more than one function as they are complex mixtures of a number of chemical substances (Srilakshmi, 2002).

Food is the usual vehicle for meeting the need for nutrients, but foods differ in their nutrient content. No one food can be depended upon to provide all the nutrients necessary for normal growth and health. Nutritive value refers to the nutrient content of a specific amount of food. Nutrients promote health by making possible the normal operation and maintenance of the body. No matter how different people are in size, appearance, activity, race or age they all need the same nutrients (Packhan, 1979).

1.3 GOOD HEALTH

Good health is a state of complete physical, mental and social well being and not merely the absence of disease or infirmity. The food that one eats provides the basis for good health and no discussion of routine for healthful living would be complete without mentioning food.

Finally good health means more than just the well being of the body; one's mind and spirit should be functioning smoothly as one's body.

Good nutrition and fitness are the twin physical structures underlying good health. But good health has other enormous benefits besides the most obvious ones. If you are healthy you look good. (Archibald, 1986 and Lowe, 1955)

1.4 SANITATION

The word "Sanitation" is derived from the Latin word “Sanitas” which means "health". Further, this word is applied to the Food Sanitation that is the creation and maintenance of hygienic and healthful conditions while processing, preparing and handling food. Sanitation is the application of a science to provide wholesome food handled in a hygienic environment by healthy food handlers to prevent contamination.

Proper sanitation practices are important in maintaining food safety. Lack of hygienic practices can contribute to outbreak of food borne illnesses (Marriott, 1985).

1.4.1 Principles of Sanitation

To sanitize means, to reduce the bacterial contamination of the area being treated to a safe level. This condition is considered to be superior to physically clean and slightly less desirable than sterile. To ensure that the environment and equipment not only have been cleaned, but also are

protected against microbial contamination, it is thus necessary to apply sanitation.

It may appear to be unnecessary to sanitize cooking utensils that are subjected to heat during cooking. However, heat from cooking is not always uniform enough to heat all parts of the item to a high temperature for a long enough time to ensure effective sanitization.

Sanitation of items, which come in contact with food, requires a washing area away from the food preparation area. The work station should be equipped with three or more sinks, separate drain boards for clean and soiled items and an area for scrapping and rinsing food wastes into a garbage container or disposal (Marriott, 1985).

1.5 MICROORGANISMS

Microorganisms are form of life found on all non-sterilized matter that can be decomposed. This word is of Greek origin and means "Small" and "living beings". These organisms can not be seen with the naked eye, metabolize in a manner similar to microorganism since they intake nourishment, discharge waste products and reproduce. It is believed that these tiny organisms were discovered in 1693 by a Dutch merchant named Anton van Leeuwenhoek through lenses that he developed. He observed microorganisms in food and water from other materials.

Fast Food is highly perishable, since they contain nutrients required for microbial growth. Control of microbial proliferation is necessary to reduce food spoilage and to eliminate food borne illness (Frazier and westhoff; 1983).

1.5.1. Microorganisms and Sanitation

To comprehend fully the principles of food sanitation, one must understand the role of microorganisms in food spoilage and food poisoning. Microorganisms are found throughout the natural environment. These microorganisms cause food spoilage through colour and flavour degradation and food borne infection through ingestion of food, which

contains microorganisms of public health concern. The importance of sanitation practices is to combat the proliferation and activity of food spoilage and food poisoning microorganisms. A major challenge of the sanitarian is to protect the production area and other involved areas from the microorganisms that can reduce the wholesomeness of foodstuffs.

1.5.2 Nutrient Requirements for Growth of Microorganisms

Food is food to humans and microbes. In addition to water and oxygen (except for anaerobes), microorganisms have other nutritional requirements as well. Most microbes need external sources of nitrogen, energy, minerals and vitamins to support their growth.

1.5.3 Temperature for Growth of Microorganisms

Microorganisms have an optimum temperature as well as minimum and maximum temperature for growth. Therefore, the environmental temperature determines not only the proliferation but also the genera of microorganisms that will thrive and the extent of microbial activity that occurs. These characteristics have been responsible for the use of temperature as a method of controlling microbial activity.

1.5.4 pH for Growth of Microorganisms

The pH for optimal growth of most of the microorganisms is near neutrality (7.0) while yeasts can grow in an acid environment, but grow best in an intermediate acid (4.0-4.5) range, acidophilic (acid-loving) bacteria will grown on food or debris down to a pH of approximately 5.2, Below 5.2, microbial growth is dramatically reduced from growth in the normal pH range.

1.5.5 Relative Humidity

This extrinsic factor affects microbial growth and it then can be affected by temperature. All microorganisms have high requirements for water to support their growth and activity. A high relative humidity can cause moisture condensation on food equipments; condensation causes moist surfaces, which are conducive to microbial growth and spoilage. Also microbial growth

is inhibited by a low relative humidity. Bacteria require the highest relative humidity out of the various microorganisms. Optional relative humidity for Bacteria is 92% or higher, whereas yeast need 90% or higher [Marriott, 1985]

Table No. 1

General characteristics of some micro organisms

Species	Remark / Significance
B. anthracis	Causative agent of anthrax disease in humans and animals.
B. cereus	Gastroenteritis / food poisoning
B. licheniformis	Produces antibiotic – Bacteria
B. polymyxa	Produces antibiotic polymyxin
B. subtilis	Produces biosurfactant surfactant used for bioremediation, oil spill dispersion and enhanced oil recovery.

1.6 HYGIENE

The word "Hygiene" is used to describe a system of sanitary principles for the preservation of health. Personal hygiene refers to the cleanliness of a person's body. The health of workers plays an important part in food sanitation. People are potential source of microorganisms that cause illness to other through transmission of virus or through food poisoning (Hasior and Horman, 1967).

1.6.1 Health Status of Food Handlers

In its simplest form the word "health" means the absence of disease. Health status, on the other hand, is an outcome of health indicated by or measured by injury, sickness, disease, physical and physico-social functioning other than morbidity and mortality. In fact, it is a general term for the state of health of an individual group or population that reflects the degree to which a person is able to function physically, emotionally and socially, with or without aid from the health care system.

The concept of health status, well being of workers in food service establishments particularly the food handlers applies to the self-assessed or self-reported perception of a person with respect to his or her health condition.

Food handler is the key person to maintain food safety in the food service establishment, since he/she deals with unpackaged food, food equipments or utensils, or food contact surfaces. In this context, therefore, people known or suspected to be suffering from or to be a carrier of a disease or illness, likely to be transmitted through food, should not come to work or allowed to enter any food handling area if there is a likelihood of their contaminating food.

The conditions or the specific infections which should be reported to management so that any need for medical examination and/or possible exclusion from food handling could be considered including - Jaundice, Diarrhea, Vomiting, Fever, Sore throat with fever, discharges from the ear or nose, visibly infected skin lesions (boils, cuts etc.).

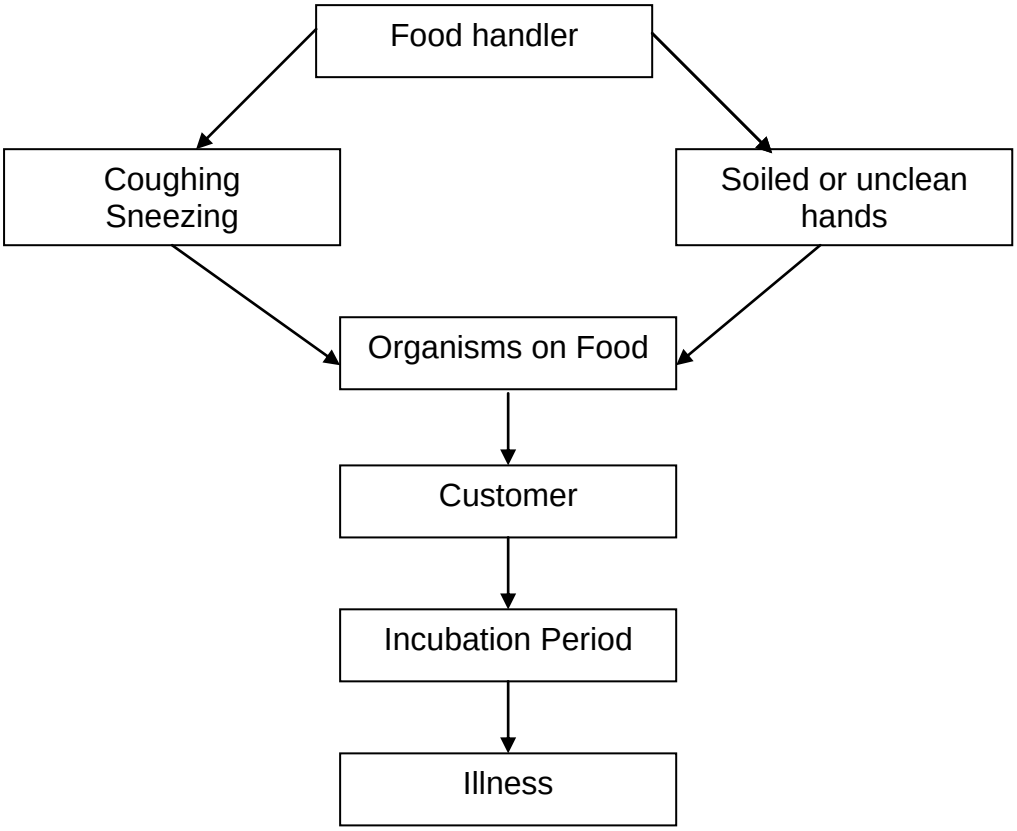
It is important to remember that any worker infected by the above mentioned microbes should not touch food or equipments/utensils used to process, prepare or serve food. Contaminated foods can cause several illnesses including respiratory diseases e.g. cold, sore throats, Pneumonia, and tuberculosis, gastrointestinal diseases, e.g. vomiting, diarrhea, dysentery, Typhoid fever, Infectious Hepatitis etc. Even if a food handler does not feel sick, he or she can still be carrying microorganisms on their body or clothes that can cause illness if they get into food. Hence, food handlers should maintain a high degree of personal cleanliness and hygiene (Sabarwala, 1999).

1.6.2 Employee Hygiene

Employee should not be in contact with food and with equipment and utensils used in processing, preparation and serving of food. Human illnesses that may be transmitted through food are diseases of the respiratory tract, such as the common cold, sore throat, Pneumonia, scarlet fever, tuberculosis and trench mouth. A person with this condition is known as a carrier.

Figure No. 1

Modes of transmission of infection in food service.



When employees become ill, their bacterial count and potential as a source of contamination increases dramatically. Staphylococci are normally found in and around boils, pimples, carbuncles and infected cuts, eyes and ears. A sinus infection, sore throat nagging cough and other symptoms of the common cold are further signs that microorganisms are increasing in number. The same principle applies to gastrointestinal ailments such as diarrhea or an upset stomach. When evidence of illness passes some of the microorganisms that caused the illness may remain as a source of recontamination.

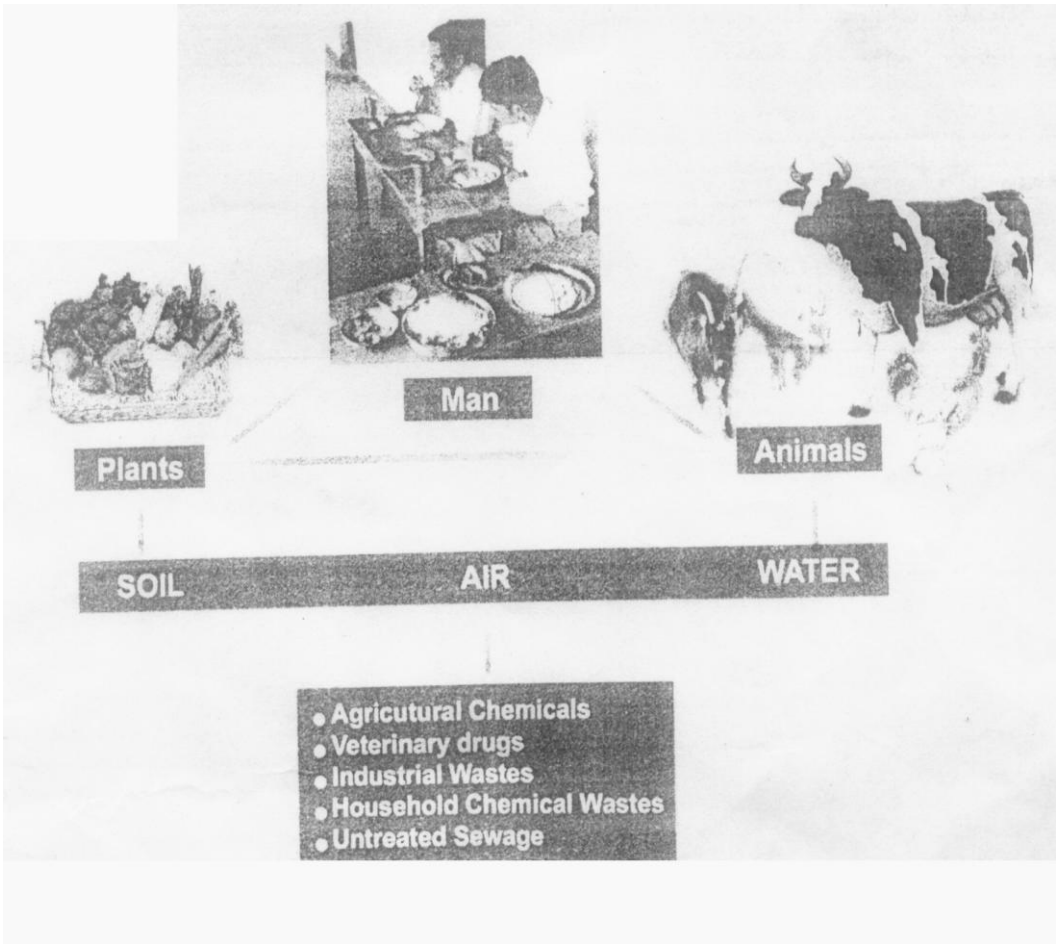
Employee hygienic practices, it is beneficial to look at different parts of the human body in terms of potential sources of bacterial contamination (Marriott, 1885).

1.7 FOOD CONTAMINATION

Food also contains a wide range of natural chemical compounds, which have no nutritional function. Some of these compounds may even act as anti-nutritional factors, interfering with the utilization of some of the nutrients present in these foods, while others may be potentially toxic, resulting in illness and death, if consumed in large quantities.

Figure No. 2

FOOD CONTAMINATION



Contamination means exposing food to filth, toxic substances, manual contact during service or preparation if such food will not be subsequently

cooked prior to serving, rodent or insect contact or infestation or any condition which permits introduction of pathogenic micro organisms or foreign matter. Then such food may be serving as a potent source of disease causing organisms.

Our food can get contaminated by the water used for cooking or washing the soil in which the food is grown, by the container used for storage, preparation and service by the personal handling of the food at various stages etc. Contaminants in foodstuffs can chiefly be classified as physical, biological and chemical contaminants:

(1) Physical contaminants include extraneous matter such as sand, soil, hair etc.

(2) Biological contaminants consist of microorganisms such as fungi, and their metabolic products.

(3) Chemical contaminants - on the other hand, are the products of fast growing modern technology. Modernization of the population's lifestyles also has resulted in the production of synthetic chemicals for use in all aspects of modern life.

1.7.1 Contamination Sources for Food and Ingredients

Food products are rich sources of nutrients and generally have pH values of about 4.0 to 7.0 since food products are excellent nutritional sources for both man & microorganisms. Food products are contaminated with soil, air and waterborne microorganisms. Harvesting, processing, distribution and preparation generally lead to contamination of foods.

Unfortunately one of the most viable contamination sources is the food product itself. If raw products are not handled in a appropriate way, they become contaminated and support microbial growth. Equipment can be instrumental in the contamination of food, of all the viable sources of exposing microorganisms to food; employees are the largest contamination source. Employees, through unsanitary practices, contaminate food that they touch with spoilage and pathogenic microorganisms that they come in contact with through work and other parts of the environment. Various parts of the body

such as the hands, hair, nose and mouth harbour microorganisms that can be transferred to food during processing, packaging, preparation and service by touching breathing, coughing or sneezing. Because of the warm temperature supplied by the human body microorganisms rapidly proliferate on humans, especially if hygienic practices are not conducted.

Although water serves as a cleaning medium during the sanitation operation and is an ingredient added in the formulation of various processed foods, it can also serve as a source of contamination. The airborne microorganisms enter food the during food processing, packaging, storage and preparation areas. Air contamination can result from unclean air surrounding the food plant or from contamination through improper sanitary practices.

Rodents can transmit the disease if they are not eradicated. But rodents carry disease-producing microorganisms on their feet, fur and in their intestinal tract. As with flies and cockroaches, these rodents transfer filth from garbage dumps and sewers to food or food processing and food service areas (Marriott, 1985).

1.8 SMALL VENDOR'S FOODS

Vendor's foods are an essential part of the food system in developing countries. One is the relocation of vendors into "food centers" located at strategic site where people congregate in the city. Persons of all income levels eat vendor's food, but poorer people spend more on them than the better off. Fast food is more popular in Rajkot school, college canteens. Many people like office workers are eating daily one meal outside the home. Vendor's food is very cheap and unhygienic food but very tasty.

The Food and Agricultural Organization of the United Nations (FAO) defines street foods as 'ready-to-eat foods and beverages prepared and/or sold by vendors, especially in streets and other similar public places.' Vendor's foods are a heterogeneous food category consisting of meals and

snacks. They are inexpensive and available foods that, in many countries form an integral part of the diet, because they are consumed with regularity and consistency across all income groups, but particularly among the urban poor and in some countries by children. Changing life-styles have led to large numbers of people eating out.

International organizations have paid particular attention to the safety of street foods and much less to the composition and presentation of their nutritional quality (Gupta, 1996).

1.8.1 Vendor's Food is a Major Occupation

Street (Vended) foods are not only a major occupation in developing countries; they provide essential food service to millions of productive urban workers. Contrary to assumptions, many sellers pay daily market fees. Inside walk vendors paid dues to their own self regulating organization so as to avoid clashes with the police. Indeed fear that the police or Military would break-up their carts or shacks and destroy their merchandise was the greatest problem for street sellers. Bribes and protection, money was higher than what license fees might have been. Vendor's food is very cheap, easily available on the road. Middle class families twice in a week have dinner outside. Street food business provides almost 50% margins (Gill, 1993).

1.8.2 Reasons for Consumers to Consume Street Vendors Food

People eat street foods for certain as reason fast-food are cheap convenient and save a time Economics of scale plus high cost of cooking fuel often make street foods cheaper than food prepared at home. Further traditional foods often take hours to cook.

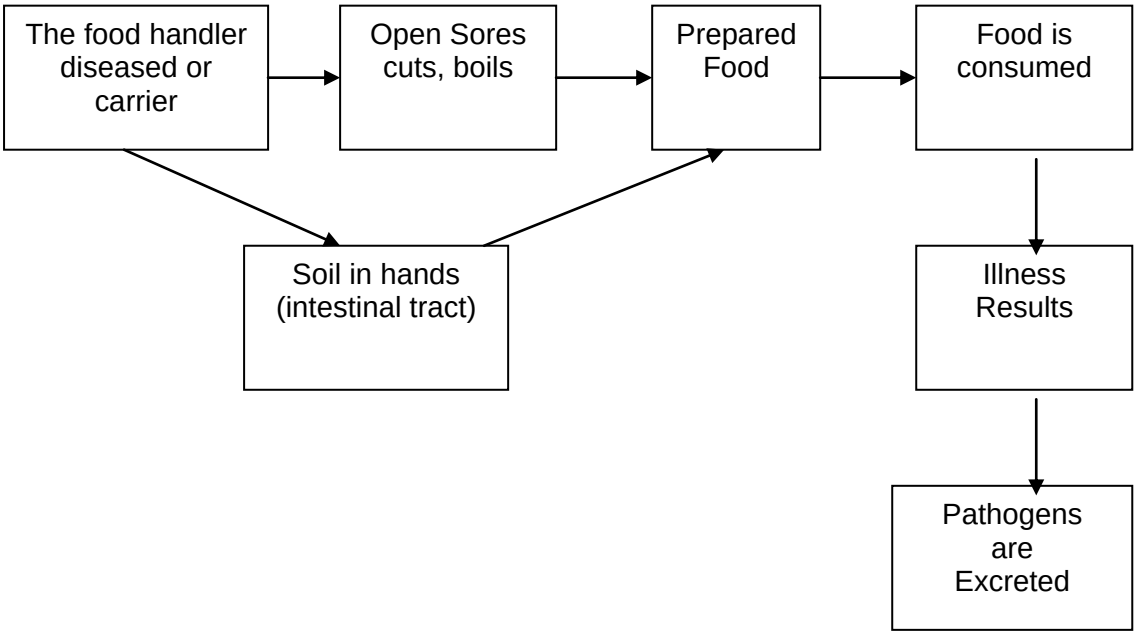
Their choice is between hours of preparation and ready -to-eat food at almost the same price. For working woman, there is no question which they would choose. A similar choice is reflected in the fact that some 40 percent of all meals in the U.S. are eaten out of the home.
(www.doh.gov.2a/com/department of food control/streetfood.)

1.9 VENDOR'S HYGENIC TRAINING

An integrated action plan on street foods should have a strong educational and training component. Food handlers need to be trained in food hygiene and good food handling practices and also in small business management. They should be knowledgeable about regulatory aspects of preparing and selling street food. It is desirable that such training be imparted within an overall program for vended food improvement. As far as possible such qualified vendors should be asked to wear something distinctive, such as an apron or a badge, which may also give them recognition and an enhanced sense of pride in their work. N.G.O. can play an important role in educational and training programs in motivating vendors towards better performance and in raising financial and other resources. Personal hygiene of employees who handle food during processing and preparation is an important part of sanitation.

Figure No. 3

Cough and Sneezes (Respiratory Tracks)



Humans are the major source of food contamination. Food handlers can be sources of bacteria causing illness in others through transmissions of these harmful bacteria.

Employees to assure personal hygiene should conduct the following practices.

(1) Physical health should be maintained and protected through practice of proper nutrition and physical cleanliness.

(2) Illness should be reported to the employer before working with food so that work adjustments can be made to protect food from the employee's illness or disease.

(3) Hygienic work habits should be developed to eliminate potential food contamination**.**

(4) During the work shift, hands should be washed after (a) using the toilet (b) handling garbage or other soiled materials, (c) handling uncooked muscle foods (Perishable foods), (d) handling money, (e) smoking, (f) coughing and sneezing.

(5) Personal cleanliness should be maintained by (a) daily bathing and use of deodorants (b) washing hair at least twice a week (c) cleaning fingernails daily (d) use of a hat or hair net while handling food (e) wearing clean underclothing and uniforms.

(6) Employee hands should not touch food service equipment and utensils. Disposable gloves should be used when contact is necessary.

(7) Rules such as "no smoking" should be followed and other precautions related to potential contamination should be taken (Marriott 1985).

1.9.1 Basic Facilities to be provided to Vendors

Among the very basic facilities to be provided by the local authority are space, water, electricity, lavatories and garbage disposal services. Depending upon the local situation, serious consideration should also be given to the provision of community or collaborative cooking promoting community cleaning and sanitation of utensils, provision of tableware and the likes. The logistics of such common services would need to be worked out carefully and in consultation with vendors. This may help in the recovery of day-to-day running costs from the vendors on a "cost recovery only" basis.

1.9.2 Needs to Local Facilities

There are a range of options that are available one is the relocation of vendors into "food centers" located at strategic sites where people congregate in the city. In such centers, they would operate under one roof and have facilities such as water, electricity and a garbage disposal service. Some cities may consider following this approach in highly congested city centers or other similar locations and licensed vendors to operate only from these centers. In the peripheral areas vendors may be allowed to operate as before but within regulatory systems.

Another approach is that of "special areas" for street food vending where again the necessary facilities are provided by the local body, yet another option might be to allow street food vending within specified time periods, local facilities such as water, electricity, waste disposal and toilets by the local bodies is bound to require capital investment and additional recurring maintenance costs. (http:/www street market.com.street/contact Docs/c.)

1.10 TECHNOLOGICAL ASPECTS OF STREET FOOD VENDING

It would be useful to involve appropriate technical institutions in the subject. This will enable further scientific and technical inputs appropriate to the needs of both vendors and consumers. These might include improved water storage and dispensing equipment, improvements in preparation of foods to achieve more nutritious meals, improvements in maintaining food at the correct temperature and innovative designs for food stalls and push carts, wearing clean clothes. Foods prepared and sold by street vendors in certain countries is another important area which may call for attention from technical institutions. National authorities could sponsor work on these matters. The impact of such improvements on the ultimate cost of the food and on vendor's income should be carefully considered so that they are not burdened with unrecoverable costs.

1.11 FOOD SAFETY AND IMPORTANCE OF SAFE FOOD

Food Safety has always been an important issue. The reasons for this are manifold. There is a strong consumer awareness of food quality and safety and this continues to increase. International trade in food has also increased the risk of infections agents being disseminated from the original point of production to locations thousands of kilometers away. The consequence of this is that there is an increased risk to human health, as well as implications for international trade in food. As a result, there has recently been a realization in many countries of the need for an integrated approach to food safety.

Food safety is improved by defining the basic concepts, hazard and toxicity. 'Hazard' is the relative probability that harm or injury will result when the substance is used in a proposed manner and quantity while 'toxicity' is the capacity of a substance to produce harm or injury of any kind under any conditions. Food or ingredient is safe. It should not be based on its inherent toxicity.

There after comprehensive review of the different terms used in the context of food and its safety concerns. This includes both negative attributes such as spoilage, contamination, adulteration, food safety hazards and positive attributes such as the origin, colour, flavour, texture etc.

After comprehensive review of the different terms used in the context of food and its safety concerns the importance of safe food and hazards which are a concern to food safety is covered here under (Bamji, 1996).

1.11.1 Safe Food Handling for Optimum Nutrition

Good nutrition and food safety are important consumer issues of the age. Nutrition, food safety and health are integrally related because no food is nutritious if it’s not handled properly.

Overall Americans enjoy a very safe food supply. USFDA the Food and Drug Administration, the Environmental Protection Agency, State and Local Health Departments and others are all working together to ensure that food is safe, wholesome and accurately labeled.

The consumers are concerned about food safety because even though food is inspected, it can contain bacteria that can cause illness, if it is not handled properly. Fruits and vegetables may contain bacteria. These bacteria are present throughout our environment.

At the right temperature, in just a few hours' small amounts of bacteria that we can't see, smell or taste can multiply to dangerous levels on food and cause food borne illness, sometimes called food poisoning. Common symptoms of many food borne illnesses are style-like and include diarrhea which prevents the body's absorption of the nutrients in food.

Everyone in the food chain plays a role in safety. Most of us eat foods grown and packaged many miles away. Yet safe handling of food is as critical in the home as it is in a processing plant, retail store or restaurant. The food prepared in homes, *Lorries* and in safety of the food on the family table.

Perishable foods should be refrigerated within two hours of purchase so that food poisoning bacteria do not multiply; proper storage of food prolongs its self-life and preserves nutrients as well as safety. Foods stored to long gradually spoil and also will loose nutritional value.

Frozen foods will maintain top flavour and nutritional value if the freezer is kept at or below $O^{o}C$ (Gill, 1993).

(1) Preparing Food

Cleanliness is the first critical step in safe food preparation. It is necessary that hands are thoroughly washed with soap and water before handling food. Hands, utensils, cutting boards, must also be washed and work areas after handling raw products must also be cleaned.

Frozen foods should never be thawed at room temperature. Instead of this the food must be thaw safely in the refrigerator, or in the microwave only immediately before cooking.

(2) Serving Foods

Food safety errors can be made during the serving and handling of cooked food.

While serving foods one must be sure to wash hands thoroughly with hot soapy water. Serve cooked products must be served on clean plates and with clean utensils.

Foods should never be kept at room temperature longer than two hours, one hour in hot weather. During serving, hot foods should be held above 80^{o} C and cold foods should be kept cold.

(3) Leftovers

When handling leftovers, cleanliness and temperature control are critical with hands, before handling leftovers and use clean utensils surface.

Food spoilage bacteria may grow in the refrigerator, so discard any outdated foods. Most foods will remain safe in the refrigerator for about four days, but use highly perishable foods such as stuffing or gravy within one to two days.

(4) Food Safety Tips

(1) Keep it safe; refrigerate those foods, which will be used quickly. Freeze perishable foods if you can't use them in one or two days. Freezer should register of, ref. 10^{o} C.

(2) Don't thaw food on the kitchen counter because bacteria multiply rapidly at room temperature.

(3) Wash hands before preparing foods. Wash hands and utensils after contact with perishable foods. Wash cutting boards or other work surfaces;

as bacteria often present on raw foods, can spread to other foods if you don't clean them properly.

(4) Never leave perishable food out for more than two hours.

(http://www.street market.com.).

1.12 STATEMENT OF PROBLEM

"Nutritional and Hygienic Assessment of Foods Sold by Small Vendors in Rajkot City."

1.13 SIGNIFICANCE OF THE STUDY

The present study is to find out the nutritional and hygienic quality of foods sold by small vendors. Most of people who are daily eating outside the home, cannot always afford expensive food from hotels or restaurants. Vended food is easily available at cheaper rates. By this study the researcher will be able to find out nutrients and microbial quality in small vendors foods. Although, Vendor's food is very cheap, but whether it maintains good quality or not that is to be found out by this study. People will know about difference between homemade foods and vendor's foods by this study. Many people have misconceptions regarding what to eat, why to eat and how to eat. On other hand they are vulnerable to food poisoning as well as many infections arising out of vended food. This study will help people by providing scientific knowledge about the quality of food they eat; it will be of great help to them in choosing right food. It can also help the statutory body like PFA, FPO etc. to evaluate new standards to the vender food/ street food.

The following are some of the important aspects that can be benefited from the study.

1.13.1 Significance to society

(1) People of Rajkot city will be able to gain awareness regarding basic concepts of Nutrition.

(2) People of Rajkot city will be able to understand nutritional quality of vendor foods.

(3) People of Rajkot city will be able to understand microbial quality of vendor's foods.

(4) They will be able to know about difference between home made and vendor sold food in respect to its hygienic and nutritional quality.

1.13.2 Signification to the Home science discipline

Human nutrition is a major part of the Home Science. The results of this study will help the society choosing proper and qualitative foods. Food is the nutritive material consumed by humans. It is metabolized in the body functioning for the purpose of energy, repair, maintenance and other vital processes of the body. Due to the change in life style, people now a day prefer going for fast foods, which are readily available. But due to unhygienic handling, external contamination or inferior quality of raw materials used bacteria contaminate this fast food.

To assess the nutritional status of a population researchers use surveys. One kind of survey, determines what food people eat, calculates or measures the nutrients in them, and compares the amounts of nutrients consumed with a standard such as the R.D.A. Another kind of survey, a nutritional status survey - assesses the nutritional status of the people themselves. Any one interested in nutrition needs not only to study nutrients and foods but also to acquire an understanding of the human body. The interactions among foods nutrients and the body are not as simple as one might expect.

One situation represents a lifestyle where every meal is eaten at home under relaxed conditions. The other represents a lifestyle where every meal is eaten outside the home under hurried or hectic conditions.

1.14 OPERATIONAL DEFINATION

1.14.1 Vendor's foods

FAO defines vendor's food as a street food, as ready to eat foods prepared and sold by vendors, especially in street and the similar public places.

1.14.2 Nutritional Assessment

Quantitative assessment of different nutrients in food by different chemical methods.

1.14.3 Hygienic Assessment

Observations regarding practices followed by the vendors while preparing foods.

1.14.4 Microbial Assessment

Assessment of microbial population present in food.

1.14.5 Food Quality

Food quality refers to the attributes that influence a products value to a consumer.

1.14.6 Food Hygiene

Food Hygiene refers to all conditions and measures necessary to ensure the safety and suitability of food at all stages of the chain.

1.14.7 Food Sanitation

Food Sanitation means creating and maintaining hygiene and healthful conditions in the food preparation storing and serving areas.

1.14.8 Food Handler

The persons who prepare food and sell it.

1.15 OBJECTIVE OF THE STUDY

(1) To study nutrient components of food sold by small vendors.

(2) To study hygienic factors of food sold by small vendors.

(3) To study microorganisms those are present in food by various methods.

(4) To compare between home made and vended food with respect to nutritional quality.

(5) To compare between home made and vended food with respect to hygienic qualities.

1.16 JUSCTIFCATION OF THE STUDY

The knowledge will help consumers to understand the importance of food we eat. It will help consumers to change our eating practices and motivate consumers to eat nutritious and hygienic foods.

The people of Rajkot city are health conscious and diet conscious. They will be able to take scientific decision what to eat and are what not to eat. Most people like eating a small vendor's food. Most of working woman and their family are generally eating outside the children need a nutritious food. Better nutrition in childhood leads to optional physical and mental growth their work efficiency will be increased and will be able to produce more in less time. The counts will thus benefit economically whenever they become health conscious, a number of nutritional deficiencies and food poisoning can be kept at bay.

The study will help us to know about food contamination and unhygienic foods, which microorganisms are present in food. The contamination has always been a potential source of illness but proper storage and handling of food can avoid this problem. The major cause of health problems associated with food is the microorganisms that are present in food. The key to a safe food supply is control of the microorganisms in the

various types of food that constitute the diet. As would be anticipated the microorganisms of concern vary with the chemical and physical properties of specific foods and include certain bacteria. Microorganisms enter the food supply in a variety of ways by contamination through water, soil, hand and vessels. Vended foods on a health risk basis are categorized into "high risk foods" and "lower risk foods". The bulk of food borne illness is associated with microbiological contaminations of foods. Same time home made food may be rich in nutrients and number of microorganisms may also be very less.

1.17 JUSTIFICATION OF THE SAMPLE

The four major areas in Rajkot city were selected and samples were collected of a many popular vended food just like a Punjabi Food, Chinese Food, South Indian Food, Fast-Food viz. *Bhel, Panipuri* and *Paubhaji.* These are easily available on public place and are very cheap than restaurant foods, on Laries that are standing on roadside. Many Lories are standing in a group. So, there is vendor-to-vendor competition. So, food is very cheap, middle and higher middle class people eat this food very often. Assessment of its nutritional quality and hygienic quality was attempted. The hygienic quality was assessed by growth on Nutrient agar and MacConkey's agar and was compared with home made foods. Nutritional quality was assessed by quantitative analysis by chemical method and compared with home made foods

Most of College/School boy and girls eat vendor foods. These students would be around thirteen to twenty years, which is the most important period of life of an individual. During this stage, the foundation stones of ones personality and health are laid. Thus, this is the right time to be exposed to a nutritional and hygienic food.

1.18 HYPOTHESES

There will be no significant difference in the carbohydrates, protein, fat, moisture level, thiamine, riboflavin, niacin, ascorbic acid, calcium, iron, sodium, potassium, pH and fiber value of various dependant variable, obtained from the collected samples of different areas as compared to home made food.

Chapter – 2
REVIEW OF LITERATURE

2.1 NUTRITION RELATED LITERATURE

Kamaliya (2006) in his study planned to enrich commercially available bread with wheat bran (WB) and analyzed its nutritional merit to find out its possible uses in the dietary management of people suffering from various chronic diseases. Good quality raw materials were purchased from the local market of Vallabh Vidhyanagar and Anand. One method of bread preparation was selected through market and literature survey. Both the breads (EB-Experimental Bread and CB-Control bread) were analyzed for only moisture (AOAC, 1970). However the carbohydrate and energy value were reduced in EB as compared to CB, Both the situations have beneficial effect on chronic diseases. Calcium, phosphorus and iron content were estimated 2 to 3 times higher in EB as compared to CB, which is again beneficial in some deficiency diseases and even to healthy human beings.

Vaid and Dave (2006) had reported that *Handwa*, a fermented savory of Gujarat state served as main meal, or as a snack item. Cooked *handwa* was analyzed for pH, ash, iron, carbohydrates, and protein. After fermentation, pH of batter decreased from 4.79 to 3.77. Solar cooked *handwa* had the highest pH (3.89) while conventionally cooked had pH 3.78. Moisture content was the least in microwave-cooked *handwa* (39.89 gm. per 100 gm.) while highest in conventionally cooked *handwa* (54.4 gm. Per 100 gm.). Solar cooked *handwa* had the highest carbohydrate content; iron and protein content.

Mubeen and Sarkara (2006) had carried out the nutritional composition, terrible acidity and pH of Yoghurt estimated before and after inoculation and fermentation. pH of the yoghurt samples was obtained by ‘Elico’ pH meter model No-L1-163. (Protein was estimated by Kjeldahl method, fat by Soxhlet method, (AOAC, 1970). Sodium and potassium was estimated by ELICO’S

flame photometer. The percent change of ash value was increased by +25.58, which was significant (P<0.05), the percent change of protein level was +51.12 which was highly significant increase. Increase of fat the percent decrease after fermentation was -29.80, which was found to be highly significant. Shahani and Chandan (1979) reported that culturing causes the partial digestion of proteins, carbohydrates and fats, improves the digestibility of fat and produces anticholesterolemic compounds. The carbohydrate percent decrease. The percentage change of calcium, phosphorus, potassium and iron was increased by +1.41, +22.4, +67.48 and +142.5, which was highly significant. Culturing caused increase in these respective nutrients, this helps in the better bioavailability and absorption of nutrients. The sodium value decreased with a high significance, with a percent value of -30.90. The addition of supplementary culture L. acidophilus did not increase the magnesium levels and the percent change observed was -13.34, which was significant at (P<0.05).

Vasavada and Dave (2006) in a study made different variation in ingredients for preparing *dhokala* and it was compared with the traditional *Dhokala f*or its nutritive value. Traditional *dhokala* (A) was prepared by using rice, black gram dal, Bengal gram dal, curd and salt. Variations were made using dry Corn (B) and Kodri (varagu) (C) instead of rice. Total amount and rest of ingredients and procedure were kept same. Carbohydrate content was highest in sample (A). Free amino acid, protein, iron, thiamine, riboflavin and fat were highest in sample (B), while calcium content was highest in sample (C). It was found that variation of corn improves free amino acid, protein, iron, riboflavin and thiamine values. It is also moderately acceptable. Its texture was very good but the flavor and taste were found average Variation of *kodri* improves calcium and other nutrient comparatively traditional sample. Its acceptability was highest. Its color and flavors were found highest compared to other two samples. It is also concluded that both the modification were found highest in nutritive value and in acceptability.

Goswami and Mehta (2006) had reported that dahi is highly nutritive and its therapeutic value is also high as it gives protein, riboflavin and calcium in highest range. The procedure carried out included taking 100 ml of Goat’s milk

in a clean container and then heating at 95^{o} C for 5 minutes while cooling at 40^{o} C. The suspension of homogenized 50 ml egg white was added in goat's milk mixed well then 2 ml of pasteurized Amul milk was added and again mixed well. This seeded milk 100 ml was transferred into 150 ml of big china clay pot and incubated at 34^{o} C for about 8 hours. The pH was measured by using pH meter, which falls on 3.5. Now 100 grams of Bengal gram flour is added along with approximately 5 grams of sugar and mixed well then again it was kept for incubation process for about 10 hours. The batter is mixed well with 5 grams of salt (as per taste) and 10 ml of Luke warm water and dispended in small bowl and steamed at 110^{o} C for 10 minutes. Standard recipe was prepared using same procedure except it was not fortified with egg white. From the observations it can be concluded that the nutritive value of carbohydrate, protein, iron, calcium, riboflavin, and thiamine increased in enriched fermented food compared to standard fermented food recipe but the fat content decreases. The product acceptability of this recipe was generally good and there were remarkable increase found.

Shah and Vasavada (2004) in her study, the food was modified and compared with the standard item. The sample 'A' served as standard containing rice flour, black gram flour and wheat flour, Fenugreek seeds, salt and sugar were added along with it. It was then allowed to ferment by adding buttermilk for 8 to 10 hours and finally cooked. The variation was done using vegetables (carrot and bottle gourd) in sample 'B' and wheat semolina in sample 'C'. Other ingredients remained the same as standard 'A'. Moreover the cooking pattern too remained the same for all. It was found that addition of vegetables in 'B' increases the amount of calcium; its color was very good, whereas texture, flavors and taste were moderate; overall it was moderately accepted. The sample 'C' got highest preference in terms of texture, flavors and taste; whereas, it increased the amount of carbohydrate, fat, protein, iron, riboflavin and thiamine.

Dave (2004) had reported that *Vada* is traditional fermented food, which is commonly prepared from fermented black gram dal and rice. Adding buttermilk or curd and warm water and allowing the mixture to stand at room

temperature for at least eight to ten hours for fermentation before deep fat in frying was drained out paper. In present study, different variations were made in ingredients of *vada* like soybean, green gram, cheese and coconut. Carbohydrate was high in sample A compared to sample B, C and D, Free amino acids, protein, iron and calcium were found to be higher in sample B, C and D. Calcium, iron and fat content were found the deep frying was done in hot oil till golden brown.

Dave and Joshi (2004) had reported *dhokala* is a traditional Gujarati fermented food, which is commonly prepared from parboiled rice, black gram dal, and salt. In present study different variations were made in ingredients for preparing *dhokala* and it was compared with the standard (A-traditional) *dhokala* for its nutritive value as well as its acceptability. Standard *dhokala* (A) was prepared using parboiled rice, black gram dal, curd and salt. Variations were done using soybean (B) (pretreated for destroying anti nutritional factors) as well as peanuts (C) in two different recipes. Total amount and rest of the ingredients were kept common as in standard *dhokala*. Fermentation time (10 hr.) and all the cooking procedures were kept same for all the samples. Carbohydrate and sodium content was highest in Sample 1 (Standard). Free Amino acids, protein, iron and calcium were found highest while ascorbic acid content was found lowest in Sample B (10% Soybean). Fat and thiamin contents were found highest in sample C (10% Peanuts). It can be concluded that, addition of 10% soybean to the standard *dhokala* improves free amino acid, protein, iron and calcium values.

Joshi and Dave (2004) carried out a study in which analysis of different nutrients was done from well-known commercially available white bread samples from the market of Rajkot city, Gujarat, India have been analyzed for different. nutrients. The fresh white bread samples were obtained from market distributors at the time when they received breads from the bakeries. Total carbohydrate, total soluble proteins, fat, ascorbic acid, riboflavin, thiamin, calcium, sodium, potassium, and iron were analyzed. All the sample of breads obtained from Rajkot city were found nutritionally better then the average values. Calcium, iron, thiamine and riboflavin contents of the breads obtained

from Rajkot city were also found better. Therefore it is concluded that the breads obtained from Rajkot city may be nutritionally enriched or fortified.

In a study conducted in Gujarat, India shown that there were different types of cakes and unsorted cakes. It provides larger share of energy, proteins, fat and carbohydrates than any other nutrients to the body. It is often called the stuff of life. The food value of shortened cake provides important amount of energy giving nutrients and also provide minerals like iron, Ca^{+2} etc. In present study analysis of different nutrients from commercially available shortened cake, which was collected from Rajkot City, were done by Standard Chemical methods. Finding shows that the entire samples were found good for health and nutrition. (Mehta 2004).

Rathod and Rupapara (2004) carried out on study of a synthetic fruit juices powder that were available in the market which were dissolved in water and served, or in the form of bottle syrup. Synthetic fruit flavors and colors were added in the powder. These juices provide some vitamins, minerals and sugar, depending on fruit used. In the present study analysis of different nutrients from commercially available synthetic fruit juice powder, this was collected from Rajkot City.

Aghera (2004) had reported that "*Bari*" is a preparation made from Cow or Buffalo's colostrums. Two varieties of "*Bari*", viz. (1) with sugar and (2) without sugar were prepared providing steam-heat treatment. The protein, carbohydrate, fat, minerals, ash and moisture were tested. The analysis reports more fat and carbohydrate in "sweet-Bari" than without sugar *Bari*. "*Bari*" without sugar contains more moisture than "sweet-*Bari*". "*Bari*" also contains carotene, protein, vitamin-A, fat and carbohydrate in large quantity.

Geriya (2004) carried out a study of acceptability of *idli* on addition of 5%, 10%, 15% and 20% soybean, and compared with standard *idli*. Hedonic scale was used to study the acceptability. Standard *idli* had the highest acceptability, while among the modified *idlies* one containing 15% soybean showed the highest, and 20% soybean showed the least acceptability.

Kamdar (2004) had reported that the nutritive value of ragi is better than that of rice and other cereals. It is rich in calcium, iron and phosphorus. *Sukhdi* on addition of 20%, 40%, 60% and 80% ragi was studied and compared with standard *sukhdi*. Hedonic scale was used to study acceptability standard, *sukhdi* had the highest acceptability, while among the modified *sukhdi* one containing 20% ragi showed the highest, and 80% ragi showed the least acceptability.

Pandya and Bagathariya (2004) had reported that a survey of youngsters been carried out in Rajkot City of Gujarat State. Sample size was taken 100. In this, 76 were girls and 24 were boys of age group between 18-25 years. These samples belong to different economic groups, i.e. High, Middle, Low for this frequently preferred fast food, while 39% less frequently preferred fast food. Pizza and Bread butter are most popular fast food than rest of the all others, while macaroni and noodles are very less preferred.

Raval and Parmar (2004) in a study carried out analysis of different nutrients from commercially available baby food, which was collected from Rajkot city where done by well-known method. Finding shows that all the samples were found good for health and nutrition.

Nakum and Gohel (2004) had reported that *Vada* is a popular fermented food of south, in present study, variations were made in one of the ingredients for preparing *vada* and it was compared with the standard *vada* for its nutritive values as well as for its acceptability. It was observed that addition of 10% soybean improved calcium, iron, and vitamin C value. It was also having moderately acceptable taste and colour, texture was found average. Addition of 10% peanut improved, acceptability and texture contents were found highest compare to all samples.

Ankleshwaria and Karkar (2002) studied depending upon the sodium and potassium content, the snacks were classified as low (<100 mg), moderate (100 - 400 mg), high (400-1000 mg) and very high (>1000 mg) sodium or

potassium containing snacks. Among all the samples analyzed 18% samples had low, 41% had moderate, 6% had high and 35% had very high sodium content, 53% samples had low and 47% had moderate potassium content. The ready-to-eat easily perishable fasting snacks had highest sodium and potassium content. Overall the sodium content of the fasting snacks ranged from 1160 mg to 66.67 mg and the potassium content ranged from 353.33 mg to 1.1 mg, percent. Not a single snack analyzed had ideal K/Na ratio of 1.5 as suggested by JNC, the highest ratio recorded being 0.76.

West Africa, women comprise 60 and 80 percent of the workforce in trading (Ruel, 1998). The need for women to save time in food preparation has increased the share of the food budget spent on processed foods, convenience foods, snacks, and meals available as street foods.

In a paper titled, 'Greek street food vending: An old habit turned new' by Matalas and Mary (1996), state that, In Greece, street foods made their appearance in the 6th Century BC with the development of urban communities. Hot lentil soup was the only available street food in the 'agora' of the Greek cities, as eating while wandering around the market was not considered appropriate. Many foods popular in ancient times were rediscovered during the Byzantine period and are popular today. The authors provide a precise evolution of the main Greek street foods from the ancient times to the present. Price is a minor factor in the selection of street foods; taste, quality and freshness are the food attribute Greeks are looking for in selecting street foods. Street foods enjoy a wide accessibility. The authors describe the licensing, processing, packaging and distribution of street foods. They consider street foods under these categories: (a) foods without any preparation; (b) street cooked foods, and (c) ready-to-eat foods; which provide extensive information on the nutritional, chemical and microbiological quality of street foods.

A paper titled, 'Street foods in America: a true melting pot' by Taylor and co-workers (1996). In the USA, stated that, there is a vast array of food choice, but relatively little information about consumption patterns and their contribution to the diet of Americans. This paper provides an overview of the foods available

and the health, safety and regulatory issue associated with consumption of street foods, Street foods have been part of the American scene since the 17th century. The street vendor market became a business of the lower class.

'Public (street) foods in Australia' was studied by Wahlqvist and co-workers (1995). They stated that the concept of street foods is rarely seen as being a part of developed countries such as Australia with its 5,400 supermarkets and 13,000 other retail establishments. The preferred term is 'public foods' rather than 'street foods' since the locations of supply and consumption are more varied than the street e.g. sports grounds, church fetes, shopping malls, cinemas etc. By 'public foods' they refer to the immediate purchase and consumption of ready-to-eat foods in public places. Public foods have an element of environmental proximity about them, which require little anticipation, planning or preparation on the part of the consumer. They form part of the class of convenience foods but are purchased and usually consumed in a public location. Though some foods are undoubtedly purchased for later consumption in the home, e.g. jams, preserved fruit and cakes from church and other fetes. They are part of a rising trend in Australian and other western societies, the convenience food trend.

Bhatt and Waghray (1995) narrated that, although profile of street foods sold in Asian countries' was Studies Street foods have been around for hundreds of years, the proliferation of street foods in Asian countries is a new phenomenon. It began in the 1940s. Foods are selected because of taste and low cost, they are not selected for their nutritional value, although the food energy and protein value of cooked street food is higher than that which could be obtained from prepackaged processed food. The authors considers food safety a major issue and for this reason describe in detail the Hazard Analysis Critical Control Points (HACCP) on how to conduct the HACCP analysis in the field to determine critical control points. The HACCP concept has been applied to street foods in 23% of the countries which participated in the WHO street-vended food survey.

Various authors like Quisumbing (1995); Kennedy and Peters (1992); Rogers (1996); Handa (1996) had reported that in Ghana, women play a crucial role in the economy, controlling a large share of market activity and commodity trading. There are a small number of studies that have examined the impact of women's employment on the economic and social well being of the family. Women's access to the cash economy contributed to an improved economic standing of households in which children are being raised. Food consumption, measured by adjusted consumption expenditure, was highest in those households where women were the primary head of their household.

Bhatt and Waghray (1994) continued with their paper 'Street foods in America' and the Studies were conducted in some of the African countries like Nigeria and Morocco. They have shown that the major street food vendors usually earn more than the country's minimum wage. In Nigeria it is cheaper to buy street food than to cook it. Eating street foods begins in infancy. In Senegal, yoghurt is frequently given to the babies as weaning food and is never prepared at home. Street foods were the major source of nutrients for many of the adolescents (n>142) in Abeokuta (Nigeria). Between 40 and 70% intake of all the major sources of food groups were obtained from street foods which were the major sources of dairy products (70%), legumes (60%), fish (50%), meat (50%) and eggs (50%); 21% of energy for males and 29% energy for females was supplied by street foods. Street foods also supplied greater than 50% total proteins, 64% calcium and 60% vitamin A for both males and females. For other minerals (iron) and vitamins (thiamine and ascorbic acid) street foods supplied greater than 50% of total intake. Selection of street foods is based on taste, price, and on nutritional quality too.

Bhatt and Waghray (1994) also examined 'Street foods in Latin America' in the next paper. Street food industry is part of the informal economy of the Latin American countries. Most of the street vendors earn more than the minimum wage. Miriam de Chavez and co-workers (1984) look specifically at Mexican street food in 'the sale of street food in Latin America. The Mexican case: jeopardy J. in the paper which follows. Mexico has an old tradition of street foods. Fruits and juices are prominent items along with cooked snacks

and meals. As in other Latin American countries, food safety and licensing are important issue, as are the economic aspects of street foods, which represent an important sector of the economy.

Amirthaveri and Lakshmi (1994) had reported that a breakfast provides a large proportion of our needs for energy, complex carbohydrate, protein, dietary fiber and many vitamins and minerals. For all the breakfast items selected the raw ingredients were carefully weighed and with the help of the nutritive value book, the nutrients were calculated for each preparation. The loss of nutrients occurs. The maximum loss was shown with regard to ascorbic acid but that was the known fact and also it was due to the specific characteristic and chemical nature of ascorbic acid. In the case of energy only minimum loss occurs during the processing and cooking. Totally the percentage of loss of iron was more when compared to calcium but for both the nutrients same ash solution was used for analysis. The fiber loss varied from item to item that may be due to pre-preparation or cooking or during analysis.

Goyle and Dugar (1994) in a study showed that the protein content ranged from 5.4 to 10.7 g/100g, fat from 11.5 to 30.5 g/100g and crude fiber from 0.20 to 0.59 g/100g. The quality of oil extracted from the snacks obtained from the canteens was found to be inferior when compared to that of the oil extracted from the samples prepared in the laboratory as the values of alcoholic acidity and acidity of extracted fat of the former were found to be significantly higher than those of the latter.

Rosenberg and Trotler (1993) describe ‘Street food vending: The Isaraeli scenario’ in their paper. Street food vending as seen in developing countries is not part of the Isaraeli scenerio. Street food vending as seen in developing countries is not part of the Israeli version. Street foods are generally available at Falafel, sunflower seeds, nuts, ice cream or pizza are all part of the daily culinary street scene. Israeli food fairs were also described. The nature of the Israeli trend in street foods includes two major characteristics. First, it is an established and organized activity, mainly localized in commercial urban centers. Second, it is mainly for snacking purpose, and does not confirm to the

FAO definition because it is neither prepared nor sold by street vendors and hawkers.

A study was conducted on urban household food security and nutrition by Haddad (1993). One of the key objectives was to identify vulnerable households in an urban environment. While the study was not specifically designed as a comparison of male-and female-headed households, difference in gender and headship emerged as a significant factor in the analysis. Ghanna women have a strong presence in the urban economy, especially in the rapidly growing informal sector, working as street food vendors and petty traders; they balance their livelihood with the responsibilities of feeding and caring for their children and other family members. To gain a better understanding of urban women's livelihood and vulnerability to food insecurity, this paper highlights the main findings of a larger study on Urban Food and Nutrition Security in Accra, focusing on the difference in employment, income, consumption, and food security between male-and female-headed households.

Cheri (1971) in his study the samples were taken after 4h of slaughter and immediately packed in HDPE and stored at 2, -1^{o}C. From 6 kg lot of sample, measurement of pH and determination of cooking loss pH of finely minced samples were determined after homogenizing 10 g of the sample with 50 ml distilled water using laboratory homogenizer (make Insala Co.). pH of the samples were recorded using reference and glass electrode portable type digital pH meter (model Khera).

2.2 MICROBIAL RELATED LITERATURE

Siddika (2006) in his study reported that microorganisms used as a culture in preparing yoghurt are believed to synthesize vitamin B complex. Yoghurt drinks are also available in markets, which are also highly nutritious food. All the samples were tested for their microbiological qualities using the parameters of total viable count (per ml), coli form count (per ml), yeast count (per ml), mould count (per ml). The total viable count per ml of yoghurt samples were 89.17 (±6.29) X 10^4, 88.33 (±7.53) X 10^4, 89.67 (±9.60) X 10^4

respectively. Statistical analysis showed that there was no significant difference among the different samples. No coliforms bacteria were detected in the sample, which may be due to strict sanitary condition followed during collection and processing of milk.

Kowsalya and Shymy (2005) had carried out a comparative study of reports and findings of several authors that point out hazards in the consumption of beverage is due to poor handling and hygienic practices adopted by the food vendors. Actions like nose picking, finger licking, nail biting, sneezing, scratching and failure to wash hands after visiting toilet arouse feelings of disgust in the minds of people. To study the hygienic practices followed by the sellers and restaurant workers, a simple interview scheduled/checklist was framed to draw information on aspects like personal hygienic of vendor the usage, storage and disposal of water. Microbial contamination of selection beverages the total bacterial count in different beverages. The results from plate count techniques revealed the presence of bacteria in all the samples analyzed except in commercial canned juices. An unhygienic habit of smoking, chewing betel during work and spitting nearby was seen in 20.32 and 28 % respectively of petty shop workers, where as in cool bars and restaurants these practices were not followed. Forty eight per cent of pantry shop workers and 20 per cent of restaurant workers scratched/picked nose during work. Similar unhygienic practicing among the vendors of India was reported by Shuping and Guzman, 1984. The samples were found to be contaminated especially with *Escherichia coli* and other physical agents such as dirt.

Dave (2004) had reported that *Chutney* is an inevitable component of Indian fast food. *Chutney* is usually made of tomatoes, spices and herbs. Ten samples of *chutney* were randomly collected from the road side food vendors of Rajkot city. SPC (Standard plate count) method was determine total CFU/ml. pH was determined used pH meter. Gram staining examination was used for identification of colony forming units. The samples were found containing *lactobacillus, Staphylococcus, Escherichia coli, Clostridium sporogenes* and *streptococcus*. pH, water content, nutrient content, storage temperature and

time are some intrinsic and extrinsic factors affecting the microbial quality of chutney. Microbial contamination may occur at almost all stages in the preparation and serving of chutney. Preparing gadgets, storage and serving utensils, soil, water, spices and food handlers are major sources of bacterial contamination in *chutney.* This type of microbial contamination is one of the responsible factors for food born diseases like nausea, vomiting, diarrhea, bacillary dysentery, abdominal cramp and pain. This type of foodstuff may be hazardous to the health of consumers and requires utmost care to be taken towards maintenance of proper sanitation and hygienic measures.

Avashia and Dave (2004) had reported that Milk is a nutritive medium for human beings as well as for bacteria. 25 Random samples of raw milks from cow origin of uncontrolled vendors were collected and bacteriological analysis was made. According to standard methods colonies of *streptococci, lactobacilli, staphylococci,* gram +ve bacilli and few colonies of coli form group of organisms were detected on different culture media. From the findings it was concluded that the raw milk is often contaminated from uncontrolled vendors.

Trivedi and Vyas (2004) A study among Ladies hostel at Rajkot city during process of cooking. Microbiological assessment were made by agar plate method and by ASA strike method for air sampling, average colony count were 155 on nutrient agar plate and 50 colonies on agar strip. Air flora changes according to time to time and place to place and methods to methods.

Vyas and Joshi (2004) had carried out a study on Jam & Tomato Ketchup samples. Randomly Jam and Tomato Ketchup samples were purchased having ISI mark from local departmental stores. Four samples were screened for microbiological, analysis at various intervals by SPC method, and by Howard method. At the time of opening all samples were within the limits for mould count while all specimens at initial level showed presence of *lactobacillus* in remarkable numbers. All specimens were screened at the interval of 15 days for microbiological screening and for chemical changes such as pH.

In study by Nansal and Madhu (2003) ten government and private school canteens of Chandigarh were surveyed at random to determine the hygiene standards maintained in their kitchens. The total bacterial counts of food samples (Table - I) ranged from 3.60 X 10^5 to 1.93 X 10^7 CFUgm/ml, with pattie having the highest counts and sambhar the lowest counts. The gram negatives count was between 2.20 X 10^3 to 1.75 X 10^5 CFUgm/ml; the highest being in sandwich and the lowest in sambhar. The total bacterial counts of water ranged from 3.10 X 10^5 to 2.49 X 10^6 CFU/ml. The gram-negative counts were between 3.10 X 10^3 to 1.67 X 10^4 CFU/ml.

Kannappan and Varma (2003) carried out a study on South Indian fast food products namely, Gobimanchuri, Pani and puri, Fried rice, Churmuri, Masalapuri, fried fish and noodles procured from 6 different locations in Mysore city. The samples were analyzed for total plate count, coliform, yeast and moulds and *Staphylococcus aureus*, *Escherichia coli*, *Bacillus cereus* and *Vibrio parahaemolyticus* and others. Few of them were screened for antagonism by Pediococcus pentosaceous NCIM 2292. The spent culture of Pediococcus showed highest inhibition against *Bacillus cereus* and *Staphylococcus aureus* than its cells. The panipuri sample was analyzed saprately viz. Pani Puri and masala puri. In poori and noodles, total plate count values were log 4.77 cfu/g, log 2.77 cfu/ml and log 7.14 cfu/g, respectively. In masalapuri, Gobimanchuri, and Chumuri, *Staphylococcus* aureus and *Escherichia coli* counts were 6.39, 4.69 and 5.14 log cfu g and 6.39, 6.07 and 6.47 log cfu/g, respectively. Poori at one location had 6.47 *loads* of Vibrio parahaemolycticus. It was evident from the results that most of the fast foods were contaminated with spoilage bacteria with the low level of *Bacillus cereus*.

In a study Sathisbabu and Rati (2003) had collected the Pani Puri and masala from street vendors in labeled sterile plastic covers. The samples were transported and held at 4^{o}C till analysis on the same day. The prevalence of *Yersinia enterocolitica* an emerging food borne pathogen was studied in panipuri, which is crowned as the king of evening snacks. The snack product panipuri consist of three separate items viz. pani, puri and masala. Eight

samples of panipuri each consisting of individual items of pani, puri and masala collected from surrounding area of Mysore city was analyzed for *mesophilic aerobes, coliforms* and *Yersinia spp*. Amongst the pani, puri and masala samples, the latter sample showed high level of contamination recording *mesophlic aerobes, coliform* and *Yersinia spp* counts up to 6.9, 6.4 and 6.1 $\log_{10}$ CFU/g, respectively. *Escherichia coli* were present in three samples of masala. The identification based on microscopic character and key biochemical tests conducted on 33 pure cultures isolated from Yersinia selective plates showed six cultures to be *Y. enterocolitica*. Characterization of these six isolates for virulence factors showed two isolates to be virulent stains as they showed positive reaction to auto agglutination and crystal violet binding tests.

A survey was conducted to study the consumption pattern of food in Kochi, following which eight commonly consumed street foods were collected from three different sources viz. (i) a street vendor (ii) restaurant and (iii) a house in the city. All the samples were analyzed for proximate composition and tested for adulteration. Four most widely and frequently consumed foods were subjected to microbial evaluation. Hazard analysis critical control points (HACCP) evaluation of one food sample was carried out and hygienic practices adopted by street vendors and restaurant workers were also evaluated. The study revealed the presence of non-permitted colours, artificial sweeteners, adulterant oils and poor sanitary quality of food. The HACCP analysis of Bengal gram curry showed high microbial counts in raw and soaked samples. The hygienic practice adopted by vendors and restaurant personnel were far satisfactory. Though foods from all sources were nutrient dense, home made foods were less expensive and quality wise superior to both restaurant and street foods. (Chandrasekhar and Kowsaly, 2003).

Kaul and Mahajan (2002) had conducted a survey of Fresh milk shakes, ice and packed flavoured milk samples from various shops in Chandigarh collected aseptically in sterile vials. Samples of milkshakes and flavoured milks were screened for their bacterial counts. The total and gram negative counts of freshly prepared milkshakes were found to lie between $10^6 – 10^8$ and $10^4 – 10^6$ Colony Forming Unit (CFU) / ml respectively. Samples of mango shakes

showed the highest counts for both total and gram negative organisms. The lowest total count was observed in chocolate shake samples while banana shake samples gave the lowest gram-negative counts. The total and gram-negative counts for ice lay between 10^5 – 10^6 and 10^3 – 10^4 CFU/ ml respectively. For packed flavoured milks, the total and gram negative counts in the present investigation lay between 10^5 – 10^7 and 10^3 – 10^5 CFU/ ml respectively. Response to other questions revealed that in three (27.3%) out of 11 shops, the workers washed their hands with plain water where as in eight shops (72.7%) soap and water was being used. For cleaning glasses, 45.5 per cent of personnel used soap and water where as 54.5 per cent used detergent and water. Six out of nine shops (66.7%) were using detergent while three shops (33.3%) were using soap for cleaning and wiping clothes. For cleaning mixer jars, 7 out of 11 shops (63.6%) used detergent and water while in four shops (36.4%) the personnel cleaned the jars only with plain water.

Musleh and Ahmed (2001) had reported that the quantitative aspect of bacterial flora from muscle, gills and intestinal content of Indian Shad (Tenualosa ilisha) was evaluated during ice storage in insulated polystyrene and wooden boxes. The initial total bacterial count in the muscle of the fish stored in insulated boxes was 3.5 X 10^4 CFU/g and it increased to 1.8 X 10^9 CFU/g after 18 days when the fish became orgnoleptically unfit for consumption. The intestinal contents contained the highest load of bacteria, followed by gills. The bacterial flora of the fishes stored in wooden boxes showed comparatively high count of 4.4 X 10^6, 1.8 X 10^7 and 4.9 X 10^7 CFU/g for muscle intestinal contents respectively. The bacterial flora of the different parts of the fish kept in wooden boxes increased rapidly during storage for 8 days bacterial load exceeding those fishes stored in insulated boxes for 18 days. Initially, Coryneform group was found predominant by in both types of storage followed by *Micrococcus, Achromobacter,* and *Aeromonas*. No *Enterobactor* was found in muscle and gills initially. Absence of *Pseudomonas* was also observed.

Kumari and Prasad (2001) had done a study on fish. A total of 80 samples, (40gills and 40 intestines) from 40 rohu fishes were collected from

different fish markets of Patna in sterilized plastic bags for isolation of aerobic bacteria. *Escherichia coli, Pseudomonas spp. Staphylococcus spp., Klebsiella spp.* and *proteus spp.* were isolated from samples. The prevalence rates of these microorganisms among gills and intestines were found to be statistically ($P<0.05$). The public health significance of different members of aerobic bacteria isolated is discussed. The microbiological analysis is important to generate data changes during handling of equipment, transport of live fish and cleaning, extent of spoilage of fishes. The present findings suggest that the market fish of Patna was contaminated with several pathogens, which are generally associated with different clinical conditions of human beings. Though, absence of *Salmonella* is a good sign for consumers, the public health importance of the above findings cannot be ignored.

Gupta and Mann (2000) for a study on Mishti Doi, collected samples of Mishti Doi (Sweetened Dahi) sold in and around Calcutta market and analyzed them for microbiological, chemical and ultra structural characteristics. The wide variations in different parameters can be attributed to manufacturing conditions and the type of starter cultures used. This survey was particularly exploited for the standardization of a good quality Mishti Doi. Two promising starter combinations were developed comprising *streptococcus*. Experimental samples presented different casein-stabilizer matrices showing defined distribution of lactic acid bacteria and yeast cells in the experimental samples.

Gaborone and Botswana (2000) had conducted a study to this evaluate the microbiological safety and quality of street foods sold. A total of 148 point-of-sale composite street food samples were bought and analyzed between June 2001 and May 2002. The analysis focused on the level of contamination of various street foods with *Bacillus cereus*. The *B. cereus* (vegetative and spores), total spore, and total viable counts were determined on all the samples. Also *B. cereus* isolates from 444 individual point-of-sale food samples were characterized with respect to their biochemical profiles and enterotoxigenic properties. The *B. cereus* contamination rate for point-of-sale foods was 65%. The *B. cereus* counts ranged from not detectable to levels as high as 9.1 logs CFU/g. Despite the high rate of contamination of some

samples, generally, most samples had *Bacillus cereus* counts of less than 4 logs cfu/g; hence, they were of acceptable microbiological quality. *Bacillus* diarrheal enterotoxin was detected from 52 isolates from individual's portions of meals using the *B*. *cereus* enterotoxin reserved passive latex agglutination kit. Results of the assay revealed that 59.6% of the *B. cereus* isolates were enterotoxigenic. Most of the enterotoxigenic isolates were obtained from vegetables samples.

Three varieties of Ready-to-Eat (RTE) fried foods, viz., samosa, batetawada and patra sold at railway stalls, small shops and streets in Mumbai city were examined for microbiological safety. Samples of samosa, batatawada (11.1% each) and patra (45%) had *staphylococcal* counts of more than 3 logs. Samples of samosa from streets showed higher counts of all organisms, but only the counts of total fecal coli form were statistically significant ($p<0.05$). Samples of batatawada from streets also showed higher counts, but the difference was not significant. Packed samples did not differ from foods sold open. Among the three food items, patra samples were the most contaminated. Ready-to-eat (RTE) fried fruits/snacks are quite popular in Mumbai city. They are sold almost everywhere and at every kind of outlet, either open or packed. Open foods are mostly exposed to environmental pollution and handling. Most of the time, the open foods sold in small shops are exposed to dust and soot from the atmosphere, the bad handlers involved have poor personal hygienic and also the customers often like to feel the food texture before purchase, thus, contaminating the food further. (Kakar and Udipi, 1998).

In a study done by Guha and Das (1994), counts of *mesophile aerobes,* aerobic spore formers and staphylococci in market samples of ice cream varied in relation to the sources and packages. Higher counts of coliforms were prevalent in samples collected from local vendors; ice-cream samples from parlors and hostels showed higher *staphylococci* count. With reference to the packages, ice cream sold in cups had higher counts of *coliforms* and *staphylococci*, while aerobic spore formers were on a higher side in ice-cream bars.

Bansal (1993) on a study, developed a quantitative comprehensive scoring system for the gradation of hygiene standards of catering establishments. The food handlers were evaluated with the help of a two point scale of 9 variables, namely: clean clothing; protective apparels as above, apron, hair and beard restrains; washing hands before cooking or returning from a break; free from communicable diseases and wounds; health consciousness; at least primary education; training in food safety and hygiene practices; manicured nails; substance use during food handling. Microbial contaminants are responsible for over 90 per cent of episodes of food-borne illnesses. Majority of food handlers being illiterate, they have no training for food hygiene, and the legal approaches. In his study, it was observed that none of the establishments met the model regulations. Their physical structure was not compatible with good hygiene: facilities for the preparation and storage of the raw and cooked food articles were scanty, leaving aside the delicate provision of adequate refrigeration; chances of high cross contamination of food articles; unhygienic food handlers and handling procedures; plenty of files and vermin; poor water supply quality, all of which have been conclusively documented to lead to food-borne illnesses.

Bacillus brevis, *B. circulans*, *B. laterosporus*, *B. licheniformis*, *B. pumilus*, *B. stearothermophilus* and *B. subtilies* were isolated from Indian snack and foods. Higher count of 4.2 $\log_{10}$ (CFU/g) and a lower count of 2.6 $\log_{10}$ (CFU/g) were observed in bisibele bhath and uppma, respectively. The isolated cultures were positive for production of either one or more of the following: hemolysins, phospholipase, protease, and lipase analyzed. A few selected cultures of Bacillus species occurring as post-processing contaminants in plain cooked rice reached cell populations, which were sufficient to cause health hazards. These findings indicate the significance of Bacillus species as post-processing contaminations in processed foods and were done. (Varadraj and Keshava 1992).

Sharma and Joshi (1991) in a study on various milk and milk products reported that, *salmonella spp*. could be isolated from 5 samples of milk products. Among these, *S. weltevreden* and *S. enteritieds* could be isolated

from two samples each whereas *S. typhimurium* was isolated from one sample. Various other microorganisms isolated from these samples were *Escherichia. coli*, *Klebsiella* spp., *Pseudomonas* spp., *Alkaligenes faecalis* and *Proteus* spp. The public health importance of these findings is received.

Sarada and Bagum (1991) had reported the bacteriological quality of ice creams and water ice, which are referred as lollies, sold in Banglore city. One hundred and twenty samples of ice creams in cups, cones, and barsand lollies from hotels, parlors and local vendors are assessed for standard plate count and coli forms. Microbiologically, no significant differences were found between samples from hotels, parlors and local vendors. The counts were comparatively less in lollies than in ice creams. Out of the total samples collected for the study, only 47 samples for standard plate count and 74 for coli forms were meeting the standards prescribed by Bureau of Indian Standards.

Grawal and Tiwari (1989) studied Twenty five market samples of rasmalai & reported that all showed a very high aerobic plate count which ranged from 10^2 – 10^6 CFU/g. *Staphylococcus aureus* was the most common isolate (76%) followed by *Escherichia coli* (72%) and *Klebsiella* (68%). The other organisms isolated were species of *Pseudomonas* (52%) *Enterobacter* (44%), *Bacillus* (32%), and *Citrobacter* (8%). However, no correlation could be established between the types of isolate with the total aerobic count. Samples having an aerobic count of 10^3 – 10^4 cfu/g yielded majority of the enteric organisms. Only one isolate of *Staphylococcus aureus* could be type with the usual set of phages routinely used for typing clinical isolates.

In a study carried out by Guha and Das (1989), one hundred samples of ice cream of ten different manufacturers, marketed in Calcutta were analyzed over a period of two years for standard plate count, psychrophilic and lipolytic bacteria yeast, mould, enterococci, coliform and fecal coliform and also for the presence of pathogenic microorganisms. 22% of the samples were within the numerical limit suggested by ISI; only 12% could be classed as of grade A quality as per U.S. Public Health Service code. Presence of *Escherichia coli* was confirmed in 37% of the samples. Most of the strains of *Escherichia coli*

(95.1%) were resistant to penicillin but sensitive to chloramphenicol (91.9%). Multiple resistances were observed in coliform as well as in the isolates of *Escherichia Coil*. Out of eight serotypes of enteropathogenic variety, all were resistant to more than one antibiotic used in the study. Public Health significance of coliform and *Escherichia coli* in ice cream was discussed. *Salmonella,* coagulase positive *Staphylococcus aureus*, *Vibri parahaemolyticus* were not detected.

Rao (1979) had done a study on various finished products analysis for total counts and yeasts and moulds and primary isolations. Presence or absence of *staphylococci, Salmonella* and coliforms were also carried out utilizing standard methods and media. Incorporate nutrient agar (NA) and nutrient both (NB) as well as by the agar cup assay method. *Staphylococci, coliforms, Salmonella* and *moulds* were not present in the finished product. Usually Bacillus strains have been reported as common contaminants in wheat and bakery products present in the flour, air and equipments. The normal cooking eliminated the gram-negative rods, cocci and the vegetative cells of the *Bacillus* and pathogens.

Rao and Bhagirath (1978) had conducted a study of vegetarian and non vegetarian preparation from kitchens for their coliform count. From each item containing coliforms, about 20% of colonies were picked from violet red bile agar plates and biochemically characterized. Coliforms were recovered from 64% of samples, salads had the highest coliforms, followed by vegetable curries. *Escherichia coli* from foods, water and human sources, *Klebsiella* and *Enterobacter* from foods and non-lactose fermenters (NLF) from foods and human sources were examined for resistance to twelve antibiotics. Most of the organisms were resistant to *amplicillin, penicillin, chloramphenicol, erythromycin* and *sulphadimidine. Escherichia coli* from foods (1 strain) were sensitive to *amphicillin, penicillin* and *chloramphenicol.*

Ito and Chen (1978) conducted a study in which Fresh figs were pureed, the puree mixed with one of three syrup variables (water, light or heavy syrup), the pH adjusted at 0.1 pH intervals from 4.6 to 5.4, and the tubes were

inoculated with a composite of 5 tubes A and 5 tubes B. *Clostridium botulinum* spores at 2 inoculums levels (10^2 or 10^6 spores/tube). Anaerobic incubation was done at 30 ^{o} C for almost 1 yr. The results of our experiments show that maintenance of pH 4.9 or below in this product will prevent the outgrowth of *Cl. botulinum* spores. An inoculated pack utilizing commercial procedures confirmed these results.

In a study done by Pradhan and Chetty (1978) the microbial tests on foods may be quantitative to detect total number of organisms or qualitative to identify certain kinds of organisms or the products elaborate by them. The coliform group is being used as an index of quality of food products in general and for frozen foods in particular. Recent studies indicate that fecal *streptococci* along with total counts can serve effectively as indices of food quality particularly among precooked frozen foods.

Tamhane (1978) had reported that for acid foods with pH value less than 3.5 acid uric bacteria, yeasts and moulds are troublesome organisms. Their heat resistance is generally low. Foods held at recommended frozen storage temperature (-18 ^{o} C) are microbiologically stable as hardly any growth occurs at temperatures much below 10 ^{o} C. Majority of bacteria and fungi grow between 20 ^{o} and 45 ^{o}. The temperature optima for bacterial pathogens are 30 ^{o} or higher. The availability of water for microbial growth is commonly measured by its activity. Few food poisoning bacteria grow at pH 4 or lower.

Shehnaz (1975) conducted a study to assess the nutritional and chemical changes occurring in Bengal (*Cicer arietinum*) and tiled bean (*Delicious lablab*) due to insect infestation. The uric acid content of the samples was estimated and an experiment on weaning rats was carried out to determine the nutritive value of insect legume samples. Results of the physical, chemical and biological tests showed that the losses due to insect infestation are not only quantitative but also qualitative.

In a study conducted by Kamat and Syllable (1973), Pedha samples purchased from the local market were examined for their total microbial profile in terms of psychrophilic, mesophilic, thermophilic counts, and coliforms and for the presence of coagulate-positive *Staphylococci*. Coli forms, surprisingly, could not be detected in any of the samples examined. *Staphylococci* were detected in 14 of the 16 samples of which four were coagulate-positive and 64.3 per cent of the strains isolated haemolysed human red blood cells. The need to establish microbiological quality standards to protect the consumer has been stressed.

Israni and Mankar (1973) had carried out a study of 62 samples of *Gulab Jam*un mix by standard plate Counts, for *Staphylococcal* Counts, Yeast and Mould Counts, Coli forms, Faecal Coliforms and for the presence of *Salmonella.* Yeasts were not observed in any of the samples studied while, moulds were observed in 29% samples. Similarly *Staphylococci* were observed in 22% samples. The Coli forms were in the range of nil → 1100 and Faucal Coli forms in the range of nil → 500. Coli forms were observed in all except 2 samples studied. Only 13% samples indicated nil feacal coli forms while rest of the samples was positive for feacal coli forms. The mean standard Plate Counts reported in the present study were 12 X 10^4 CFU/gm. Out of the 62 samples, yeasts were not observed in any of the samples studied. Moulds were observed 29% samples while rest of the samples indicated moulds counts. The range of coli forms and faucal coli forms was from nil → 1100 and nil → 500 respectively. The BIS (2) has recommended that coli forms and *Staphylococci* be absent in ready *gulab Jamun* Mix. Coli forms were recorded in all except 2 samples and Faucal Coli forms in 87% of the samples studied. *Staphylococci* were seen in 22% samples only, while 78% samples indicated nil *Staphylococcal* counts, and therefore were in agreement with the standards recommended by BIS (2). No *Salmonella* were isolated from any of the samples studied.

Krishnaswamy and Parthasarathy (1973) had reported incidence of microorganisms on cashew nut at different stages of processing in 7 different cashew-processing units in Tamilnadu sector has been examined. The extent

and type of contamination depended on the level of sanitation that prevailed in the units studied. Yeasts and moulds, aerobic mesophilic spores, aerobic-thermophilies, thermophilic flat-sours and *staphylococci (*non-coagulase) were present to a limited extent. *Salmonella* and *clostridium* perfringens were not present.

Chapter – 3
MATERIALS AND METHODS

There are different food zones in the Rajkot city where small street vendors, sell their food products on lorries. Vended food items are very popular in Rajkot city. Rajkot city has a population of about 12 lakes and a large number of people eat food from the vendor's daily in afternoon as a substitute of lunch. The reason for this is busy schedule, working couples, working parents. Students and people who are daily commuters from near places for their work find it a good, cheap substitute for their lunch. To prepare the food early in morning and carry it to work place is now day-by-day loosing the charm & its place is taken by vended food available in areas near workplace. About public eats food items outside their home in evenings especially on Sunday, or other holidays. With need of time, changing atmosphere eating out has become a fashion or habit.

This study is related to food items sold by small vendors, which are found in large number and to, which citizens of Rajkot city frequently go for their delicacies.

3.1 SAMPLING

Food samples were collected from the four main areas, which are selected on the basis of their popularity, and the nutrient profile, microbial analysis and hygienic practices were carried out. Freshly prepared food samples were collected from four different food zones of city like (1) Indira circle, (2) Bhaktinagar circle (3) Sant Kabir road (4) Race Course ring road.

The researcher had collected twelve food items from each food zone and food items were also prepared at home for comparison of the nutritional and hygienic profile. The twelve food items were as follows.

(1) Fast food & Snacks: (1) Pau bhaji (2) Pani puri (3) Bhel (4) Kacchi bread (5) Burger (6) Pizza.

(2) Chinese food: (7) Chinese Rice (8) Chinese Bhel.

(3) South Indian food: (9) Masala dosa (10) Mendu vada.

(4) Punjabi food items: (11) Vegetable kolhapuri (12) Paneer tikka masala.

All food samples were collected, and at that time all vendors were asked about approximate amount of ingredients used in cooking of 5 kg food items. On bases of that amount raw ingredients for 100 Gms of food was calculated.

Generally middle and higher middle class people of Rajkot city prepared the above selected items at home. Fifty middle class families were given a questionnaire to find out the ingredients and correct method of cooking of above mentioned twelve items. On the basis of the results of questionnaire the average ingredients were obtained and a recipe was standardized.

After standardizing home made recipes for ingredients and amount they were prepared compared with vendor’s food samples for nutritional and microbial quality.

Table No. 2

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *PAUBHAJI*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Potato	7	12
Tomato	5	10
Onion	5	5
Cabbage	5	5
Cauli Flower	7	7
Bens	3	5
Brinjal	-	2
Gourd	-	2
Oil	15	10
Butter	2	5
Garlic (dry)	2	1
Lemmon	-	5
Spices	10	3
Water	15	7
Wheat flour (refined)	20	20

Homemade *pau bhaji* is nutritionally rich as compared to vendor's food. Vendor's food is containing more amount of oil, spices and water there by making it unfit, heavy for digestion and also more perishable.

Table No. 3

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *PANI PURI*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Wheat flour (refined)	10	10
Rava	5	5
Bengal gram	15	25
Potato	5	15
Pudina	-	5
Coriander	-	3
Date	-	3
Oil	11	6
Onion	1	2
Lemon	-	3
Jaggery	-	2
Tamarind Pulp	10	-
Spices	3	3
Water	43	20

Home made food is containing more amount of Bengal gram and potato thereby is nutritionally rich as compared to vendor's foods. Vendor's foods is rich in oil and tamarimed pulp making it tangy for tongue but harmful for body in long term.

Table No. 4

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *BHEL*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Rice Puffed	20	25
Potato	5	7
Tomato	5	5
Onion	10	7
Bengal gram (whole)	5	10
Wheat flour (refined)	5	5
Green chilly	2	5
Coriander	2	2
Date	-	5
Tamarind pulp	5	5
Pomegranate	5	7
Sev	10	15
Spices	5	5
Water	11	10

Home made *Bhel* is containing more amount of Bengal gram, sev, rich (puffed) thereby is rich in proteins and more amount of vegetables. Where as vendor's foods are is more watery. As water used may also not be potable or unfit for human consumption.

Table No. 5

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *PIZZA*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Wheat flour (refined)	30	30
Cheese	5	10
Tomato	10	15
Onion	10	10
Potato	10	15
Cabbage	10	-
Butter	8	2
Spice	10	10
Oil	5	2
Water	2	2

Nutritional content of home made food is rich as it contains large amount of potato and tomato. While vendors food contain more amount of Butter (fats) and cabbage a cheap ingredient widely available.

Table No. 6

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *BURGER*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Wheat flour (refined)	30	30
Potato	10	20
Onion	12	10
Tomato	10	10
Green Chilly	10	3
Cheese	3	5
Butter	5	7
Spices	2	2
Water	20	15

Home made food is containing large amount of potato, butter, while vendor's food is containing more amount of onion, water.

Table No. 7

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *KACCHI BREAD*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Wheat flour (refind)	10	10
Potato	10	15
Onion	5	8
Groundnuts	5	8
Bengal Gram dal	2	3
Sev	5	5
Green chili	10	3
Tomato	10	5
Tamarind pulp	5	1
Pomegranate	2	5
Lemon	-	5
Date	-	5
Garlic	5	3
Spices	5	5
Water	25	20

Home made *kacchi Bread* as compared to vendors food is rich in potato, groundnuts , sev, while vended contains more amount of water.

Table No. 8

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *CHINESE RICE*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Rice	30	45
French Beans	5	10
Cabbage	7	7
Onion	3	3
Cheese	3	3
Spices	5	5
Water	47	27

A nutritional content of home made *Chinese rice* is high in terms of rice, beans. While vended food is containing less amount of actual food content and more water. Again making it easily perishable in small time.

Table No. 9

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *CHINESE BHEL*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Noodles	20	20
Ground nuts	3	8
Cabbage	10	5
Corn flour	20	25
Tomato	10	5
Onion	10	5
Cheese	1	7
Spices	5	5
Water	11	10
Sauces	10	10

Home made *bhel* is rich in protein as it contains more corn flour, ground nuts. While it contains less amount of raw vegetables and more cheese as compared to vendors food which is containing bulk of raw vegetables.

Table No. 10

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *MENDU VADA*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Black Gram dal	10	10
Oil	20	15
Green Gram dal	10	15
Onion	5	5
Tomato	10	10
Potato	5	5
Spices	5	5
Water	35	30

Home made *menduvada* is rich in green gram dal and vendor's food is more oily and having less nutrients compared to home made ones and of course it is containing more water hence easily perishable.

Table No. 11

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *MASALA DOSA*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Black gram dal	5	5
Rice	10	10
Oil	10	8
Potato	10	15
Onion	5	10
Tomato	10	20
Green Gram dal	5	15
Spices	5	5
Water	35	12

Nutritional content of home made *dosa* is rich as it contains more amounts of green dal and vegetables, while vendor's food is more only and containing large amount of water.

Table No. 12

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *VEGETABLE KOLHAPURI*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Tomato	20	15
Onion	10	15
Oil	10	10
Cheese	3	3
Cabbage	5	5
Butter	2	2
Cauli Flower	5	5
French beans	5	5
Coriander leaves	3	3
Capsicum	10	10
Spices	5	5
Water	20	20

Vegetable kolhapuri home made is rich in tomatoes and onions and there it's nutritionally richer as compared to vendor's food.

Table No. 13

INGREDIENTS AND AMOUNTS FOR VENDOR'S AND STANDARDIZED HOME MADE *PANNER TIKKA MASALA*

Ingredients	Amounts in (100 gm)	
	Vendor's foods (gm)	Standardized home made foods (gm)
Paneer	10	20
Tomato	10	15
Onion	10	10
Coriander	5	5
Cheese	5	5
Spices	10	5
Water	50	40

Home made *panner tikka masala* contains more amount of tomato as compared to vendor's food which is containing more amount of water thereby decreasing its keeping quality and making it more perishable.

3.2 SAMPLE SELECTION AND PREPARATION FOR NUTRITIONAL ANALYSIS

All the food items that were collected were freshly prepared by vendors.

All the food samples were collected at 10:00 p.m on first day and packed in plastic containers. After this, these samples were individually homogenized in mixer and 100 gm sample was packed immediately in containers. These containers were stored at -34ºC in freezer. Home made food sample were also prepared, homogenized and preserved along with samples collected from vendors.

The chemical analysis was carried out, next day at 9.00 A.M

3.3 SAMPLE PREPARATION FOR MICROBIAL ANALYSIS

From each of the homogenized food samples exactly 1 gm food sample was weighed and suspended in 9 ml of sterile Distilled water blank. This was considered as 10^1 dilutions. After which serial dilutions 10^2, 10^3 were prepared and 10^3 dilutions were selected for inoculation of bacteriological media.

3.4 HYGIENIC PRACTICES

Observations were made for hygienic practices as compared to homemakers such as; wearing clean clothes, apron and hair cap, washing hands, nails cut, smoking during work, chewing betel, splitting near by, scratching nose while work.

3.5 STATISTICAL ANALYSIS

As per the above observation of the samples collected, it is observed that the various nutritive properties have got variations in their values, but after applying the scientific statistical tools (t-test) on the same data. It is observed from the analysis that the calculated value is more/less than the tabulated value (approach **p** value); therefore the hypothesis is accepted or rejected (Pal and Sarka 2005, Gupta, 2004).

This research project was undertaken for the purpose and with the aim of awareness towards nutritional and microbial quality of vendor's foods.

3.6 METHODS OF NUTRITIONAL ANALYSIS OF FOOD

3.6.1 Determination of Total Carbohydrates

Carbohydrates were determined by method of Sadashivam and Manickam (1991).

PRINCIPLE

Carbohydrates are first hydrolyzed into simple sugars using dilute hydrochloric acid. In hot acidic medium glucose is converted into hydroxymethyl furfurals. This compound reacts with anthrone to a green coloured product with absorption maximum at 630 mm.

REAGENTS

(1) 2.5 N – HCI

(2) Anthrone reagent 95 %

(3) Standard glucose

PROCEDURE

The sample 100mg was weighed and hydrolyzed by keeping it in boiling water bath for three hours with 5 ml of 2.5 N – HCI and is cooled to room temperature. It was then neutralize with solid sodium carbonate until the effervescence ceases. Total volume was made 100 ml with distilled water and centrifuged. The supernatant was collected 0.5 ml aliquots were taken for analysis. The volume was made 1 ml in all the tubes including the sample tubes by adding distilled water. Then were 4 ml of anthrone reagent was added all the tubes were heated for eight minutes in a boiling water bath there after cooled rapidly and reading was taken of the green to dark green colour that developed at 630 nm. The graph of standard was plotted. From the graph amount of carbohydrate present in the sample was calculated.

CALCULATION

Amount of carbohydrate present in 100 mg of the sample

$$= \frac{\text{Mg of glucose}}{\text{Volume of test sample}} \times 100$$

3.6.2 Determination of Fat (AOAC 1970)

PRINCIPLE

Oil from a known quantity of food is extracted with petroleum ether. It is then distilled off completely, dried, the oil weighed and the % oil is calculated.

REAGENTS

(1) Petroleum ether [40° – 160° C]

(2) Whatman filter paper No. 1

PROCEDURE

Standard procedure of Association of Official Analytical Chemist (AOAC) (1970) was adopted for the determination of fats and oils. The sample 5.0 Gms was weighed on the fat free paper and hanged firm on the upper portion on the extraction chamber gripped on its sides. The bottom flask was filled with ether. It was heated to nearly 4 to 6 hours depending upon the material. The thimble containing fat free material was carefully removed from the chamber. The residue was air-dried at room temperature and the dried material was weighed on after evaporation of ether from the extracted material and the percentage composition of fat were calculated.

$$\text{Fat} = \frac{\text{Weight of oil (g) X 100}}{\text{Weight of sample (g)}}$$

3.6.3 Determination of Protein

Protein was determined by Kjeldhal method of Sadashivam and Manickam (1991)

PRINCIPLE

The nitrogen in protein or any organic material is converted to ammonium suplhate by H_2SO_4 during digestion. This salt on steam distillation librates ammonia, which is collected in boric acid solution and titrated against H_2SO_4.

REAGENTS

(1) Sulphuric acid (2) Potassium sulphate (3) Sodium hydroxide (4) Indicator solution (5) Boric acid standard (6) HCI or H_2SO_4

PROCEDURE

Take 0.5 gm food sample digest it with 10 ml of concentrated sulfuric acid along with a pinch of digestion mixture. After transparence digestion volume was made up to 10 ml with distilled water. Take 10 ml of digested sample in Kjeldahal flask along with 10 ml of 50% NaOH and distill it for 10 minutes, to liberate the ammonia from the sample. The liberated ammonia was collected in 5 ml of 2 % boric acid containing mixed indicator [methyl, red, blue]. Titrate the ammonium borate solution formed with 0.02 N sulphuric acids to a purplish grey end point. Blank was carried out in a similar manner without the sample, using 5 ml or 10 ml of distilled water.

CALCULATION

$$\text{Protein \%} = \left(\frac{\text{Titer. reading}}{1}\right) \times \left(\frac{N H_2SO_4}{0.02}\right) \times \left(\frac{0.28}{\text{aliquot taken}}\right) \times \left(\frac{\text{Vol. made up}}{\text{sample taken}}\right) \times \left(\frac{100}{1000}\right) \times 6.25$$

3.6.4 Determination of Crude Fiber

Fiber was determined by method of Sadashivam and Manickam (1991).

PRINCIPLE

During the acid and subsequent alkali treatment oxidative hydrolytic degradation of the native cellulose and considerable degradation of lignin occurs. The residue obtained after final filtration is weighed, incinerated, cooled and weighed again. The loss in weight gives crude fiber content.

REAGENTS

(1) Sulphuric acid solution [0.255 $\pm$ 0.005 N]

(2) Sodium hydroxide solution [0.313 $\pm$ 0.005 N]

PROCEDURE

Extract 2 gm of ground material with ether or petroleum ether to remove fat. After extraction with ether boil, 2 g of dried material with 200 ml of sulphuric acid for 30 min. filter it through muslin and wash it with boiling water until washings are no longer acidic. There after boil with 200 ml of sodium hydroxide solution for 30 min. Filter it through muslin cloth again and wash with 25 ml of boiling 1.25% H_2SO_4 three 50 ml portions of water and 25 ml alcohol. Remove the residue and transfer to ashing dish [W_1]. Dry the residue for 2h at 130 $\pm$ 2ºC cool the dish in desiccators and weigh [W_2]. Ignite for 30 min at 600 $\pm$ 15ºC. Cool in desiccators and reweigh [W_3].

CALCULATION

$$\% \text{ fiber in ground Sample} = \frac{\text{Loss in weight on ignition } (W_2 - W_1) - (W_3 - W_1)}{\text{Weight of the sample}} \times 100$$

3.6.5 Determination of Ascorbic Acid

Ascorbic acid was determined by method of Sadashivam and Manickam (1991).

PRINCIPLE

Ascorbic acid is first dehydrogenated by bromination. The dehydroascorbic acid is then reacted with 2, 4-dinitrophentyl hydrazine to form osazone and dissolved in sulphuric acid to give an orange – red colour solution, which is measured at 540 nm.

REAGENTS

(1) 4 % oxalic acid
(2) 0.5N sulphric acid
(3) 2% 2, 4-dinitrophenyl / hydrazine reagent.
(4) 10% thiourea solution
(5) 80% sulphuric acid
(6) Bromine water
(7) Standard ascorbic acid.

PROCEDURE

Grind 0.5 – 5.0 gm of sample material either mechanically or using a pestle and mortar in 25-50 ml 4% oxalic acid solution, centrifuge or filter and collect the liquid.

Transfer an aliquot (10 ml) to a conical flask and add bromine water drop wise with constant mixing. The enolic hydrogen atoms in ascorbic acid are removed by bromine when the extract turns orange yellow due to excess bromine expels it by blowing in air. Now make up volume (25 or 50 ml) with 4% oxalic acid solution.

Similarly convert 10 ml of stock ascorbic acid solution into dehydrates form by bromination.

Standard dehydrate ascorbic solution into a series of tubes serial diluted. Take 2 ml of brominated food sample extract. Make up the volume to 3 ml with distilled water. Add 1 ml of DNPH reagent followed by 1-2 drops of thiourea and incubate at 37ºC for 3hrs. After incubation dissolve the orange red osazone crystals formed by adding 7 ml of 80 % sulphuric acid, measure absorbance at 540 nm.

CALCULATION

$$\text{Vit C} = \frac{0.5\text{ mg}}{V_1\text{ ml}} \times \frac{V_2}{5\text{ ml}} \times \frac{100\text{ ml}}{\text{Wt. of sample}} \times 100$$

3.6.6 Determination of Moisture (AOAC 1970)

The sample (100 mg) was weighed (to kill the bacteria it was kept in an oven at 105^{o}C for 5 hrs) and then transferred it into the desiccators. It was dried till constant weight was obtained from it. The loss in weight of the moisture per 100 gm of the sample was calculated.

3.6.7 Determination of Thiamine

Thiamine was determined by method of Sadashivam and Manickam (1991).

PRINCIPLE

Alkaline potassium ferricyanide oxidizes thiamine to thiochrome, which is a fluorescent compound. The thiochrome is extracted in isobutyl alcohol and measured in a fluorimeter.

REAGENTS

(1) 15% NAOH

(2) 1%Potassium Ferricyanide

(3) Isobutyl Alcohol

(4) Sodium Sulphate (anhydrous)

(5) 0.1 N HCL

(6) Stand Thiamine Hydrochloride

PROCEDURE

Sample hydrolysis (acid)

(1) 10 gm foodstuff in conical flask.

(2) Add 125 ml of 0.1 NHCl

(3) Hydrolyse it in boiling water bath for 45 min.

(4) Cool it to RT. Adjust pH 4.5 with saturated sodium acetate.

Thiamine standard

Stock: 1 mg thiamine hydrochloride $\longrightarrow$ 100 ml with 0.1 N HCl.

Working standard: 1 ml stock $\longrightarrow$ 100 ml with 0.1 HCl (conc. 1 µg/ml).

Table No. 14

Thiamine standard & Sample

Reagent	Standard				Sample	
	S1	S2	S3	S4	A	B
Sample	-	-	-	-	5	5
Working std.	1	2	3	4	-	-
distilled water	4	3	2	1	-	-
K_3 [Fe (CN) $_6$]	3	3	3	3	3	-
15% NaOH	-	-	-	-	-	3
Mix well						
Isobutyl Alcohol	15	15	15	15	15	15

Shake for 2 min. allow it to settling remove the bottom layer. Then add 1 spatula of anhydrous sodium sulphate. Then read in fluorimeter by using filter (Primary violet & secondary blue).

CALCULATION

$$B1\ (\%mg) = \frac{\text{(Std. conc. µg)}}{\text{F. R. of Std.}} \times \frac{\text{F. R. of (a-b)}}{\text{Aliq. Taken}} \times \frac{\text{Vol. made-up}}{\text{Sample taken}} \times \frac{100}{1000}$$

3.6.8 Determination of Riboflavin

Riboflavin was determined by method of Sadashivam and Manickam (1991)

PRINCIPLE

Riboflavin fluorescence at wavelength 440 to 500 nm. the intensity of fluorescence is proportional to the concentration of riboflavin in dilute solutions. The riboflavin is measured in terms of the difference in fluorescence before and after chemical reaction.

REAGENTS

(1) 0.1 n H_2SO_4

(2) Sodium acetate 2.5 M

(3) Potassium permanganate 4%

(4) Hydrogen peroxide 3%

(5) Sodium hydrosulfate [solid]

(6) Riboflavin standard

PROCEDURE

Accurately weigh 2-5 gm sample and add 75ml 0.1 N H_2SO_4 and mix and autoclave at 15 lbs for 30 min. Shake the flask every 5 min. let it cool to room temperature and add 5 ml 2.5 M sodium acetate solution. Mix and let it stand for at least 1 hr. The solution is now at pH 4.5 make up the volume 100 ml with distilled

water. Take 10 ml of sample solution add water 1 ml and 0.5 ml potassium permanganate [4 %] after a time lapse of 2 min., hydrogen peroxide [3 %] is added 0.5 ml, take the reading in fluori meter.

CALCULATION

$$\text{Riboflavin mcg./100g} = \frac{B-C}{A-B} \times \frac{R}{S} \times \frac{V}{V_1} \times 100$$

A= reading of the sample plus riboflavin standard.

B= reading of sample plus water

C= reading after adding sodium hydrosulphite

R= Standard riboflavin added= µg/V1 of sample solution

V= original volume of sample solution= ml

V1= volume of sample solution taken for measurement (10ml)

S= sample weight (g)

3.6.9 Determination of Niacin

Niacin was determined by method of Sadashivam and Manickam (1991).

PRINCIPLE

Niacin reacts with cyanogens bromide to give a pyridine compound, which undergoes rearrangement-yielding derivatives. These derivatives couple with aromatic diamines to give yellow coloured pigment under proper conditions. The intensity of the yellow colour produced is proportional to the amount of niacin present.

REAGENTS

(1) 4N H_2SO_4

(2) 60% basic lead acetate.

(3) Thymol blue indicator

(4)10 N sodium hydroxide

(5) Conc. H_2SO_4

(6) 40% ZnSO4

(7) Potassium cyanogens bromide

(8) 4% aniline

(9) Alcohol

(10) Standard niacin

PROCEDURE

Grind the sample (5g) in 4N H_2SO_4 (30 ml) and steam it for 30 min Cool and make up the volume to 50 ml with distilled water. Filter through Whatman filter paper No. 1. Add 60% basic lead acetate to the filtrate. Adjust the pH to 0.5 with a thymol blue indicator. After this centrifuge the sample with 10 N NaOH. To the supernatant add 2 ml conc. H_2SO_4 and allow it to stand for 1 hour, centrifuge collect the supernatant add 5 ml 40 % $ZnSO_4$ and adjust pH to 8.4 with 10 N NaOH. Centrifuge and collect the supernatant of the source material. Take 0.1 ml to 0.5 ml of the standard niacin solution. Take different volumes of sample solution. Make up the volume to 6 ml with distilled water add 3 ml of cyanogens bromide, after 10 min add 1 ml of 4% aniline read the yellow colour developed after 5 min at 420 nm.

CALCULATION

Draw a standard graph with the reading of the standard niacin. Find out the niacin content in the sample volume taken and calculate for gm. weight of the sample.

3.6.10 Determination of Calcium

Calcium was determined by the titrimetric method of AOAC 1970

PROCEDURE

Prepare an ash of the food as described previously; make up the volume to 10 ml with glass distilled water. Two and four ml of ash solution was taken in

centrifuge tubes 3-4 drops of bromocresol green indicator was added and pH was adjusted to 4.8 to 5.0 blue colour with a saturated solution of sodium acetate. The calcium was precipitated as calcium oxalate by the addition of 4% oxalic acid till the solution changed to a yellow shade. Heat at 70^{o}C on sand bath for 45 minutes & allow it to settle overnight. The tubes were centrifuged and the supernatant drained out and the precipitates were washed with 3 ml of 2% ammonia solution to remove the excess oxalic acid. Add to the tube 3 ml of 1 N H_2SO_4 and keep it at 60^{o} to 80^{o}C for 5 minutes and titrate against 0.01 N $KMnO_4$ until a slight pink colour appears which persists for 30 seconds. For blank 3 ml of NH_2SO_4 was taken and heated in a water bath at 60^{o} – 80^{o}C for 3-4 min and titrated against 0.01 N $KMnO_4$ until a slight pink colour appears which persists for 30 seconds.

CALCULATION

$$[\text{Calcium mg \%}] = \frac{\text{Titration reading S-B}}{\text{A liqout taken [ml]}} \times \frac{\text{N of } KMNO_4}{\text{0.01 N}} \times \frac{0.2}{\text{1 ml}} \times \frac{\text{Volume made-up}}{\text{Sample wt (g)}} \times 100$$

3.6.11 Determination of Iron

Iron was determined by method of Sadashivm and Manickam (1991)

REAGENTS

(1) Ferric acid

(2) Potassium thiocynate -20%

(3) Hydrochloric acid – 2N

PROCECURE

Ferric ammonium sulfate 2 to 10 ml in flask. Add 1 ml 2N HCl and 5 ml of 20% KCNs make up volume 100 ml with distilled water and after 10 min. measure optical density at 480 nm in colorimeter.

STANDARD CURVE FOR IRON

Construction of standard curve. 2.6 /2.8 gm ferric ammonium sulfate was dissolved in 1 lit. Distilled water, few drops of conc. H_2SO_4 was added to the solution to make it colorless / transparent Concentration of iron in this solution was 0.3 mg per ml. To make the working standard 10 ml of stock solution was taken and diluted to 100 ml.

2 ml, 4 ml, 6 ml, 8 ml and 10 ml of working standard was taken in volumetric flasks 5 ml potassium thiocyanate and 1 ml HCl was added. Volume was made 100 ml Content of the flasks was mixed well. The red colour was read at 480 nm.

CALCULATION

A graph was plotted of concentration on X axis versus optical density on Y axis. From that concentration of Iron (mg) was obtained.

3.6.12 Determination of Sodium and Potassium

Sodium & Potassium was determined by method of Sadashivm and Manickam (1991).

PROCEDURE

Take 10 mg of ash sample in a 250 ml conical flask and acidify it with nitric acid, evaporate it to dryness on a water bath. Add further 25 ml of concentrated HNO_3 and heat to near boiling until the acid is evaporated to a small volume. The presence of brown fumes indicates the unoxidized organic matter. Add some more

conc.HNO_3 and small quantities of H_2SO_4 for complete ashing of organic matter. Final residue is colorless dissolve this residue in small amount of HCl and warm distilled water filter the contents neutralize it with con. NH_4OH and diluted it to suitable volume.

SODIUM: 0.634 gm of dry A R grade NaCl
Should be accurately weighed dissolved in pure distilled water and washed into a 500 ml volumetric flask.

POTASSIUM: 477 gm of dry A R grade KCl should be accurately weighed dissolved in pure distilled water and washed in to a 500 ml volumetric flask.

Take an ashing-colourised sample in flask and make up volume 100ml with distilled water. Take standard NaCl take 2 to 20 ml and make a volume 100ml with distilled water. There after take the readings using flame photometer.

CALCULATION

K & Na 1000 ppm = 1 mg in 100 gm food.

3.6.13 Measurement of pH

Finely minced sample were used to determine. The pH after homogenizing 10 gm of the sample with 50 ml distilled water using laboratory pH meter. pH of the samples was recorded using reference and glass electrode portable type digital pH meter.

3.7 METHODS OF MICROBIAL ANALYSIS OF FOOD

3.7.1 Selection of media

Selection of medium was carried out keeping in mind the various types of microorganisms that may be present in the food samples.

Two different media were selected:

(1) The Nutrient Agar medium: This is the media used for the general cultivation and isolation of microorganisms. It supports growth of majority of common microorganisms found in nature. This medium is routinely used in microbiological laboratories for general cultivation & isolation of bacteria.

(2) The MacConkey's agar medium: This medium is a selective and a differential medium. It was used for cultivation and isolation of specific group of organisms' namely enteric group. As chances of microorganisms belonging to this group being present in food samples were high. These organisms are generally present in water and may enter food via use of improper or non-potable water used during the various stages of preparation of food.

This medium is selective for such enteric (gram negative) bacteria as it inhibits the gram positive bacteria. Further gram-negative bacteria are differentiated into lactose fermented and lactose non-fermented group on this medium.

To get well-isolated and countable colonies, as we are carrying out quantitative analysis, serially diluted samples were inoculated on these medias.

3.7.2 Preparation of media

Table No. 15

Nutrient Agar

1. Nutrient Agar	Peptone	1 gm
All the ingredients were dissolved in distilled water except agar powder and then pH was adjusted to 7.6. Thereafter agar powder was added and it was autoclaved at 15 lbs pressure for 15 min.	Meat Extract	0.3 gm
	NaCl	0.5 gm
	Distilled water	100 ml
	pH	7.6
	Agar	3 gm

Table No. 16

MacConkey's Agar

2. MacConkey's Agar:	Peptone	2.0 gm
All the ingredients were dissolved in distilled water except agar and then pH was adjusted to 7.6. Thereafter agar was added and was sterilized by autoclaving at 15 lbs pressure for 15 min. After sterilization 1 ml of 1% Neutral red solution (indicator dye) was added before pouring the plates	NaCl	0.5 gm
	Bile Salt	0.5 gm
	Lactose	1.0 gm
	Distilled water	100 ml
	pH	7.6
	Agar	3 gm

Both the above media after autoclaving were poured into previously sterilized petri dishes, aseptically. The plates were allowed to cool and solidify (Salle, 1992).

3.7.3 Inoculation of Media by Samples

The Nutrient agar and MacConkey's agar plate were inoculated with selected dilution, which were prepared by the serial dilutions of selected samples. A quantitative estimation was to done, known volume of diluted samples say 0.1 ml was plated on agar plates in strict aseptic conditions.

0.1 ml of selected sample, with help of a sterile pipette was poured on the medium plates and then it was evenly spread with help of sterile glass spreader in strict aseptic conditions. So as to prevent any chances of contamination with aerial or other microorganisms during any stages of analysis.

The spreader was used with a light hand and gentle spreading should be done, by periodically rotating the Petri dish at right angles till the sample is completely absorbed into the medium.

Thereafter plates are incubated in inverted position at $37^{o}C$ for 24 hrs.

(1) Quantitative Analysis

Next day the number of visible colonies is counted from each plate and number of organisms (C.F.U.) present in each sample per ml is calculated by using the formula

$$N = \frac{Y}{Vx}$$

N= No. of orgs/ ml.

Y= No. of colonies.

X= dilution

V= aliquots amount of.

This gives us an average, approximate idea of number of organisms present in 1 gm of food sample collected.

(2) Qualitative Analysis

Colony characters of different types of colonies present on Nutrient agar plate were noted down. Gram staining was done from different types of visible colonies present on plate. The result of gram staining gave us rough idea of different morphological types of bacteria, which were present in the collected sample.

There by the researcher got an approximate idea of different types of organisms and number of organisms/ml present in different food samples collected.

On MacConkey's agar the type of colony present is colourless (of lactose non-fermented group) or pink coloured colonies (lactose ferment or group) were

counted and gram staining was also done from selected colonies. It gave us idea regarding the number of enteric organisms present / gm of food sample.

Depending on these results we can ascertain how far food is safe for human consumption.

3.7.4 Standard Plate Count Method

PROCEDURE

Dissolve all the ingredients except agar powder and then adjust the pH to 7.6 add agar powder and heat to dissolve medium completely. Auto clave at 15 lbs pressure for 15 min there after pour agar in previously sterilized Petri dishes. Prepare serial dilution of given sample adding 1 gm in 9 ml distilled water will give 10^1 dilution [1: 10] again add 1 ml from 10^1 tube to 9 ml d/w will give 10^2 [1:100] dilution and so on [10^1 to 10^8]. Inoculate 0.1 ml of suspension from each dilution on N. agar and MacConkey's agar plate spread, strictly in aseptic conditions. Incubate the plates at 37ºC for 24 hrs in incubator in inverted position (Salle A. 1992)

3.7.5 Gram Staining

Gram staining is a differential staining technique, which separates bacteria into two groups depending upon their staining properties. It is the most used bacterial staining process and is very useful in identification of bacteria.

Gram staining method employs two different stains, a mordent and a decolouriser. At the end of staining procedure, cells are divided into two groups. Those cells, which retain the colour of primary dye, are called gram positive and those, which loose the colour of primary dye and take the colour of the counter stain are called gram negative. The gram-positive characteristic results from the ability of a cell to resist the loss of primary stain during decolorization step, as compared to gram-negative cells, which do not possess this ability.

Principle

Gram positive and gram-negative bacteria are stained differently due to differences in their surface chemical structure.

Numerous explanations have been given to explain mechanism of gram reaction.

(1) Gram-negative bacteria contain a higher percentage of lipids than gram-positive bacteria. Gram-negative cell walls are also thinner than gram-positive cells. During staining procedure, alcohol treatment extracts the lipid, which results in increased porosity or permeability of gram-negative cell wall. Thus gention violet – iodine complex is extracted and gram-negative organisms are decolorized. Gram +ve bacteria are dehydrated, permeability is reduced and gention-violet iodine complex is not removed.

(2) Peptidoglycan content is higher in cell wall of gram positive bacteria as compared to gram negative bacteria. So in gram positive bacteria gention-violet iodine complex is trapped in the wall following ethanol (alcohol) treatment. It causes decrease in the diameter of pores in cell wall peptidoglycan. In gram negative bacteria peptidoglycan is also less extensively cross-linked, so pores remain sufficiently large after ethanol treatment, so gention-violet iodine complex extracted.

(3) Lipoidal material extracted from gram positive organisms differs from gram negative organisms as gram positive lipoidal material contains much larger proportion of unsaturated fatty acids, which have greater affinity with oxidizing agents. Mordents are oxidizing agents. They increase affinity of an organism for basic stains (Salle, 1992).

(4) Stearn & Stearn Theory

This theory involves isoelectric point, which is defined as pH at which ionization of an amphoteric compound occurs at maximum rate.

According to Stearn and Stearn Theory its protein content determines staining capacity of a cell. The proteins are amphoteric and thus bacterial cells also exhibit amphoterism. For single bacterial cells, there is an isoelectric range

as there are many proteins in the cell. The isoelectric range of gram positive bacteria is lower than that of gram negative bacteria.

As a rule, the bacterial cells can react with both, acidic and basic dyes. In acidic conditions they react with basic dyes and in alkaline conditions with acidic dyes. There is no reaction at all at the isoelectric pH. At the pH below isoelectric range, the cells behave as alkali and react with acidic dye. At pH above the isoelectric range, the cells behave as acid and react with basic dye.

The isoelectric range of gram positive bacteria is lower than gram negative bacteria, thus more acidic. Thus at reaction pH, they behave as stronger acid than gram negative bacteria. As a result of this, they can bind more firmly than gram negative bacteria. So the decolorizing agent alcohol fails to remove the dye from the cells of gram positive bacteria. In case of gram negative bacteria, however, the binding between stain and cells is less firm and it can be easily removed by alcohol.

(6) The Mordant

Grams iodine is an oxidizing agent, it increases the overall affinity of the organisms for the basic dyes – Gention Violet increases.

Requirements

Clean glass slide, 1% Gention violet, Gram's Iodine, Safranine, alcohol.

PROCEDURE

(1) Take a clean glass slides and prepares a uniform smear from sample of choice.

(2) Allow the smear to air dry & heat fix the smear.

(3) After slide gets cooled, cover the smear with gention violet and allow it to act for 1 min.

(4) Wash off gention violet with water.

(5) Cover the smear with grams iodine and allow it to act for 2-3 mins.

(6) Wash off the iodine with water.

(7) Tilt the slide and drop wise add alcohol over the smear, so that it runs off the edge of the slide after passing over the smear. Continue this until the drop of alcohol picks up no purple colour from the smear. This is the most important step of this technique and it should not be overdone.

(8) Rinse the slide with water, to remove any residual alcohol.

(9) Cover the smear with safranine and allow it to act for 7-10 min.

(10) Wash off the safranine with water, blot dry and examine under oil-immersion lens (Salle, 1992).

Chapter – 4
RESULT & DISCUSSION

4.1 NUTRITIONAL ANALYSIS

In the whole research main emphasis is given on the comparison of nutritive value of home made food sample and vendor food sample. The comparison is also done with respect to the area from where samples were collected as for example,

1. Area – A (Indira Circle IC = A) where majority of the customers, belonged to cream class and middle class of the society.
2. Area – B (Bhaktinagar Circle BTC = B) where customers of vended food generally belongs to middle class family.
3. Area – C (Sant Kabir road SK = C) customers here are from middle class of the society used to come frequently for vended food.
4. Area – D (Race course road RC = D) where customers belongs to all the classes of the society.

That's why these different areas were selected. Food samples were compared for nutritive value, microbial load and hygienic practices. Punjabi and fast foods are of main choice in vended food now a day.

4.1.1 *Pau Bhaji*

Pau bhaji is a palatable recipe most prevalent in Gujarat. A combination of bread and or pau, eaten with vegetable made up of almost all seasonal vegetables available. Good to eat, nice to pocket and there by preferred food by office goers in form of a mini lunch. Thereby its availability in the form of vendors' food is more prevalent.

Pau bhaji consumed on day to day basis, it may lead to deficiency of vitamin its daily requirement is not supplemented from other foods consumed.

Table No. 17

Nutritional Value of *Pau Bhaji* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home Made(HM)
Carbohydrate(gm)	10.00	11.00	8.00	11.00	12.00
Protein (gm)	1.20	1.30	1.20	1.90	6.40
Fat (gm)	16.00	17.00	15.00	17.00	18.00
Fibre (gm)	0.10	0.01	0.09	0.08	0.10
Moisture (%)	60.00	62.00	61.00	60.00	56.00

(1) Carbohydrate

Homemade sample contains more carbohydrates than all other vended food samples. Sample (B) and (D) were found equal and more than sample (A) and (C). Home made Sample contain more amounts of onion, tomato, and potatoes. That is the reason; vended food sample contains more amount of water than homemade sample. Carbohydrate content of HM sample was high.

(2) Protein

Protein content of homemade sample was very high compared to all good than any other samples. Sample (D) had more protein value than (A), (B) and (C). Home made sample was having more protein because of more use of green beans, but vended sample use more water and tomatoes.

(3) Fat

Like other nutrition, fat value of the home made sample was found to be more because it contains high quantity of butter, as compared to other vended food samples. Sample (B) and (D) were found to contain equal and more than sample (A) and (C). All vended samples contain more fat because they use more oil and less amount of butter.

(4) Fibre

Value of fiber in sample (A) and homemade is found to be equal and was more than other vended samples. Sample (B) had less amount of fiber than all food samples. Sample (B) to be more water than other samples.

(5) Moisture

Sample (B) had more moisture than any other food samples. So home made samples contain less moisture than any other samples because of less water and maximum use of vegetables in preparation.

Table No.18

Nutritional Value of *Pau Bhaji* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.005	0.004	0.005	0.002	0.30
Riboflavin (mg)	0.12	0.20	0.20	0.29	0.20
Niacin (mg)	0.80	0.70	0.15	0.80	0.40
Ascorbic acid (mg)	0.05	0.04	0.45	0.40	1.00
Calcium (mg)	25.00	26.00	16.90	18.00	30.00
Iron (mg)	0.12	0.12	0.04	0.03	0.08
Sodium (mg)	14.50	14.00	12.00	13.00	13.00
Potassium (mg)	25.00	26.00	18.00	20.00	26.00

(6) Thiamine

Thiamine value of home made sample is more than any other food samples, because in *pau bhaji*, amount of vegetable are more than any other food samples. In case of vended food samples thiamine concentration of sample (A) and (C) is equal but more than sample (B) and (D).

(7) Riboflavin

Value of riboflavin is more in sample (D). Sample (B) and (C) and home made were found equal and more than sample (A).

(8) Niacin

Niacin concentration is much more in sample (A) and (D) but sample (A) and (D) were found equal. Sample (C) had less amount of niacin than all vended food samples.

(9) Ascorbic acid

Homemade food sample contains more vitamin C than any other food samples. Sample (C) had more vitamin C than all vended food samples. Use of lemon in home made food sample made the sample rich in vitamin C.

(10) Calcium

Homemade food sample contains more calcium concentration as compared to other food samples. Sample (C) had less amount of calcium than other food samples.

(11) Iron

Concentration of iron in sample (A) and (B) was more than any other food sampled but were found equal. Homemade sample had more iron than sample (C) and (D) but less than sample (A) and (B).

(12) Sodium

Level of sodium in all the food samples, as compared to sample (A), was recorded much higher. Sample (B) had more sodium than sample (C) and (D) and home made food.

(13) Potassium

The value of homemade food sample and sample (B) were same and more than other vended samples. Sample (A) had more potassium than sample (C) and (D). Sample (C) had less amount of potassium than other vended and home made sample.

Home made *pau bhaji* is nutritionally rich in protein, fibre, thiamine, and ascorbic acid, calcium, iron and potassium. It contains less amount of sodium compared to the vendor's food.

Table No. 19

(14) STATISTICAL ANALYSIS OF *PAU BHAJI* (AREA ---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.035	S
Protein	.000	S
Fat	.021	S
Thiamin	.017	S
Riboflavin	.000	S
Ascorbic acid	.017	S
Niacin	.008	S
Calcium	.003	S
Iron	.008	S
Sodium	.001	S
Potassium	.000	S
Moisture	.008	S
Fibre	.566	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

Pau bhaji available in vendors place in area contains less amount of fibre, while all other nutrients are significantly varying.

Table No.20

(15) STATISTICAL ANALYSIS OF *PAU BHAJI* (AREA ---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.035	S
Protein	.000	S
Fat	.287	NS
Thiamin	.076	NS
Riboflavin	.028	S
Ascorbic acid	.013	S
Niacin	.021	S
Calcium	.009	S
Iron	.008	S
Sodium	.000	S
Potassium	.000	S
Moisture	.001	S
Fibre	.006	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

Vended *pau bhaji* available from area B contains less amounts of fat and thiamin, while other nutrients are significantly varying amount.

Table No.21

(16) STATISTICAL ANALYSIS OF *PAU BHAJI* (AREA ---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.003	S
Protein	.000	S
Fat	.070	NS
Thiamin	.017	S
Riboflavin	.000	S
Ascorbic acid	.014	S
Niacin	.044	S
Calcium	.000	S
Iron	.021	S
Sodium	.000	S
Potassium	.000	S
Moisture	.021	S
Fibre	.032	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

Pau bhaji available at third area contains fewer amounts of fats, while other nutrients are varying significantly.

Table No.22

(17) STATISTICAL ANALYSIS OF *PAU BHAJI* (AREA ---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.035	S
Protein	.000	S
Fat	.070	NS
Thiamin	.649	NS
Riboflavin	.001	S
Ascorbic acid	.013	S
Niacin	.008	S
Calcium	.000	S
Iron	.008	S
Sodium	.000	S
Potassium	.000	S
Moisture	.021	S
Fibre	.032	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

Vended *pau bhaji* at area D contains fewer amounts of fat and thiamin, while other nutrients are significantly varying.

4.1.2 *Pani Puri*

Panipuri a combination of roasted puris made of flour consumed with mixture of boiled potatoes, black gram dipped in tangy water base made from mint, tamarind with all other spices.

Pani Puri is a preferred vended food as a tit-bit among females and college going teenagers. As vendors generally use less amount of black gram and quality of salts used is not standard. This food is lacking sufficient protein, sodium, potassium and fibre.

Table No. 23
Nutritional Value of *Pani Puri* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate (gm)	6.00	7.00	10.00	4.90	18.00
Protein (gm)	3.80	2.90	1.90	3.15	4.18
Fat (gm)	11.00	10.00	10.00	9.90	5.60
Fibre (gm)	0.20	0.10	0.21	0.19	0.20
Moisture (%)	75.00	76.00	75.00	73.00	70.00

(1) Carbohydrates

The Carbohydrate value of homemade food sample was more than any other vended food samples. Sample (C) had more carbohydrate than sample (A), (B) and (D) but less than homemade sample. Homemade sample use more potato and Bengal gram then other vended sample. So Carbohydrate content was more.

(2) Protein

All vended samples contain less protein and homemade sample contains maximum protein value. Sample (A) protein value found more than any other vended samples but less than home made sample. Sample (D) had protein value more than sample (B) and (C) but less than homemade sample (A). Home made contains more protein as it makes use of more Bengal gram in masala of Panipuri than any other vended food samples.

(3) Fat

Sample (A) contained more fat than any other vended food samples and home made samples, because vendor use more oil in puri and also masala. Homemade sample contains less fat value than other vended food samples. The smoking temperature affects the fat absorption. Fat absorption is greater in the fats with the lowest smoking points.

(4) Fibre

Sample (C) had contained more fiber value than any other vended and home made sample. Homemade sample and sample (A) value were found equal but less than sample (C) and ore than (B) and (D).

(5) Moisture

The moisture content in home made foods was less than vended sample because home made foods require more potatoes, Bengal gram than vended foods sample.

Table No. 24

Nutritional Value of *Pani Puri* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	-	0.01	0.01	0.015	0.020
Riboflavin (mg)	0.20	0.20	0.20	0.20	0.70
Niacin (mg)	0.10	0.17	0.16	0.20	0.80
Ascorbic acid (mg)	0.05	0.50	0.50	-	1.00
Calcium (mg)	20.00	21.00	16.80	15.00	25.00
Iron (mg)	0.08	0.09	0.16	0.16	0.19
Sodium (mg)	16.60	17.00	10.10	19.00	10.10
Potassium (mg)	27.70	27.00	25.00	27.00	28.00

(6) Thiamine

Homemade food sample had very more thiamine than vended food samples. Sample (D) thiamine value was maximum among vended sample. Sample (A) contains almost negligible thiamine.

(7) Riboflavin

Homemade food sample showed presence of substantially more riboflavin than all vended food sample. All vended food samples are found to have equal values of riboflavin.

(8) Niacin

Home made sample contain good amount of Niacin than any other vended food samples. Sample (D) had more Niacin than other vended samples.

(9) Ascorbic acid

Homemade sample contained more vitamin C than all vended samples. Sample (D) contains almost negligible vitamin C. Sample (A), (B) and (C) were found to contain equal value but less than home made sample.

(10) Calcium

All vended sample contains less calcium and homemade sample contains more calcium value. Sample (B) calcium value found only 4.05 less than homemade sample but at the same time, it was maximum compared to other vended food samples.

(11) Iron

Homemade sample contained more Iron than any other vended samples. Sample (C) and (D) had found to have amount of iron equal, more than sample (A) and (B). Sample (B) had more than sample (A).

(12) Sodium

Sample (D) had been found to contain more than all other food samples. Sample (B) had more sodium than sample (C) and (A) and home made sample. Sample (A) had more sodium than sample (C) and home made sample. Sample (C) and home made were found equal but less than all vended food samples.

(13) Potassium

Homemade sample was found to have maximum potassium among are vended food samples. Vento's sample (A), (B) and (D) were found to have equal but more than sample (C) and less than homemade sample. Sample (C) had less potassium than all other food samples.

Macro nutrients available in home made *panipuri* are carbohydrate, protein in large amount as compared to vendor's food, while it contains less amount of fat and moisture as compared to vendors' food.

Home made *panipuri* contains all micro nutrients, some of which are lacking in vendors preparations. It contains less amount of sodium compared to vender's food. While is rich in thiamin, riboflavin, niacin, ascorbic acid and calcium and iron.

Table No. 25

(14) STATISTICAL ANALYSIS OF *PANIPURI* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.190	NS
Fat	.000	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.002	S
Niacin	.000	S
Calcium	.002	S
Iron	.022	S
Sodium	.061	NS
Potassium	.021	S
Moisture	.847	NS
Fibre	.399	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The variation in micro and macro nutrients except protein, sodium, moisture and crude fibre were non significant, where as the rest of the nutrients varied significantly.

Table No. 26

15) STATISTICAL ANALYSIS OF *PANIPURI* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.000	S
Fat	.000	S
Thiamin	.002	S
Riboflavin	.009	S
Ascorbic acid	.007	S
Niacin	.008	S
Calcium	.074	NS
Iron	.003	S
Sodium	.002	S
Potassium	.021	S
Moisture	.022	S
Fibre	.150	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The variation in micro and macro nutrients except calcium and crude fibre were non significant, where as the rest of the nutrients varied significantly.

Table No. 27

(16) STATISTICAL ANALYSIS OF *PANIPURI* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.009	S
Protein	.000	S
Fat	.001	S
Thiamin	.002	S
Riboflavin	.007	S
Ascorbic acid	.009	S
Niacin	.007	S
Calcium	.012	S
Iron	.070	NS
Sodium	.251	NS
Potassium	.021	S
Moisture	.019	S
Fibre	.287	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-C the iron, sodium and fibre contents were at par statistically. However, other values were found to be statistical significantly.

Table No. 28

17) STATISTICAL ANALYSIS OF *PANIPURI* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.068	NS
Fat	.141	NS
Thiamin	.019	S
Riboflavin	.008	S
Ascorbic acid	.002	S
Niacin	.003	S
Calcium	.002	S
Iron	.007	S
Sodium	.960	NS
Potassium	.021	S
Moisture	.355	NS
Fibre	.141	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-C the protein, fat, sodium, moisture and fibre contents, were at par statistically. However, other values were found to be statistical significantly.

4.1.3 *Bhel*

Bhel is again a food prevalent in Gujarat used for tit- bit among children and teenagers. A combination of roasted puris of wheat mixed with masala prepared from mashed potatoes, Bengal gram, onion, sev, salt, papper and rock salt. A novel combination may contain pomegranate also, served with chutney of mint and tamarind.

Table No. 29
Nutritional Value of *Bhel* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate (gm)	18.00	12.50	12.50	15	17.00
Protein (gm)	3.55	3.50	2.62	3.20	4.18
Fat (gm)	6.00	7.50	5.00	7.00	9.80
Fibre (gm)	0.55	0.25	00.35	0.35	0.40
Moisture (%)	65.00	75.90	44.90	60.00	60.00

(1) Carbohydrates

Sample (A) had more carbohydrate than other food sample. Sample (B) and (C) carbohydrate values were found to be equal but less than sample (A) and (D) and home made samples. But homemade sample had less carbohydrate value than sample (A). Carbohydrate values of D were found more than sample (B) and (C) but less than sample (A) and Home made sample. Sample (A) and Home made sample contain more amount of potatoes and puffed rice and onion.

(2) Protein

All vended food samples contain less protein than homemade food samples. Sample (A) had more protein value than other vended food samples. Sample (B) had protein value more than sample (C) and (D) but less than sample (A) and homemade sample. Sample (D) protein value is less than home made sample and sample (A) and (B) but more than sample (C). Sample (C) was found to have less protein value because this sample contains less Bengal gram but home made sample contain more Bengal gram.

(3) Fat

Homemade food sample contains more fat than any other food samples. Sample (B) and (D) had to be more than sample (A) and (C) but sample (B) and (D) were found equal. Home made sample contain more amount of oil in Bengal gram, Sev, Rice puffed all vended food samples contain less amount of sev. Etc.

(4) Fibre

Sample (A) had more fiber value than any other sample. Home made sample had less fiber but more than other food samples. Sample (B) had less than any other vended samples and home made samples.

(5) Moisture

Sample (B) had moisture value more than any other samples and home made sample. Second high values recorded in sample (A) and (C). This sample value was equal but more than home made sample and sample (D). Home made and sample (D) moisture values found are equal but less than all vended food sample. Home made sample value less than other food sample because it had less chatani and more potatoes and Bengal gram.

Table No. 30

Nutritional Value of *Bhel* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.02	0.50	0.05	0.02	0.06
Riboflavin (mg)	0.20	0.40	0.30	0.20	0.70
Niacin (mg)	0.60	0.80	0.60	0.70	0.80
Ascorbic acid (mg)	0.25	0.25	0.50	0.20	1.50
Calcium (mg)	23.00	20.0	25.00	22.00	22.50
Iron (mg)	0.01	0.06	0.02	0.01	0.02
Sodium (mg)	13.00	12.00	14.00	14.00	15.00
Potassium (mg)	9.80	12.00	12.00	10.00	13.00

(6) Thiamine

Home made sample contain maximum thiamine than any other vended samples. Sample (A) and (D) thiamine values were found equal but less than any other food samples.

(7) Riboflavin

Homemade sample contained riboflavin more than vended samples. Sample (B) had more riboflavin than other vended samples. Sample (A) and (D) were found to have equal values but less than sample (B) and (C) and home made sample.

(8) Niacin

Home made food sample and sample (B) had more niacin than other vended samples but equal value were found in sample (B) and home made sample.

(9) Ascorbic acid

Vitamin C value was found to be high in home made sample than all vended samples. Sample (C) had more vitamin C than all other vended samples. Sample (A) and (B) were found to have equal but less value as compared to sample (C) and home made sample. Sample (D) had less vitamin C than any other food samples. Homemade sample had more pomegranate and tomato.

(10) Calcium

Calcium value is more in home made sample and vended sample (C). Sample (A) had calcium value more than sample (B) and (D) but less than sample (C) and home made sample. Sample (D) calcium content is more than sample (B).

(11) Iron

Iron value is more in sample (B) than any other food samples. Home made sample and sample (C) had more iron than sample (A) and (C) but less than sample (B). Sample (A) and (D) were found equal but less than all food samples.

(12) Sodium

Sodium content is more in home made sample than all other vended samples. Sample (C) and (D) were found to have more sodium than any other vended samples but less than home made sample and equal to each other.

(13) Potassium

Home made sample had more potassium than any other vended food samples. Sample (B) and (C) were found to have equal and more potassium than (A) and (C) but less than homemade sample.

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Nutritionally bhel prepared at home is rich in protein, fat and fiber, while contains less moisture as compared to vended food.

Nutritionally home made *Bhel* is rich in thiamine, riboflavin, niacin, ascorbic acid and sodium and potassium.

Table No. 31

(14) STATISTICAL ANALYSIS OF *BHEL* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.070	NS
Protein	.043	S
Fat	.000	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.001	S
Niacin	1.84	NS
Calcium	.407	NS
Iron	.000	S
Sodium	.000	S
Potassium	.032	S
Moisture	4.25	NS
Fibre	.005	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *bhel* sample collected from area A was statistically at par for niacin, calcium, carbohydrate and moisture contents. However, other values were found to be statistical significant.

Table No. 32

(15) STATISTICAL ANALYSIS OF *BHEL* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.045	S
Fat	.000	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	. 001	S
Niacin	.566	NS
Calcium	.120	S
Iron	.000	S
Sodium	.005	S
Potassium	.048	S
Moisture	.842	NS
Fibre	.000	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area B the niacin and moisture content, were at par statistically insignificantly. However, other values were found to be statistical significantly.

Table No. 33

(16) STATISTICAL ANALYSIS OF *BHEL* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.043	S
Fat	.000	S
Thiamin	.000	S
Riboflavin	.002	S
Ascorbic acid	.002	S
Niacin	.000	S
Calcium	.001	S
Iron	.267	NS
Sodium	.059	NS
Potassium	.048	S
Moisture	.000	S
Fibre	.062	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *bhel* sample collected from area C is statistically at par for iron, sodium and fiber contents. However, other values were found to be statistical significantly.

Table No. 34

(17) STATISTICAL ANALYSIS OF *BHEL* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.006	S
Protein	.028	S
Fat	.003	S
Thiamin	.000	S
Riboflavin	.002	S
Ascorbic acid	.000	S
Niacin	.001	S
Calcium	.305	NS
Iron	.129	NS
Sodium	.059	NS
Potassium	.000	S
Moisture	.258	NS
Fibre	.062	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *bhel* sample collected from area D were statistically at par for calcium, iron, sodium, moisture and fibre contents. However, other values were found to be differing significantly.

4.1.4 *Pizza*

In today is world of globalization we can see globalization in food habits also. Fast junk food is preferred by children*. Pizza* is one such food available in different type's .As a general pattern it composed of a *pizza* base made from fermented batter of Maida and wheat flour, served with different toppings of vegetables, pasta, and macaroni with cheese.

Table No. 35

Nutritional Value of *Pizza* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate (gm)	16.00	16.00	17.00	15.00	19.00
Protein (gm)	2.80	2.80	2.70	2.60	2.90
Fat (gm)	12.00	12.80	10.30	13.00	5.60
Fibre (gm)	0.01	0.01	0.01	0.009	0.01
Moisture (%)	58.00	56.00	60.00	61.00	55.00

(1) Carbohydrates

Homemade food sample had more carbohydrates than other food sample. Sample (A) and (B) carbohydrates values were found equal and less than home made sample, but were more than other vended food samples. Homemade sample contain more amount of potatoes and cheese but vended sample contain more cabbage.

(2) Protein

Like carbohydrates, all vended food samples contain less protein than homemade food samples. Sample (A) and (B) contain same amount of protein and more than other vended food. Homemade sample had more cheese than other food so, it had more protein.

(3) Fat

Sample (D) fat value is more than any other sample. Sample (B) has less fat but is more than other food samples. Sample (C) contained less fat than all the vended food samples but was more than home made food samples. In all vended samples, pizza is baked with good amount of butter so, the fat content was more.

(4) Fibre

Home made sample, sample (A), (B), (C) had equal fiber values. Sample (D) had only 0.001 gm less fiber than other samples.

(5) Moisture

Sample (D) moisture value found more than any other sample and second high value recorded in sample (C). Home made and sample (B) had less moisture value. Moisture content of homemade sample was least in all food samples as more potatoes & cheese were used.

Table No. 36

Nutritional Value of *Pizza* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.010	0.010	0.009	0.012	0.010
Riboflavin (mg)	0.20	0.30	0.20	0.02	0.40
Niacin (mg)	0.40	0.40	0.30	0.50	0.80
Ascorbic acid (mg)	0.35	0.30	0.41	0.30	1.00
Calcium (mg)	30.00	30.00	29.00	28.00	31.00
Iron (mg)	0.32	0.33	0.31	0.29	0.40
Sodium (mg)	12.00	31.00	10.10	12.00	20.00
Potassium (mg)	22.00	23.00	25.00	24.00	20.00

(6) Thiamine

Sample (D) contains maximum thiamine. But sample (A) and (B) and homemade sample contained same thiamine which is found to be less than sample (D).

(7) Riboflavin

Homemade sample contained riboflavin more than all vended samples. Sample (B) had more Riboflavin than other vended sample. Sample (A), (C) and (D) had same value but were less than sample (B).

(8) Niacin

The value of niacin in homemade sample was found to be maximum. Among vended samples, sample (D) had more niacin. Sample (A), (B) had less niacin than sample (D) but more than sample (C).

(9) Vitamin C

Vitamin C value is more in home made sample than all vended samples. Sample (C) had more vitamin C than all other vended food, but sample (A) had fewer vitamins C, sample (B) and (D) vitamin C values were less than all vended foods.

(10) Calcium

Vended sample had less calcium than homemade sample indicating calcium richness of homemade sample. Sample (A) and (B) had equal calcium value but less than home made sample. Sample (C) had less calcium than sample (A) and (B) but more than sample (D). So sample (D) had least amount of calcium.

(11) Iron

Homemade sample had more iron than all the vended food samples. Sample (B) had more iron than any other vended food.

(12) Sodium

Homemade sample had more sodium than all vended food samples. Sample (B) had more sodium than all other the vended food samples. Sample (A) and (D) had less sodium than sample (B) but more than that of the (C) sample. Sample (C) had less amount of sodium than all vended food.

(13) Potassium

Sample (C) had more potassium than all vended food samples. Sample (D) had less than sample (C) but found to be more than other samples.

Home made *Pizza* contained more carbohydrate and protein, while had less amount of fat and moisture as compared to vendors' food. Nutritionally home made *Pizza* is rich in riboflavin, niacin, ascorbic acid, calcium and iron.

Table No. 37

(14) STATISTICAL ANALYSIS OF *PIZZA* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.021	S
Protein	.070	NS
Fat	.005	S
Thiamin	1.00	NS
Riboflavin	.000	S
Ascorbic acid	.002	S
Niacin	.000	S
Calcium	.070	NS
Iron	.000	S
Sodium	.002	S
Potassium	.649	NS
Moisture	.070	NS
Fibre	1.00	NS

NS= Not Significant=T-value>0.05, S=Significant=T-value <0.05

The *Pizza* sample collected from area A is statically at par for that protein, thiamin, calcium, potassium, moisture, and fibre content. However, other values were found to be differing significantly.

Table No. 38

(15) STATISTICAL ANALYSIS OF *PIZZA (*AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.021	S
Protein	.070	NS
Fat	.005	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.002	S
Niacin	1.00	NS
Calcium	.070	NS
Iron	.000	S
Sodium	.000	S
Potassium	.070	NS
Moisture	.070	NS
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to contain almost same level of protein, niacin, calcium, potassium, moisture and fiber as the variation found was statistically non-distinguishable. However, other values were found to vary significantly.

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Table No. 39

(16) STATISTICAL ANALYSIS OF *PIZZA* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.281	NS
Protein	.021	S
Fat	.001	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.008	S
Niacin	.000	S
Calcium	.013	S
Iron	.000	S
Sodium	.000	S
Potassium	.008	S
Moisture	.003	S
Fibre	.190	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Pizza* sample collected from area C were statistically at par for carbohydrate and fiber contents. However, other values were found to be statistical significantly.

Table No. 40

(17) STATISTICAL ANALYSIS OF *PIZZA* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.021	S
Protein	.020	S
Fat	.007	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.002	S
Niacin	.000	S
Calcium	.014	S
Iron	.000	S
Sodium	.000	S
Potassium	.008	S
Moisture	.003	S
Fibre	.190	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Pizza* sample collected from area D the fiber content, were at par statistically. Where as other values were found to be significantly different.

4.1.5 *Burger*

Burger is consists of a combination of *pau* along with *Tikki*, which is prepared from potatoes other green vegetables and is generally deep fried served by placing *Tikka* in between slitted *pau* along with raw tomato, cucumber, cheese sometimes mayonnaise etc. along with salad leaves.

Table No. 41

Nutritional Value of *Burger (*100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	14.00	15.00	14.00	13.00	16.00
Protein (gm)	2.62	2.10	2.20	2.40	2.80
Fat (gm)	2.00	3.10	2.10	3.00	4.60
Fiber (gm)	0.02	0.02	0.02	0.02	0.03
Moisture (%)	55.00	60.00	60.00	59.0	56.0

(1) Carbohydrates

Home made sample had more carbohydrate than vended food samples and moisture content found to be less because more amount potato used in cutlet. Sample (B) had more carbohydrates than other vended food but less than homemade samples.

(2) Protein

Homemade food sample had more than the entire vended sample. Sample (A) had more protein than any other vended sample. Sample (D) had less protein than sample (A) and more than other vended food. Sample (B) had less protein among all the vended food. So simple (C) had less amount of protein than all food samples. Sample (D) had more moisture than sample (A) .

(3) Fat

Fat content of home made sample is found to be more as compared to vended food, because in burger, cheese & butter was used more than vended food. Among vended food samples, sample (B) had more fat. Sample (A) had least fat content as sample (A) had less cheese & butter.

(4) Fibre

Homemade sample value of fiber was found to be more than all the vended food samples but all vended samples had almost equal amount of fiber content.

(5) Moisture

Sample (B) and (C) had more moisture than other food samples. But sample (D) had less moisture than sample (B) and (C) and more than sample

(A). Homemade food sample had less moisture than sample (B), (C) and (D) and more than sample (A).

Table No. 42

Nutritional Value of *Burger* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	**B**	**C**	**D**	**HM**
Thiamine (mg)	0.005	0.004	0.004	0.005	0.015
Riboflavin (mg)	0.25	0.23	0.2	0.20	0.06
Niacin (mg)	0.30	0.40	0.4	0.30	0.80
Ascorbic acid (mg)	0.52	0.56	0.40	0.50	0.75
Calcium (mg)	26.00	25.00	23.00	27.00	28.00
Iron (mg)	0.20	0.10	0.20	0.23	0.30
Sodium (mg)	12.00	13.00	12.00	15.00	17.00
Potassium (mg)	20.00	21.00	22.00	22.0	25.0

(6) Thiamine

Homemade sample had more thiamine than all vended samples. But sample (A) and (D) values were found to be equal but less than home made sample. Sample (B) and (C) had same thiamine value but less than all the food samples.

(7) Riboflavin

Riboflavin value of homemade sample was maximum among all the samples. Sample (A) had more riboflavin than other vended food samples. Sample (B) had less than sample (A) and more than sample (C) and (D).

(8) Niacin

Homemade sample had more niacin than all other food samples. Sample (B) and (C) had same amount of niacin which is more than sample (A) and (D) and is found to be less than home made samples.

(9) Vitamin C

Vitamin C value of home made food is found to be more than other food samples because it was prepared with good quantity of tomatoes, capsicum and green chattani. Sample (B) had more Vitamin C than other vended food samples but less than home made sample.

(10) Calcium

Homemade sample had good amount of calcium than any other food samples. Sample (D) had more calcium than all other vended food. Sample

(A) had less calcium than sample (D). Sample (B) contains less amount of calcium than sample (D) but more than sample (C).

(11) Iron

Homemade sample had more iron than other samples. Sample (D) had more iron than other vended food samples.

(12) Sodium

Homemade sample had more sodium value than vended foods. Sample (D) had more sodium value than other vended food. Sample (B) had less sodium than sample (D) but more than other vended food. Sample (A) and (C) had same amount of sodium, which is found to be less among all the food samples.

(13) Potassium

Homemade sample had more potassium than vended sample. Sample (C) and (D) had same potassium value which is more than other vended food samples. Sample (B) had more potassium than sample (A) and less than sample (C) and (D). Sample (A) had least potassium among all vended food samples.

Home made *burger* contains more amounts of carbohydrate, protein, fat and fibre. Less amount of moisture compared to vendors food.

Home made food is rich in thiamin, niacin, ascorbic acid and calcium, iron, sodium and potassium and it contains less amount of riboflavin compared to vendor food.

Table No. 43

(14) STATISTICAL ANALYSIS OF *BURGER* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.013	S
Protein	.068	NS
Fat	.007	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.000	S
Niacin	.655	NS
Calcium	.021	S
Iron	.002	S
Sodium	.003	S
Potassium	.010	S
Moisture	.287	NS
Fibre	.079	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under his group were found to contain almost same level of protein, niacin, moisture and fiber as the variation found was statistically non significant. However, other values were found to vary significantly.

Table No. 44

(15) STATISTICAL ANALYSIS OF *BURGER (*AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.082	NS
Protein	.003	S
Fat	.000	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.000	S
Niacin	.553	NS
Calcium	.013	S
Iron	.000	S
Sodium	.003	S
Potassium	.012	S
Moisture	.008	S
Fibre	.079	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The variation in micro and macro nutrients except carbohydrate, niacin and crude fibre were non significant, where as the rest of the nutrients varied significantly.

Table No. 45

(16) STATISTICAL ANALYSIS OF *BURGER* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.013	S
Protein	.002	S
Fat	.007	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic	.000	S
Niacin	.553	NS
Calcium	.014	S
Iron	.002	S
Sodium	.003	S
Potassium	.010	S
Moisture	.008	S
Fibre	.079	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under his group were found to contain almost same level of niacin and fiber as the variation found was statistically non significant. However, other values were found to vary significantly.

Table No. 46

(17) STATISTICAL ANALYSIS OF *BURGER* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.006	S
Protein	.052	NS
Fat	.000	S
Thiamin	.000	S
Riboflavin	.000	S
Ascorbic acid	.000	S
Niacin	.655	NS
Calcium	.000	S
Iron	.002	S
Sodium	.002	S
Potassium	.010	S
Moisture	.007	S
Fibre	.079	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under his group were found to contain almost same level of protein, niacin and fiber as the variation found was statistically non significant. However, other values were found to vary significantly.

4.1.6 *Kacchi Dabeli Bread*

Kacchi Bread an Indian version of *Burger* consists of *pau* with in slitted from between. In between the two slits is filled with a mixture prepared from boiled potato, tomato, peanuts, pomegranate and other spices, served along with mint, tamarind and garlic chutney and topped with sev

Table No. 47

Nutritional Value of *Kacchi Bread* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	HM
Cabohydrate (gm)	15.00	12.00	13.00	11.00	17.00
Protein (gm)	4.00	4.00	2.90	2.60	3.15
Fat (gm)	10.00	9.00	10.10	8.50	5.50
Fibre (gm)	0.02	0.02	0.02	0.03	0.04
Moisture (%)	55.00	54.00	60.00	64.00	61.00

(1) Carbohydrates

Homemade sample has more carbohydrate than other vended food. Sample (A) has more carbohydrate than all the vended food samples. Homemade sample had maximum carbohydrate because it had good amount of onion, potatoes. In vended food samples, filling of bread was in fewer amounts and that is why amount of potatoes & onion were less.

(2) Protein

Sample (A) and (B) had same protein content and more than vended food and home made food sample. Home made had less protein than sample (A) and (B) but more than other vended food. Value of protein is more because of use of groundnuts. Sample (A) and (B) had more groundnuts, Bengal gram dal.

(3) Fat

Sample (C) had more fat than vended food and home made food sample. Home made sample less fat than all vended sample. In vended food, oil was used in good amount and fried groundnuts were used.

(4) Fibre

Home made sample has more fiber value than vended samples but sample (D) had more fiber than vended sample. Nutritive value of sample (A), (B) and (C) are equal but percentage value of sample (C) was recorded more because it contains more moisture.

(5) Moisture

Sample (D) moisture content was more than all other food samples. Sample (C) had less moisture than sample (D). Sample (A) has less moisture than sample (C) and (D) and more than other samples. Sample (B) had more

moisture than home made sample and less than other vended sample. Homemade food had less moisture content than all the other food samples.

Table No. 48

Nutritional Value of *Kacchi Bread* (100gm) for Micro Nutrient

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.015	0.012	0.02	0.02	0.10
Riboflavin (mg)	0.20	0.20	0.30	0.20	0.80
Niacin (mg)	0.40	0.40	0.17	0.36	0.36
Ascorbic acid (mg)	0.75	0.60	0.40	0.60	0.90
Calcium (mg)	15.00	14.00	10.00	10.00	16.00
Iron (mg)	0.10	0.10	0.20	0.20	0.21
Sodium (mg)	14.80	13.00	12.50	12.60	12.50
Potassium (mg)	26.00	26.00	28.00	26.00	28.00

(6) Thiamine

Homemade sample had more thiamine than vended food. Sample (C) and (D) values were equal and more than other vended food material.

(7) Riboflavin

Homemade sample riboflavin value is found to be more than other vended food samples.

(8) Niacin

Sample (A) and (B) had same value and more than other samples. But niacin value of sample (D) and homemade found to be equal and more than sample (C).

(9) Vitamin C

Homemade sample had more vitamin C than other food samples. Sample (A) had less vitamin C than homemade samples.

(10) Calcium

Homemade sample had more calcium. Sample (A) had more calcium than any other vended food samples. Sample (B) had more calcium than sample (C) and (D) but less than other samples.

(11) Iron

Homemade sample had more value of iron than other food sample. Sample (C) and (D) had same iron value and sample (A) and (B) had same value of calcium, but less than other sample.

(12) Sodium

Sample (A) had more sodium than other food samples. Sample (B) had more value of sodium than sample (C) and (D) and home made sample. Sample (D) had more sodium than sample (C) and homemade sample. Sample (C) and homemade sample had same value of sodium but less than other sample.

(13) Potassium

Sample (C) and homemade sample were found to have equal amount of potassium, which is, and more than other food samples. Sample (A), (B) and (D) had same value of potassium but less than sample (C) and homemade sample.

Home made *kacchi bread* is nutritionally rich and it contains more amounts of carbohydrate, protein and fibre and less amount of fat compared to vendor food.

Home made food is rich in thiamine riboflavin, ascorbic acid, calcium, iron and potassium and less amount of sodium compared to vendors' food.

Table No. 49

(14) STATISTICAL ANALYSIS OF *KACCHI BREAD* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.033	S
Protein	.661	NS
Fat	.000	S
Thiamin	.478	NS
Riboflavin	.000	S
Ascorbic	.000	S
Niacin	.044	S
Calcium	.074	NS
Iron	.289	NS
Sodium	.145	NS
Potassium	.021	S
Moisture	.020	S
Fibre	.036	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area A the protein, thiamin, calcium, iron, sodium content were at par statistically. However, other values were found significantly different.

Table No. 50

(15) STATISTICAL ANALYSIS OF *KACCHI BREAD* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.003	S
Protein	.661	NS
Fat	.013	S
Thiamin	.348	NS
Riboflavin	.000	S
Ascorbic acid	.066	NS
Niacin	.044	S
Calcium	.015	S
Iron	.289	NS
Sodium	.054	NS
Potassium	.021	S
Moisture	.023	S
Fibre	.036	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Kacchi Babeli bread* sample collected from area B were statistically at par for that protein, thiamin, ascorbic acid, iron and sodium contents. However, other values were found to be differing significantly.

Table No. 51

(16) STATISTICAL ANALYSIS OF *KACCHI BREAD* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate(gm)	.008	S
Protein	.174	NS
Fat	.000	S
Thiamin	.878	NS
Riboflavin	.000	S
Ascorbic acid	.018	S
Niacin	.000	S
Calcium	.005	S
Iron	.287	NS
Sodium	.889	NS
Potassium	.022	S
Moisture	.185	NS
Fibre	.036	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under his group were found to contents almost same level of protein, thiamin, iron, sodium, and moisture as the variation found was statistically non significant. However, other values were found to vary significantly.

Table No. 52

(17) STATISTICAL ANALYSIS OF *KACCHI BREAD* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate(gm)	.001	S
Protein	.038	S
Fat	.002	S
Thiamin	.878	NS
Riboflavin	.000	S
Ascorbic acid	.066	NS
Niacin	.055	NS
Calcium	.005	S
Iron	.267	NS
Sodium	.783	NS
Potassium	.021	S
Moisture	.019	S
Fibre	.051	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under his group were found to contain almost same level of thiamin, ascorbic acid, niacin, iron, sodium and fiber as the variation found was statistically non significant. However, other values were found to vary significantly.

4.1.7 Chinese Rice

A prevalent Chinese food served on almost all road side lorries consisting of rice along with seasonal vegetables carrot, beans fried and tossed together in Chinese rice. Here rice is parboiled generally hours before serving and fried along with vegetables at the time of serving. As storage during in between period may not be up to mark and may serve as breeding ground of or microorganisms.

Table No. 53

Nutritional Value of *Chinese Rice* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	13.00	11.00	12.00	10.00	20.00
Protein (gm)	1.60	1.30	1.20	1.30	1.90
Fat (gm)	3.0	2.20	3.00	2.90	3.00
Fibre (gm)	0.01	0.011	0.012	0.01	0.01
Moisture (%)	65.00	66.00	68.00	69.00	65.00

(1) Carbohydrates

Homemade sample contains more carbohydrates than any other food samples because of use of good quality of rice. Sample (A) had more carbohydrates than other vended sample. Sample (C) contains slightly less carbohydrates. Vended samples contain more cabbage than rice and thus decrease carbohydrates amount. Sample (B) and (C) contain least amount of carbohydrates.

(1) Proteins

All vended sample contains less protein and homemade sample contains maximum protein value. Sample (A) protein value found only 0.3 less than home made sample, but at the same time, it was maximum amongst all other vended food sample. Value of sample (B), (C) and (D) varies but the differences found to be negligible.

(2) Fat

Sample (A), (C) and homemade sample contains maximum fat value but sample (D) contains only 0.1 gm less fat value. Sample (B) contains very less amount of fat than any other samples. These values depend on oil used in rice and invisible fat.

(3) Fibre

All food samples contain almost same amount of fibers because of use of vegetables. But sample (B) and (C) contain little more fiber than other sample. Home made sample (A), (D) contains almost equal amount of fibers.

(5) Moisture

Sample (D) contains more moisture than any other food sample. Sample (A) and home made food contain same amount of moisture. Sample

(C) has only 1% less moisture than sample (D). So, carbohydrate value was less, as the moisture level found is high. Carbohydrates value of homemade sample was high as it has less moisture value.

Table No. 54

Nutritional Value of *Chinese Rice* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.001	0.002	0.005	0.001	0.10
Riboflavin (mg)	0.20	0.30	0.20	0.20	0.30
Niacin (mg)	0.24	0.21	0.20	0.21	0.12
Ascorbic acid (mg)	0.01	0.01	-	-	0.1
Calcium (mg)	15.00	16.00	14.00	16.00	18.0
Iron (mg)	0.16	0.13	0.12	0.14	0.19
Sodium (mg)	21.00	22.00	20.00	19.50	23.00
Potassium (mg)	11.10	10.10	10.10	10.00	11.0

(6) Thiamine

Homemade sample thiamine value found is more than any other vended food. Vended food samples contained more or less thiamine value. Sample (C) contained more thiamine than other vended food. Homemade sample contains more thiamine as it makes use of more rice than any other food samples.

(7) Riboflavin

Riboflavin value of home made sample and (B) sample was same and maximum among all the food samples. Sample (A), (C) and (D) were found to have equal amount of riboflavin.

(8) Niacin

Niacin value of sample (A) was maximum but sample (B), (C) and (D) contained relatively less amount of niacin than sample (A). Homemade sample contained very less amount of niacin.

(9) Vitamin C

Homemade sample contained more vitamin C than any other vended food sample. Sample (A) and (B) contained same vitamin C values. Homemade sample contained good amount of vitamin C as it was prepared by adding lemon juice.

(10) Calcium

Homemade sample contained maximum calcium than other food samples. Sample (B) and (D) contain same amount of calcium but it was more than sample (A) and (C). Sample (A) had less amount of calcium.

(11) Iron

Home made sample contain good amount of iron than vended food samples. Sample (A) contains more iron than any other vended food sample. Sample (B) and (D) contain more iron than sample (C).

(12) Sodium

Homemade sample contained more sodium than other food sample. Sample (B) sodium value was more than any other vended food sample. Sample (A) had more value than sample (C) and (D). Sample (C) had more sodium than sample (D). So sample (D) had less sodium than other food samples.

(13) Potassium

Potassium value of sample (A) and homemade was found to be same but other vended food sample contains less potassium. All other vended food contained almost equal amount of potassium.

Nutritionally home made *Chinese rice is* rich in carbohydrate, protein and fat and less amount of Moisture as compared is vendor food.

Home made *Chinese rice* is rich in thiamin, riboflavin, ascorbic acid, calcium, iron and sodium as compared to vended food, while ascorbic acid is completely absent in vended food from two different places.

Table No. 55

(14) STATISTICAL ANALYSIS OF *CHINESE RICE* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.001	S
Protein	.021	S
Fat	1.00	NS
Thiamin	.007	S
Riboflavin	.287	NS
Ascorbic acid	.006	S
Niacin	.000	S
Calcium	.021	S
Iron	.070	NS
Sodium	.070	NS
Potassium	.830	NS
Moisture	1.00	NS
Fibre	.989	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to contents almost same level of fat, riboflavin, iron sodium, potassium, moisture, fibre as the variation found was statistically non significant. However, other was found to vary significantly.

Table No. 56

(15) STATISTICAL ANALYSIS OF *CHINESE RICE* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.002	S
Protein	.001	S
Fat	.287	NS
Thiamin	.007	S
Riboflavin	1.00	NS
Ascorbic acid	.006	S
Niacin	.000	S
Calcium	.287	NS
Iron	.001	S
Sodium	.070	NS
Potassium	.830	NS
Moisture	.287	NS
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to contain almost same level of fat, riboflavin, calcium, sodium, potassium, moisture, fibre as the variation found was statistically non significant. However other values were found to vary significantly.

Table No. 57

(16) STATISTICAL ANALYSIS OF *CHINESE RICE* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.001	S
Fat	1.00	NS
Thiamin	.007	S
Riboflavin	.287	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.021	S
Iron	.001	S
Sodium	.070	NS
Potassium	.830	NS
Moisture	.070	NS
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to contain almost same level of fat, riboflavin, sodium, potassium, moisture, fibre as the variation found was statistically non significant. However, other was found to vary significantly.

Table No. 58

(17) STATISTICAL ANALYSIS OF *CHINESE RICE* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.002	S
Protein	.001	S
Fat	.287	NS
Thiamin	.007	S
Riboflavin	.287	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.287	NS
Iron	.003	S
Sodium	.007	S
Potassium	.830	NS
Moisture	.070	NS
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to contain almost same level of fat, riboflavin, calcium, potassium, moisture, fibre as the variation found was statistically non significant. However, other was found to vary significantly.

4.1.8 Chinese Bhel

Chinese rice, here noodles replace rice, noodles are also boiled and kept, long before, just for easier serving. At the time of serving it is leased with parboiled vegetables in soya sauce and other Chinese ingredients. This gives it a tangy taste and thereby making it popular among young customers.

Table No. 59

Nutritional Value of *Chinese Bhel* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	8.00	16.00	13.00	12.00	20.00
Protein (gm)	1.90	2.20	3.50	3.00	3.20
Fat (gm)	2.00	2.23	2.90	2.50	6.80
Fibre (gm)	0.009	0.008	0.007	0.008	0.01
Moisture (%)	65.00	65.00	65.00	65.30	64.00

(1) Carbohydrates

Carbohydrates value of homemade sample was found to be more. Among all vended samples, sample (A) contains less carbohydrate. Sample (B) had more carbohydrates than other vended food and sample (B) and (C) carbohydrates values were almost same. In homemade sample, noodles were used in more proportion. Sample (A) contains least amount of carbohydrates.

(2) Protein

Sample (C) contains maximum protein but home made contain only 0.3 gm less than sample (C). Sample (D) has 0.2 gm less than homemade sample. Sample (A) contains least amount of protein. Sample (B) had more protein than sample (A).

(3) Fat

Homemade sample had more fat than other food samples. All vended samples had ⅓rd less value than homemade food sample. All vended samples fat value ranging from 2.0 to 2.9 gm Chinese bhel of home made contains good amount of cheese and vended sample lack this ingredient because of its quit expensiveness.

(4) Fibre

Homemade sample contained more fiber than any other food samples. All vended food samples contained almost same amount of fiber. But sample (C) contain 0.001 gm less fiber than other sample. Home made sample make use of cabbage and phanasi and so fiber concentration was more.

(4) Moisture

Sample (C) contains maximum value of moisture. All food samples have 0.3% less moisture than sample (C). Sample (A), (B) and (C) had same moisture content but it is 1% more than homemade sample.

Table No. 60

Nutritional Value of *Chinese Bhel* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	-	0.001	0.005	0.001	0.10
Riboflavin (mg)	0.02	0.20	0.20	0.20	0.30
Niacin (mg)	0.40	0.30	0.32	0.40	0.12
Ascorbic acid (mg)	0.12	0.10	-	-	0.10
Calcium (mg)	15.00	15.00	16.00	14.00	40.00
Iron (mg)	0.16	0.10	0.12	0.10	0.19
Sodium (mg)	21.00	21.00	19.5	21.00	20.00
Potassium (mg)	14.20	14.00	14.00	14.90	17.00

(6) Thiamine

Homemade sample contained maximum thiamine value but sample (A) had no thiamine. Sample (B) and (D) thiamine value is almost equal but sample (C) thiamine value is found more than sample (B) and (D).

(7) Riboflavin

Homemade sample had maximum riboflavin than any other food samples. All vended food samples had almost same riboflavin value.

(8) Niacin

The sample (A) and (D) value of niacin found are more than any other food sample. Sample (B) and (C) values are found same but they are less than that of sample (A) and (D). The Homemade sample niacin value less than sample (A) and (D).

(9) Vitamin C

Value of vitamin C value of was found to be sample (A) found 0.02 mg more than other food samples. Among other samples, sample (B) and homemade food contained same amount of vitamin C. Sample (C) and (D) contain almost negligible amount of vitamin C.

(10) Calcium

Home made food sample contain more amount of calcium than vended food. Among vended food samples, sample (C) contained more calcium. Sample (A) and (B) values found were same but less than that of sample (C). But sample (D) contain least amount of calcium.

(11) Iron

Homemade sample had more iron than vended food sample. Sample (A) iron value was maximum among vended food. Sample (B) and (D) values found were equal but less than other food samples. Sample (C) iron concentration found was less than sample (A) and more than sample (B) and (D).

(12) Sodium

Sample (A), (B) and (C) had same sodium value but home made sample had 1.0 mg less sodium than sample (A), (B) and (C). Sample (C) value was found to be lesser than that of homemade and other vended food sample.

(13) Potassium

Homemade sample had high potassium content than any other food sample. All vended food samples had average value of around 14.0 mg. Sample (B) and (C) had same value of potassium but lesser than other vended food. Sample (D) value was maximum and sample (A) had lesser than sample (D).

Home made *bhel* is rich in carbohydrate, fat and fiber and less amount of moisture as compared to vended food.

In Lories of micro nutrients also home made *Chinese bhel* is richer as it contains more amounts of thiamine, riboflavin, calcium, iron and potassium as compared to vended food. Home made food contains less amount of niacin as compared to vended food.

Table No. 61

(14) STATISTICAL ANALYSIS OF *CHINESE BHEL* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.000	S
Fat	.001	S
Thiamin	.007	S
Riboflavin	.087	NS
Ascorbic acid	1.00	NS
Niacin	.087	NS
Calcium	.000	S
Iron	.228	NS
Sodium	.287	NS
Potassium	.027	S
Moisture	.770	NS
Fibre	.172	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the *Chinese bhel* sample collected from area-A the riboflavin, ascorbic acid, niacin, iron, sodium, moisture and fiber contains were at par statistically. However, other values were found statistical significantly.

Table No. 62

(15) STATISTICAL ANALYSIS OF *CHINESE BHEL* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.008	S
Protein	.000	S
Fat	.000	S
Thiamin	.008	S
Riboflavin	.566	NS
Ascorbic acid	1.00	NS
Niacin	.087	NS
Calcium	.000	S
Iron	.228	NS
Sodium	.287	NS
Potassium	.027	S
Moisture	.770	NS
Fibre	.172	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the *Chinese bhel* sample collected from area-B the riboflavin, ascorbic acid, niacin, iron, sodium, moisture and fiber contain were at par statistically. However, other values were found statistical significantly.

Table No. 63

(16) STATISTICAL ANALYSIS OF *CHINESE BHEL* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.284	NS
Fat	.000	S
Thiamin	.007	S
Riboflavin	.566	NS
Ascorbic acid	.000	S
Niacin	.087	NS
Calcium	.000	S
Iron	.228	NS
Sodium	.287	NS
Potassium	.027	S
Moisture	.770	NS
Fibre	.172	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the *Chinese bhel* sample collected from area-C the protein, riboflavin, niacin, iron, sodium, moisture and fiber contain were at par statistically. However, other values were found statistical significantly.

Table No. 64

(17) STATISTICAL ANALYSIS OF *CHINESE BHEL* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.008	S
Protein	.000	S
Fat	.000	S
Thiamin	.076	NS
Riboflavin	.566	NS
Ascorbic acid	.000	S
Niacin	.087	NS
Calcium	.000	S
Iron	.228	NS
Sodium	.287	NS
Potassium	.027	S
Moisture	.770	NS
Fibre	.172	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the *Chinese bhel* sample collected from area-D the thiamin, riboflavin, niacin, iron, sodium, moisture and fiber contain were at par statistically. However, other values were found statistical significantly.

4.1.9 Mendu Vada

A south Indian delicacy comprising of Urad dal *Vadas* mixed in sambher. *Vada* are prepared from Black gram dal, which is soaked crushed and partially fermented *vada* there by deep fried in oil.

Where sambher is prepared from dal along with tomatoes and other seasonal vegetables along with tamarind now days due to availability of junk food such items are less preferred by children, but obviously are popular among middle aged people.

Table No. 65

Nutritional Value of *Mendu Vada* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	10.00	11.00	9.0	10.00	15.00
Protein (gm)	4.37	4.40	5.00	4.40	2.80
Fat (gm)	24.00	25.00	23.00	25.00	15.00
Fibre (gm)	0.07	0.07	0.08	0.07	0.001
Moisture (%)	65.00	67.00	68.00	65	60.00

(1) Carbohydrates

Homemade food sample had more carbohydrate than all vended food samples. Sample (B) had more value than other vended food samples. Sample (A) and (D) values were found to be equal and more than sample (C).

(2) Protein

Sample (C) had more protein value than all food samples. Sample (B) and (D) were found to have equal values that were more than were home made food sample and sample (A). Sample (A) protein value found only 0.03 gm less than sample (B) and (D) but at the same time, it was maximum than that of home made sample, so home made sample had less protein than all vended food samples.

(3) Fat

Sample (B) and (D) were found to have equal and more fat than all food samples. Sample (A) had more fat than sample (C) and homemade sample. Sample (C) had less amount of fat than all vended food sample. Homemade sample had very less amount of fat than all vended foods.

(4) Fibre

Sample (C) had more fiber compare to all other food samples, sample (A), (B) and (D) were found equal and more than homemade sample but less than sample (C). Homemade sample had less fiber than all vended food samples.

(5) Moisture

Sample (C) had more moisture than all food samples. Sample (B) had more moisture value than sample (A) and (D) and home made sample. Sample (A) and (D) were found to have equal and more moisture than homemade sample. Homemade sample had less moisture than all vended food samples.

Table No. 66

Nutritional Value of *Mendu Vada* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.05	0.03	0.04	0.04	0.50
Riboflavin (mg)	0.10	0.10	0.20	0.10	0.56
Niacin (mg)	0.16	0.15	0.14	0.15	0.16
Ascorbic acid (mg)	0.075	0.06	0.008	0.008	0.07
Calcium (mg)	30.00	30.00	40.00	40.00	50.00
Iron (mg)	0.06	0.07	0.09	0.08	0.18
Sodium (mg)	10.00	12.00	10.00	11.00	12.50
Potassium (mg)	22.00	25.00	26.00	25.00	26.00

(6) Thiamine

Homemade sample had maximum thiamine than all vended food samples. Sample (A) had more thiamine than other vended food samples. Sample (C) and (D) were found to have equal values but were more than sample (B). So sample (B) had less thiamine.

(7) Riboflavin

The value of homemade sample was more than other any vended samples. Sample (C) had more riboflavin than sample (A), (B) and (D). The sample (A), (B) and (D) were found to have equal but less riboflavin than home made sample and sample (C).

(8) Niacin

The value of sample (A) and homemade sample were found to be equal and more than other food samples. Sample (B) and (D) were found to

have equal niacin content which was but less than sample (A) and home made sample and was more than sample (C).

(9) Ascorbic acid

The value of homemade sample was more than all vended food samples. All vended food samples had very less amount of ascorbic acid compare to homemade samples. Sample (D) contains almost negligible vitamin C.

(10) Calcium

The homemade sample had more calcium than all vended food samples. Sample (C) and (D) were found to have equal and more than calcium sample (A) and (C). Sample (A) and (C) were found to have equal but less calcium than all food samples.

(11) Iron

The value of homemade sample was more than all vended food samples. Sample (C) had more iron than sample (A), (B) and (D). Sample (D) had more iron than sample (A) and (B). Sample (B) had more iron than sample (A). Thus sample (A) had least amount of iron.

(12) Sodium

Homemade sample had more sodium than all vended food samples. Sample (A) and (B) were found to contain equal but less than home made sample and more than sample (C) and (D). Sample (D) had more than sample (C). So sample (C) had less amount of sodium than other food samples.

(13) Potassium

The value of home made food sample and sample (C) were found to be equal and more than other food samples. Sample (D) had more value than sample (A) and (B). Sample (B) had more than sample (A). So sample (A) had less amount of potassium.

The home made recipe is rich in carbohydrate but it contains less amount of protein, fat, fiber and moisture compared to food sample of vended vada collected from different areas.

The home made food is rich in vitamins like thiamine, calcium, and iron and salts sodium and potassium compared to vended food samples.

Table No. 67

(14) STATISTICAL ANALYSIS OF *MENDU VADA* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.003	S
Protein	.006	S
Fat	.000	S
Thiamin	.287	NS
Riboflavin	.000	S
Ascorbic acid	.003	S
Niacin	.000	S
Calcium	.000	S
Iron	.000	S
Sodium	.057	NS
Potassium	.004	S
Moisture	.000	S
Fibre	.006	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Mendu vada* sample collected from area A were statistically at par for thiamine and sodium contents. However, other values were found to statistical significantly.

Table No. 68

(15) STATISTICAL ANALYSIS OF *MENDU VADA* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.008	S
Protein	.005	S
Fat	.000	S
Thiamin	.021	S
Riboflavin	.000	S
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.000	S
Iron	.000	S
Sodium	.000	S
Potassium	.319	NS
Moisture	.013	S
Fibre	.001	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Mendu vada* sample collected from area B were statistically at par for potassium contents. However, other values were found to statistical significantly.

Table No. 69

(16) STATISTICAL ANALYSIS OF *MENDU VADA* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.001	S
Protein	.007	S
Fat	.001	S
Thiamin	.287	NS
Riboflavin	.000	S
Ascorbic acid	.000	S
Niacin	.001	S
Calcium	.000	S
Iron	.000	S
Sodium	.057	NS
Potassium	.649	NS
Moisture	.001	S
Fibre	.006	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Mendu vada* sample collected from area C were statistically at par for thiamine, sodium and potassium contents. However, other values were found to statistical significantly.

Table No. 70

(17) STATISTICAL ANALYSIS OF *MENDU VADA* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate(gm)	.001	S
Protein	.005	S
Fat	.000	S
Thiamin	.287	NS
Riboflavin	.000	S
Ascorbic acid	.003	S
Niacin	.000	S
Calcium	.000	S
Iron	.000	S
Sodium	.319	NS
Potassium	.013	S
Moisture	.000	S
Fibre	.006	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Mendu vada* sample collected from area D were statistically at par for thiamine and sodium contents. However, other values were found to statistical significantly.

4.1.10 *Masala Dosa*

Another south Indian delicacy comprising of soft crispy *dosa* prepared from combination of rice and Urad dal, soaked crushed and fermented. Along with different types of masala combinations prepared from onion, potato, peas and simple dosa prepared in oil or butter.

Masala dosa served along with coconut chutney comprising of coconut, green chilies, garlic and curd. *Sambhar* is prepared from Bengal gram dal along with seasonal vegetables tomato and tamarind pulp.

Table No. 71

Nutritional Value of *Masala Dosa* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	12.00	20.00	11.00	16.00	20.00
Protein (gm)	2.90	2.80	1.40	2.10	2.9
Fat (gm)	13.20	13.10	13.00	12.20	8.0
Fibre (gm)	0.02	0.02	0.017	0.019	0.02
Moisture (%)	69.00	68.00	70.00	74.50	65.00

(1) Carbohydrates

The amount of carbohydrates present in home made food sample and sample (B) was more than all vended samples. Sample (D) had more carbohydrate than sample (C) and (A). So sample (C) had least amount of carbohydrate. Homemade sample & (B) contain more amounts of potatoes and onion in masala.

(2) Protein

Home made sample and sample (A) were found to have protein content equal, which was more than that of all vended samples. Sample (B) had amount of protein only 0.1 gm less than home made and sample (A). Sample (C) had less amount of protein than all food samples. Home made dosa had more protein value because of more amount of black gram dal.

(3) Fat

The amount of fat as sample (A) was maximum than all food samples. Sample (B) had more fat than sample (C), (D) and home made sample. Sample (C) had more fat than sample (D) and home made sample. Sample (D) had fewer amounts than all vended food but more than homemade sample. So home made sample had least amount of fat amount than all vended food. Home made sample contain less amount of oil and is cooked in non stick pan so fat content is very less as compared to vended foods.

(4) Fibre

The value of fiber in sample (A), (B) and homemade was equal .Which was more than sample (C) and (D). Sample (D) had more fiber content than sample (C). So sample (C) had least fiber content than all food samples.

(5) Moisture

Sample (C) and (D) contain more moisture than any other food samples. Sample (A) had more moisture than sample (B) and home made sample. Sample (B) more than home made sample. Homemade sample contain less moisture than all vended food samples. Homemade food contains more potatoes and dal and less amount of water.

Table No. 72

Nutritional Value of *Masala Dosa* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.015	0.013	0.005	0.015	0.1
Riboflavin (mg)	0.20	0.20	0.15	0.20	0.5
Niacin (mg)	0.18	0.17	0.15	0.15	0.3
Ascorbic acid (mg)	-	-	0.01	-	0.9
Calcium (mg)	20.00	18.00	16.80	17.00	20.00
Iron (mg)	0.11	0.10	0.08	0.08	0.16
Sodium (mg)	66.00	89.00	93.9	70.00	98.00
Potassium (mg)	22.00	23.00	22.0	26.00	25.00

(6) Thiamine

Home made had *dosa* more thiamine than other vended food samples. Sample (A) and (D) were found to have equal but less thiamine than home made food and more than sample (C) and (B). Sample (B) had more than (C) but less than other food samples. Sample (C) had very less amount of thiamine than home made sample.

(7) Riboflavin

Homemade food sample had good amount of riboflavin than any other food samples, sample (A), (B) and (D) were found to have equal but more than sample (C).

(8) Niacin

Niacin value of homemade food sample was found to be more among all vended samples. Sample (A) had more niacin than other vended samples.

(9) Ascorbic acid

Homemade food sample were found to contain more vitamin C than all vended food samples. Sample (C) had vitamin C less than homemade sample, sample (A), (B) and (D) contain almost negligible amount of vitamin C.

(10) Calcium

Home made sample and sample (A) calcium value found was equal and it was more than other vended food samples. Sample (B) had more calcium content than sample (C) and (D). So sample (C) had less than all vended and home made samples.

(11) Iron

Homemade sample had more iron value than vended samples. Sample (A) has more than other vended sample. Sample (B) had less than sample (A) but more than sample (C) and (D). Sample (C) and (D) were found to have equal but less than all other food samples.

(12) Sodium

Homemade food had more sodium value than all vended food samples. Sample (C) had more sodium than sample (A), (B) and (D).

(13) Potassium

Sample (D) had good amount of potassium than any other food samples. Homemade sample had more potassium than sample (A), (B) and (C).

Home made masala dosa is rich in carbohydrate and contains less amount of fat and moisture compared is vended food sample.

The home made food is rich in thiamine, riboflavin, niacin, ascorbic acid and sodium is completely absent in three vended sample and is present in negligible amount in one sample. Less amount of Potassium is present in all vended sample except sample from Area D.

Table No. 73

(14) STATIS TICAL ANALYSIS OF *MASALA DOSA* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	1.00	NS
Fat	.003	S
Thiamin	.007	S
Riboflavin	.036	S
Ascorbic acid	.005	S
Niacin	.061	NS
Calcium	.070	NS
Iron	.003	S
Sodium	.000	S
Potassium	.021	S
Moisture	.003	S
Fibre	.556	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost same level of protein, niacin, calcium and fiber as the variation found was statistically no significantly. However, other values were found to vary significantly.

Table No. 74

(15) STATIS TICAL ANALYSIS OF *MASALA DOSA* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.287	NS
Protein	1.00	NS
Fat	.000	S
Thiamin	.007	S
Riboflavin	.036	S
Ascorbic acid	.278	NS
Niacin	.061	NS
Calcium	.070	NS
Iron	.008	S
Sodium	.000	S
Potassium	.021	S
Moisture	.002	S
Fibre	.556	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost same level of carbohydrate, protein, ascorbic acid, niacin, calcium and fiber as the variation found was statistically nonsignificantly. However, other values were found to vary significantly.

Table No. 75

(16) STATIS TICAL ANALYSIS OF *MASALA DOSA* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.000	S
Protein	.023	S
Fat	.000	S
Thiamin	.006	S
Riboflavin	.026	S
Ascorbic acid	.005	S
Niacin	.051	NS
Calcium	.008	S
Iron	.000	S
Sodium	.004	S
Potassium	.021	S
Moisture	.003	S
Fibre	.143	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost same level of niacin, and fiber as the variation found was statistically nonsignificantly. However, other values were found to vary significantly.

Table No. 76

(17) STATIS TICAL ANALYSIS OF *MASALA DOSA* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.021	S
Protein	.023	S
Fat	.000	S
Thiamin	.007	S
Riboflavin	.036	S
Ascorbic acid	.005	S
Niacin	.051	NS
Calcium	.008	S
Iron	.000	S
Sodium	.000	S
Potassium	.287	NS
Moisture	.000	S
Fibre	.198	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost level of niacin, potassium and fiber as the variation found was statistically no significantly. However, other values were found to vary significantly.

4.1.10 Vegetable Kolhapuri

Vegetable Kolhapuri is a North Indian delicacy preferred by people who like to eat hot and spicy food. A combination of available vegetables prepared in onion, tomato, garlic, Green chili, coriander garnished with cheese. Generally it is eaten with chapatti or Nan.

Table No. 77

Nutritional Value of *Vegetable Kolhapuri* (100gm) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	5.00	5.00	4.00	3.00	5.00
Protein (gm)	2.27	2.00	2.90	3.00	2.60
Fat (gm)	8.00	7.00	6.00	8.00	8.0
Fibre (gm)	0.02	0.01	0.04	0.018	0.02
Moisture (%)	68.00	78.00	74.00	71.0	73.00

(1) Carbohydrates

The amount of carbohydrate in sample (A) and (B) and home made were found to be equal and more than sample (C) and (D). Homemade and sample (A), (B) had more carbohydrate because higher content of tomato and onion.

(2) Protein

Sample (D) had more protein than other food samples. Homemade sample had more protein than sample (A) and (B). These percentage value differences are very less, but sample (C) had contains more amount of paneer and beans.

(3) Fat

The sample of home made food and sample (A) and (D) were found equal amount of fat and was more than sample (B) and (C). The homemade, sample (A) and (D) had more content of fat because maximum butter and cheese is used than other samples.

(4) Fibre

The homemade food and sample (A) were found to have equal and more fiber than other food samples.

(5) Moisture

Sample (B) had more moisture than other vended and homemade samples. Homemade sample had more moisture than sample (A), (C) and (D). Sample (D) had more moisture than sample (C) and (A).

Table No. 78

Nutritional Value of *Vegetable Kolhapuri (*100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.003	0.003	0.004	0.003	0.05
Riboflavin (mg)	0.12	0.10	0.30	0.20	0.30
Niacin (mg)	0.16	0.18	0.24	0.20	0.08
Ascorbic acid (mg)	0.17	0.09	-	-	0.42
Calcium (mg)	15.0	16.00	17.00	17.00	20.00
Iron (mg)	20.00	13.00	12.00	12.0	15.00
Sodium (mg)	0.08	0.07	0.09	0.08	0.10
Potassium (mg)	28.10	26.10	25.1	27.1	26.0

(6) Thiamine

The homemade sample had more thiamine than all vended food samples. Sample (C) had more thiamine than sample (A), (B) and (D).

(7) Riboflavin

Sample (C) and homemade food sample were found to have equal and more riboflavin than other food samples. Sample (D) had more riboflavin than sample (A) and (B).

(8) Niacin

Sample (C) had more niacin than other food samples. Sample (D) had less niacin content than (C) but more amount of niacin than other food samples.

(9) Ascorbic acid

The homemade sample amount of vitamin C was more than other vended samples. Sample (A) had more than sample (B). The homemade sample contain more lemon juice so maximum value of vitamin C.

(10) Calcium

Homemade sample had more calcium than all vended food samples. Sample (C) and (D) were found to have equal but more calcium than sample (A) and (B) but less than homemade sample.

(11) Sodium

The value of sample (A) was more than other food samples. Homemade sample had more sodium than sample (B), (C) and (D) and less than sample (A).

(12) Iron

The homemade food sample had more iron than all vended food samples. Sample (C) had more iron than other vended food samples.

(13) Potassium

Sample (A) had more potassium than other vended and homemade sample. Sample (D) had more than home made sample and sample (B) and (C).

The home made *vegetable Kolhapuri* and sample collected from area A & B were having same amount of nutrients. Sample A is containing less amount of moisture compared to all other food sample.

The home made food sample is rich in thiamine, riboflavin but it contains less amount of niacin, ascorbic acid is present in less amount in sample A & B, while is completely absent in sample C, D and home made food rich in calcium, iron, sodium and less amount of potassium compared to other sample. Sample A contains maximum amount of calcium compared to all other food sample.

Table No. 79

(14) STATISTICAL ANALYSISOF *VEGETABLE KOLHAPURI* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.208	NS
Protein	.021	S
Fat	.287	NS
Thiamin	.014	S
Riboflavin	.087	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.003	S
Iron	.003	S
Sodium	.248	NS
Potassium	.066	NS
Moisture	.003	S
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-A the carbohydrate fat, riboflavin, sodium, potassium and fiber contents were at par statistically insignificants. However, other values were found statistical significantly.

Table No. 80

(15) STATISTICAL ANALYSISOF *VEGETABLE KOLHAPURI* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.208	NS
Protein	.117	NS
Fat	.287	NS
Thiamin	.014	S
Riboflavin	.082	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.008	S
Iron	.070	NS
Sodium	.248	NS
Potassium	1.00	NS
Moisture	.003	S
Fibre	.649	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *Vegetable kolhapuri* sample collected from area B were statistically at par for carbohydrate, protein, fat, riboflavin, iron, sodium, potassium and fiber contents. However, other values were found statistical significantly.

Table No. 81

(16) STATISTICAL ANALYSISOF *VEGETABLE KOLHAPURI* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.054	NS
Protein	.496	NS
Fat	.070	NS
Thiamin	.014	S
Riboflavin	1.00	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.021	S
Iron	.070	NS
Sodium	.295	NS
Potassium	1.00	NS
Moisture	.287	NS
Fibre	.072	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-C the carbohydrate, protein, fat, riboflavin, iron, sodium, potassium moisture and fiber contents were at par statistically insignificants. However, other values were found statistical significantly.

Table No. 82

(17) STATISTICAL ANALYSISOF *VEGETABLE KOLHAPURI* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.020	S
Protein	.052	NS
Fat	.287	NS
Thiamin	.014	S
Riboflavin	.287	NS
Ascorbic acid	.000	S
Niacin	.172	NS
Calcium	.021	S
Iron	.070	NS
Sodium	.248	NS
Potassium	1.00	NS
Moisture	.029	S
Fibre	1.00	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-D the protein, fat, riboflavin, niacin, sodium, potassium and fiber contents were at par statistically insignificant. However, other values were found statistical significantly.

4.1.11 Paneer Tikka Masala

It is a tangy and spicy delicacy to satisfy taste buds of people who like to eat spicy food, which is available in two different versions- dry and with gravy. It comprises of paneer cubes generously marinated in mixture of along with another spice and grilled and served as starter, with paneer pieces, cooked in thick gravy of onion, tomato, coconut water served garnished with roasted papad and cheese.

Table No. 83

Nutritional Value of *Paneer Tikka Masala* (100) for Macro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Carbohydrate(gm)	3.00	3.90	4.00	4.00	5.00
Protein (gm)	2.80	2.90	3.00	2.90	1.05
Fat (gm)	6.00	5.90	5.00	5.00	7.80
Fibre (gm)	0.01	0.01	0.09	0.09	0.01
Moisture (%)	80.00	81.00	78.0	80.00	80.00

(1) Carbohydrates

Home made sample of *paneer tikka masala* is compared with vended *paneer tikka* with reference to carbohydrates from different area. In different areas, composition may change because of change in quality that maintains price level. So, depending upon locality ingredients and quality of food differs. The recipe of paneer tikka masala is different. As in case of sample (A), (B), (C), (D), venders use onion, tomato and paneer in less quantity but they use more water, whereas in home made sample, tomato, onion & paneer are in much more quantity so that has help to prepare carbohydrates rich food. So as compared to samples (A), (B), (C) and (D), homemade sample contained more carbohydrates. Carbohydrates of sample (C) and (D) is more than sample (A) and (B) because the area from where sample (D) was collected, is the choice of customers of all classes of the society. That's why tomato, onion and paneer were more in sample (D) as compare to rest of the samples. The area from which sample (A) was taken, customers were mostly higher-class people and they generally like more gravy than paneer pieces.

(2) Protein

Protein value of homemade sample is very good than any other samples. Sample (C) had more protein value than (A), (B) and (D) because customers of that particular area belong to lower class and therefore they want somewhat Gujarati taste in Punjabi food. So for that vendor use bengal gram flour to make gravy thicker. The sample (A), (B) and (D) protein value found lesser which was as per demand of that particular locality.

(3) Fat

Like other nutrients fat value of the homemade sample found much more because it contains more quantity of butter. As compare to other vended food samples, sample (A) contain more fat because the vendor are located in the area where higher class customers used to come frequently and they demand good amount of butter as well as oil.

(4) Fibre

Value of fibers in samples (A), sample (B) and homemade sample is found to be equal. This is due to use of ginger in gravy. But sample (C) and (D)'s fiber value is equal but as compare to rest of the three samples, it is very less.

(5) Moisture

Moisture level of sample (A), (D) and home made food is equal but value of sample (B) is having 1% moisture content more than any other samples. In sample (C) contain lesser moisture than any other samples because bengal gram flour was used in preparation of sample (C).

Table No. 84

Nutritional Value of *Paneer Tikka Masala* (100gm) for Micro Nutrients

Nutrients	Areas				
	A	B	C	D	Home made(HM)
Thiamine (mg)	0.05	0.03	0.04	0.05	0.15
Riboflavin (mg)	0.20	0.20	0.30	0.3	0.19
Niacin (mg)	0.16	0.15	0.20	0.16	0.01
Ascorbic acid (mg)	0.15	0.09	-	-	0.47
Calcium (mg)	25.00	24.00	17.0	20.0	30
Iron (mg)	15.00	13.00	15.0	15.0	16.0
Sodium (mg)	0.08	0.07	0.08	0.08	0.10
Potassium (mg)	14.0	13.00	13.0	13.0	15.00

(6) Thiamine

Thiamine value of home made sample is more than any other food sample because in this sample, amount of onion is more than any other food sample. In case of vended food samples, thiamine concentration of sample (A) and sample (D) is equal. Thiamine value of sample (B) is very less than any other food samples.

(7) Riboflavin

Value of riboflavin is more in sample (C) and sample (D) whereas riboflavin values of sample (A) and sample (D) are equal, but lesser than sample (C). Coriander was not used in homemade food sample so; riboflavin amount was lesser in that as compare to other food products.

(8) Niacin

Niacin concentration is much more in sample (C) than any other sample as in gravy of that food contained Bengal gram flour. That's why value of niacin in other samples was less because other samples do not contain bengal gram flour was not used is preparation.

(9) Vitamin C

Homemade food sample contains more vitamin C than any other samples. Sample (C) and sample (D) don't have vitamin C at all, whereas food sample (A) and sample (B) have very less amount of vitamin C. Use of lemon in home made food sample made the sample rich in vitamin C.

(10) Calcium

Homemade food sample contains more calcium concentration as compare to other food samples because paneer was used in excess amount. But in sample (A), (B), (C) and (D) use of paneer was limited therefore calcium is in lesser proportion. Sample (A) and sample (B) has more calcium than sample (C) and (D). Minimum calcium was found in sample (C) as the area from which the sample (C) collected was from lower middle class locality. So, the customers from that locality don't like paneer taste and could not afford high price of recipe if paneer were more. Therefore demand of paneer was very less.

(11) Iron

Concentration of iron in homemade sample, paneer was more than any other sample. Amount of iron in sample (A), (C) and (D) were found to be equal but sample (B) contain less iron.

(12) Sodium

Level of sodium in all the food samples, as compare to homemade sample, was recorded much higher. Usage of tomato was much more in case of homemade food sample. (A), (C) and (D) were found equal and more

than sample (B). So sample (B) had less amount of sodium than other food sample.

(13) Potassium

Concentration of potassium was more in homemade sample but sample (B), (C) and (D) contains less amount of potassium than sample (A).

Home made food sample is rich in carbohydrate and fat but is containing less amount of protein compared to vended food sample.

The nutritional value of home made food sample is rich in thiamine, ascorbic acid, calcium, iron, sodium and potassium. Sample C&D are completely lacking ascorbic acid and is present negligible amount in other two samples.

Table No. 85

(14) STATISTICAL ANALYSIS OF *PANEER TIKKA MASALA* (AREA---A)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	. 013	S
Protein	.000	S
Fat	.038	S
Thiamin	.000	S
Riboflavin	.137	NS
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.001	S
Iron	.287	NS
Sodium	.172	NS
Potassium	.133	NS
Moisture	.833	NS
Fibre	.378	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

In the sample collected from area-A the riboflavin, iron, sodium, potassium, moisture and fiber contents were at par statistically insignificants. However, other values were found statistical significantly.

Table No. 86

(15) STATISTICAL ANALYSIS OF *PANEER TIKKA MASALA* (AREA---B)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	. 046	S
Protein	.000	S
Fat	.041	S
Thiamin	.000	S
Riboflavin	.137	NS
Ascorbic acid	.000	S
Niacin	.140	NS
Calcium	.001	S
Iron	.021	S
Sodium	.134	NS
Potassium	.021	S
Moisture	.393	NS
Fibre	.378	NS

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The *paneer tikka masala* sample collected from area B were statistically at par for riboflavin, niacin, sodium, moisture and fibre contents. However, other values were found statistical significantly.

Table No. 87

(16) STATISTICAL ANALYSIS OF *PANEER TIKKA MASALA* (AREA---C)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.101	NS
Protein	.000	S
Fat	.074	NS
Thiamin	.000	S
Riboflavin	.031	S
Ascorbic acid	.000	S
Niacin	.000	S
Calcium	.000	S
Iron	.287	NS
Sodium	.172	NS
Potassium	.021	S
Moisture	.143	NS
Fibre	.010	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost same level of carbohydrate, fat niacin, sodium and moisture as the variation found was statistically non significantly. However, other values were found to vary significantly.

Table No. 88

(17) STATISTICAL ANALYSIS OF *PANEER TIKKA MASALA* (AREA---D)

T-TEST

NUTRIENTS	T-VALUE	RESULT
Carbohydrate	.101	NS
Protein	.000	S
Fat	.079	NS
Thiamin	.000	S
Riboflavin	.031	S
Ascorbic acid	.000	S
Niacin	.210	NS
Calcium	.000	S
Iron	.287	NS
Sodium	.177	NS
Potassium	.021	S
Moisture	.834	NS
Fibre	.010	S

NS= Not significant=T-value>0.05, S= Significant = T-value<0.05

The sample under this group were found to content almost same level of carbohydrate, fat niacin, iron, sodium and moisture as the variation found was statistically no significantly. However, other values were found to vary significantly.

4.2 MICROBIAL ANALYSIS

Microbial examination of food gives us information regarding (1) the quality of raw food (2) The sanitary condition under which food is processed (3) The effectiveness of its method of preservation.

Food contains a large number of microbial organisms, which enter into it through the various ways like by ingredients used, handling and preparation. These microorganisms, which are present in food, if not properly treated and remain alive/viable, may multiply during course of its storage time, lapsed between its preparation and its consumption.

(1) The microorganisms are generally present as a normal flora on raw vegetable, which are used in the preparation of food. They may enter into food if these vegetables / fruits used are improperly washed. The knife / board used for chopping vegetables is contaminated. The tray or vessel used for storage of chopped vegetables are not clean or is contaminated. The water used for washing or the soaking of vegetables, which get tarnished during the period between its being chopped and cooked, is contaminated. Many times the time period of storage of vegetables or gap between its chopping and cooking if more it also increases the chances of its getting contaminated. The microbial population present can bloom up there by affecting the nutritional quality degrading it even before it's cooked.

(2) The oil, condiments, spices used in cooking of food should be of good quality, stored nicely in airtight containers. These if contaminated can also contaminate the food.

(3) The vessels used for storage of vegetable prior to, during and after its chopping, for purpose of washing chopped food, cooking as well as for storage after cooking should also be taken into account, any negligence at these stages will simply add to the overall microbial count of the cooked food. They're by affecting its nutritional quality and making it unsafe for human consumption.

(4) Water – the life is required at each and every stage of preparation of food, water is inevitable. If water is contaminated or unclean it's the main culprit for making the food unsafe for human consumption.

As majority of diseases caused in the human are water borne. They contribute for as large as 60% of day-to-day ailments in humans. Majority of these are transmitted from unhealthy unhygienic food.

(5) Handling [Manual]: The improper Manual handling, hygienic practices are also equally responsible for the contamination of food. The unhygienic practices are not washing hands before preparation.

- Long and dirty nail filled with dirt.
- Dirt and grim in area where preparation is done.

- Wearing dirty clothes; not using duster but hands are swapped on the clothes every time.
- Sneezing, coughing, smoking, chewing while cooking or preparing of food.
- Scratching, picking nose, spitting near by area.

Prepared food sample were collected from four different areas as well as homemade food. All these samples were analyzed both quantitatively and qualitatively.

The quantitative analysis was done by standard plate count [SPC].

Table No. 89

SPC was preferred over other counting methods

Method	Limitations, Advantages
(1) Direct Counting by Petroff Hausser Counting Chamber	Difficult or impossible to distinguish between living and dead cells. It is easy and inexpensive, quick but microbial population must be fairly large.
(2) Direct Electronic counters	Not very useful in counting bacteria due to interference by small debris particles.It can't distinguish between living and dead cells.
(3) Viable count Technique	In accurate counts, if sample is not properly diluted or cells are not well dispersed or mixing is not proper. But it is simple, sensitive and widely used for routine study.

SPC method is useful in determining the density of microbial population in water, milk, food etc. It is also useful to determine number of specific pathogenic or non-pathogenic bacteria or fungi using selective media.

The researcher had used SPC method to assess the microbial population present in food and growing them on MacConkey's Agar plate isolated the pathogenic organisms if present.

MacConkeys agar plate is used to assess presence of gram –ve organisms belonging to family entero bactericide [enteric gp] responsible for

intestinal disorders in humans. As intestinal are directly correlated with digestive systems of the humans. This system is responsible for the digestion of the ingested food, fruits in humans.

4.2.1 Pau Bhaji

Table No. 90

STANDARD PLATE COUNTS IN *PAU BHAJI*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.4	$380x10^2$	50	10	120	130	50
B	4.5	$300 x10^2$	30	15	100	100	30
C	4.5	$305 x10^2$	50	20	80	120	40
D	4.2	$290 x10^2$	40	15	100	90	40
HM	4.5	$150 x10^2$	10	10	40	20	05

Table No. 91

COLI FORM COUNTS IN *PAUBHAJI*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	$1 x10^2$	100
B	$2 x10^2$	100
C	$1 x10^2$	100
D	$1 x10^2$	100
HM	-	-

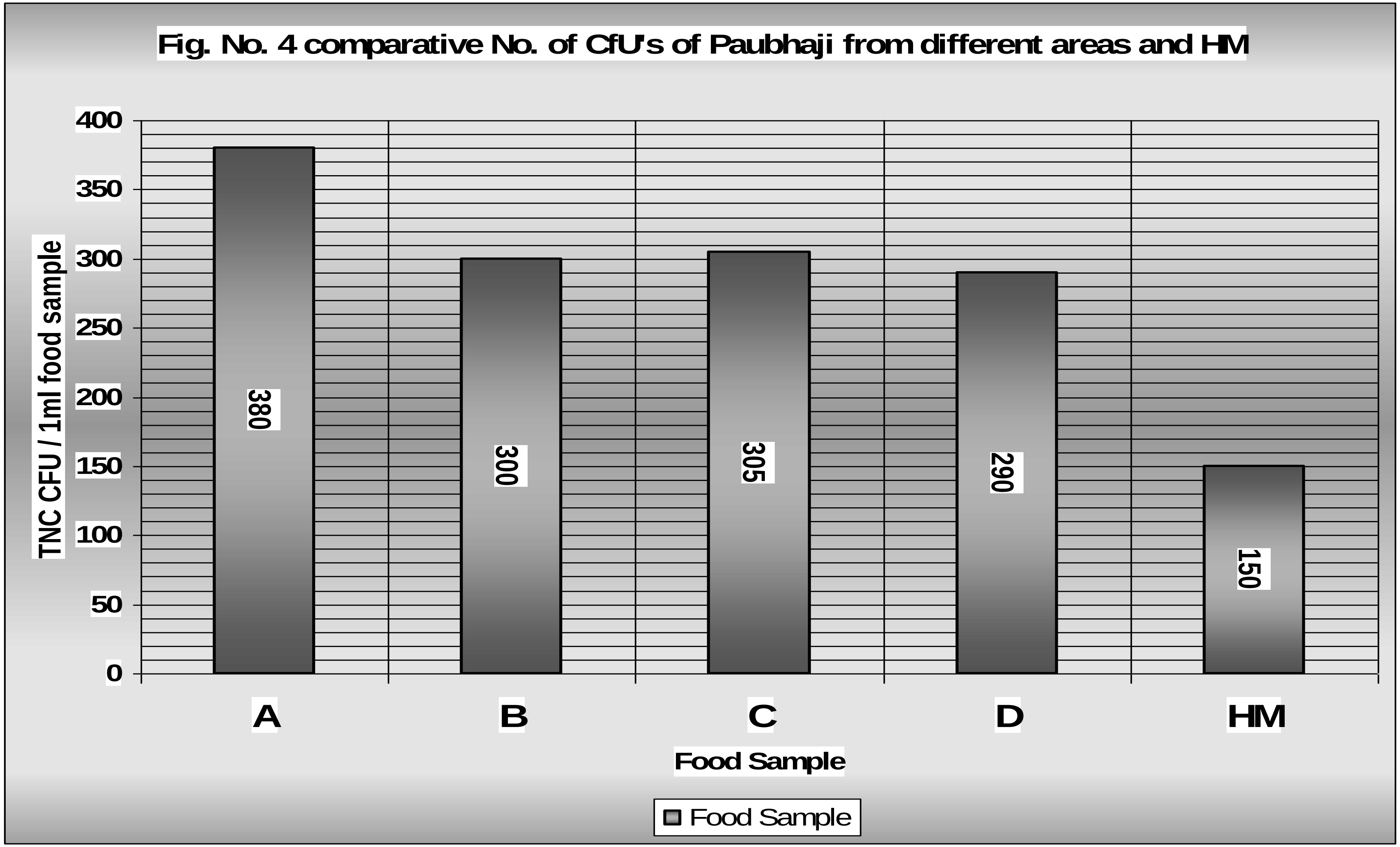


Fig. No. 4 comparative No. of CfU's of Paubhaji from different areas and HM

The sample was collected from 4 different places and their microbial population was assessed and correlated with that of home made food.

Some of these products have low (acidic) pH as compared to home made food. The number of CFU in vended food sample was much more almost double as compared to home made food. Therefore by hygienic point of view the quality of such food is poor can be considered as deteriorated food product.

As show in Table No. 90 - 91 and Figure No. 4

The number of spore formers present in vended food was very high almost five times that of home made food. These spore formers generally are acquired from dust, which is most prevalent in conditions, environment where these foods are prepared. The spore formers can easily survive in dust, for longer periods of time and also in adverse environmental conditions like acidic pH. But when they get suitable environmental conditions, they can germinate & proliferate.

When these are pathogenic their presence in food is a cause of concern, they can cause food poisoning.

The number of yeast cells present in vended food is also high (minimum 50% more) as compared to home made food. Yeast if baker's yeast used in preparation of bread then it may not be harmful. But being a fungus can easily survive and proliferate at low (acidic) pH. Some yeast can be pathogenic also.

As compared to spore formers and yeast the number of gram negative rods, was very high. The growth obtained on N-agar is further confirmed by growing these organisms on MacConkeys Agar medium. As compared to vended food the number of gram negative bacteria is very less in home made food. On MacConkeys medium, gram negative bacteria are not found in home made food, which clearly indicates that home made food is safe for consumption. Where as vended food shows presence of gram negative CFU

on MacConkeys agar medium a clear indication of its being contaminated with coliform group of microorganisms.

This strongly supports the chances of transmission of intestinal pathogens and reason for infections (gastro intestinal) on consumption of such contaminated food.

This type of microorganisms is generally present and they may enter into food preparation via use of contaminated water during different stages of food preparation.

These microorganisms (gram negative) can be further confirmed by growth on selective media. Thus it can help us to know which microbial organism (specific genus) is present, so that we can ascertain the chances of type of infection, that can be speeded by such type of contaminated food, when consumed.

The number of gram positive Cocci present in branch and chain in vended food is also very high as compared to home made food. They are generally 4 to 6 times more in vended foods as compared to home made food.

These organisms are generally a common inhabitant of human skin. They grow on nasal membranes and skin. As well they are found in gastro intestinal and urinary tract of warm-blooded animals.

Their presence in food indicates unhygienic conditions and practices during its preparation as well chances of water, which is used in preparation being fecal, contaminated.

4.2.2 *Pani Puri*

Table No. 92

STANDARD PLATE COUNTS IN *PANIPURI*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	3.6	300 $x10^2$	10	-	50	25	20
B	3.5	295 $x10^2$	09	-	45	20	15
C	3.7	280 $x10^2$	08	-	50	22	18
D	3.6	285 $x10^2$	10	-	48	24	16
HM	4.8	150 $x10^2$	05	-	25	15	05

Table No. 93

COLI FORM COUNTS IN *PANIPURI*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	2 $x10^2$	100
B	1 $x10^2$	100
C	2 $x10^2$	100
D	1 $x10^2$	100
HM	-	-

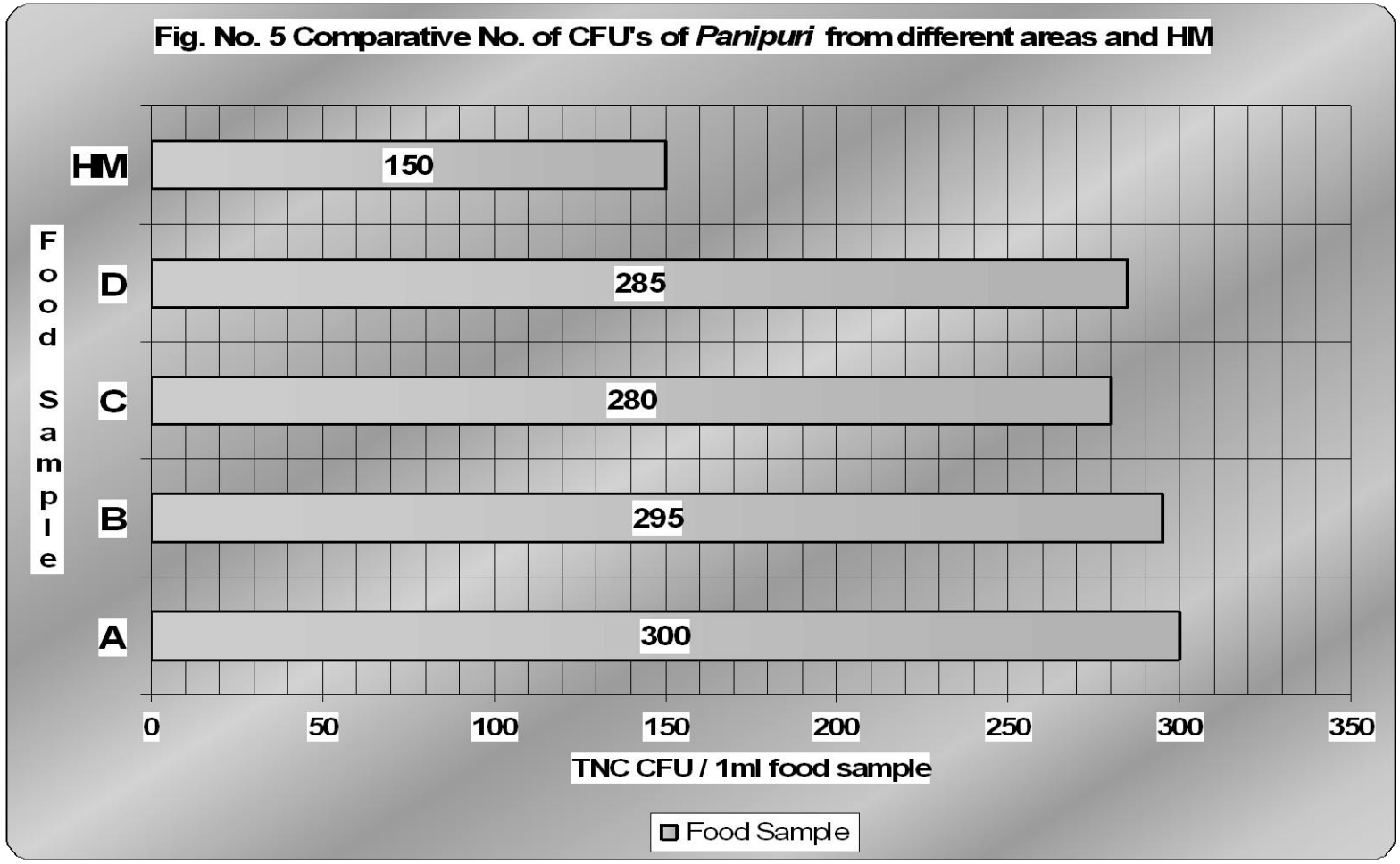


Fig. No. 5 Comparative No. of CFU's of *Panipuri* from different areas and HM
HM
D
C
B
A
150
285
280
295
300
Food Sample
0
50
100
150
200
250
300
350
TNC CFU / 1ml food sample
Food Sample

The pH of *Pani Puri* samples, which are collected from 4 different places, is low (acidic) as compared to home made. The low pH can affect the normal flora of body and can create an imbalance in normal digestion process of body.

The number of CFU / 1.0 ml is very high in vended food as compared to the homemade. The different types of microbial organisms found in it are:

As show in Table No. 92- 93 and Figure No.5

Spore former are organisms which can enter food through dust and dirt in the environment where food is prepared and served (road side stalls). As these are highly resistant, their presence in food is a matter of concern for health.

The number of gram negative organisms present in food is high almost double of that which is present in home made food. These organisms show 100% viability when grown on MacConkey's agar medium indicating chances of presence of infectious coliform group of microorganisms. These coliforms were not present in homemade food strongly supporting its consumption as compared to the vended food.

Again the chances of entry of these coliforms into the food are from use of contaminated water or water from unhealthy places.

The number of gram positive Cocci in bunches or in chain is also high in vended food as compared to homemade food. Presence of these microorganisms in food clearly indicates the unhygienic means / practices of the person who are employed or engaged in the preparation of such foods. Also the microorganisms can enter through improperly cleaned vessels, leftover food particles in the corners, orifices of the vessels used for preparation & storage of such food materials.

4.2.3 Bhel

Table No. 94

STANDARD PLATE COUNTS IN *BHEL*

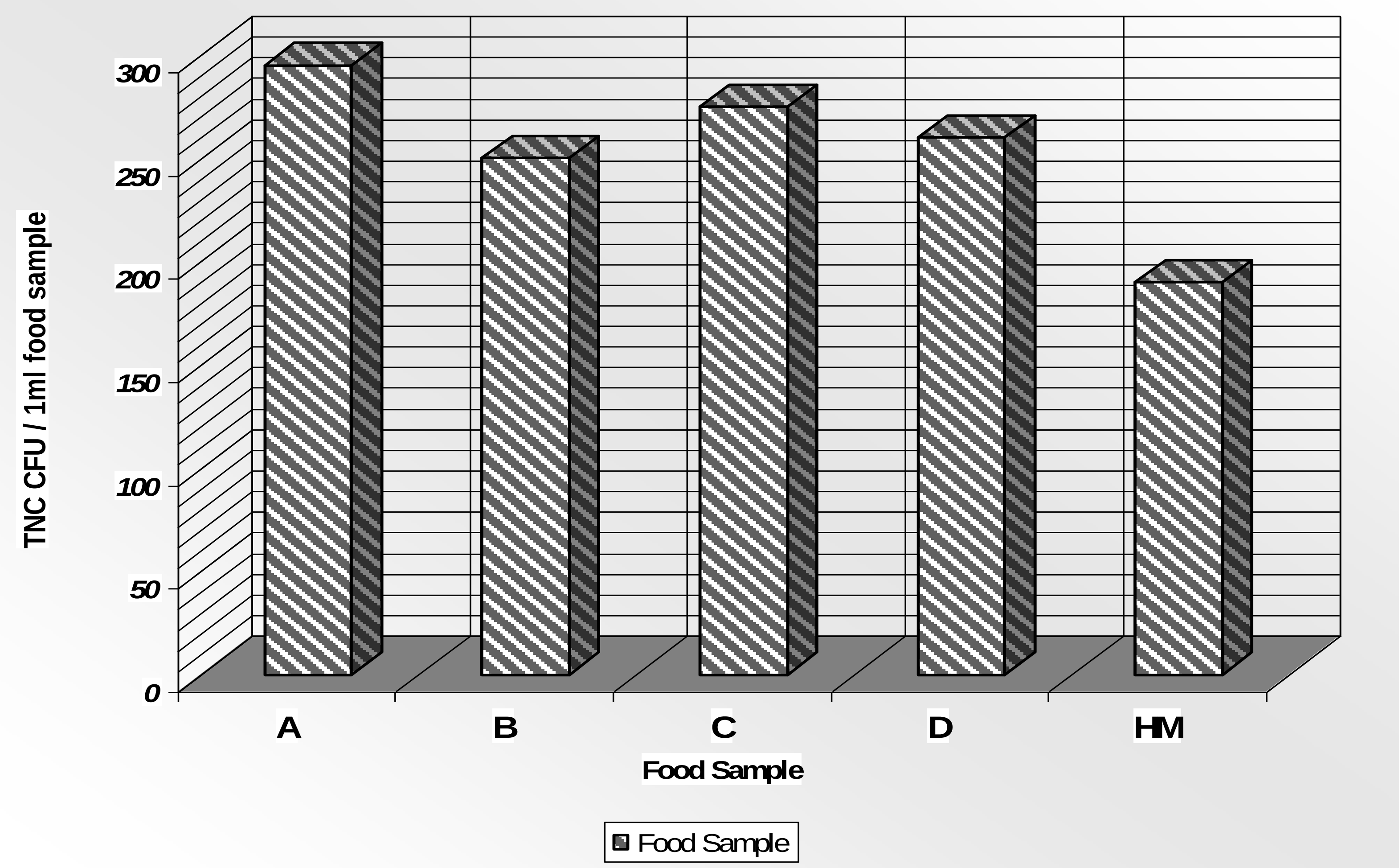
Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	5.1	295 $x10^2$	15	-	50	15	17
B	5.0	250 $x10^2$	10	-	40	20	19
C	4.9	275 $x10^2$	12	-	45	25	21
D	4.5	260 $x10^2$	15	-	47	22	22
HM	5.9	190 $x10^2$	07	-	30	05	05

Table No. 95

COLI FORM COUNTS IN *BHEL*

Food Sample	TNC CFU / 0.01 ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	10 $x10^2$	100
B	7 $x10^2$	100
C	5 $x10^2$	100
D	8 $x10^2$	100
HM	-	-

Fig. No. 6 Comparative No. of CFU's of *Bhel* from different areas and HM



The food samples collected from different places show acidic pH as compared to home made food. Low or acidic pH clearly indicates this food is hazardous, unfit for human consumption.

The microbial population in vended food was recorded high as compared to homemade preparation, clear indication of these foods unsafe / harmful for consumption when consumed from roadside stalls as compared to homemade preparation.

As show in Table No. 94 – 95 and Figure No. 6

The number of spore formers was high in vended food, almost double of what is present in homemade food. The few numbers, which is present in home made food, may be attributed to the dry, uncooked material, which is used in this preparation. As some of the food constituents who are used as such them way they are marketed. But same food from vendors the population of spore formers doubles.

This may be because of its being contaminated by dust and dirt, a common place where spores of organisms can survive for long durations. Thus vended food is contaminated with dust & dirt from roads, where it is generally available.

Yeast is not present indicating absence of pathogenic or non-pathogenic fungi.

The number of gram negative rods present is also high in vended food as compared to home made food.

The organisms when grown on MacConkeys agar medium show 100% viability in vended food. Where as homemade foods are not showing any of such contaminants. Thus the vended food is contaminated with viable gram – ve short rods, which may be pathogenic. The source of contamination can be water, which is used in preparation of such food.

The number of gram positive Cocci in bunches & chain is also high about 3 to 4 times more as compared to home made food. Its source can be attributed to the unhygienic and unhealthy environment where food is prepared.

4.2.4 *Pizza*

Table No. 96

STANDARD PLATE COUNTS IN *PIZZA*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.3	260 $x10^2$	10	15	50	35	15
B	4.3	275 $x10^2$	12	17	45	29	17
C	4.2	290 $x10^2$	13	19	55	25	19
D	4.1	285 $x10^2$	10	16	47	30	15
HM	4.9	150 $x10^2$	07	13	30	15	05

Table No. 97

COLI FORM COUNTS IN *PIZZA*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	25 $x10^2$	100
B	17 $x10^2$	100
C	19 $x10^2$	100
D	20 $x10^2$	100
HM	5$x10^2$	100

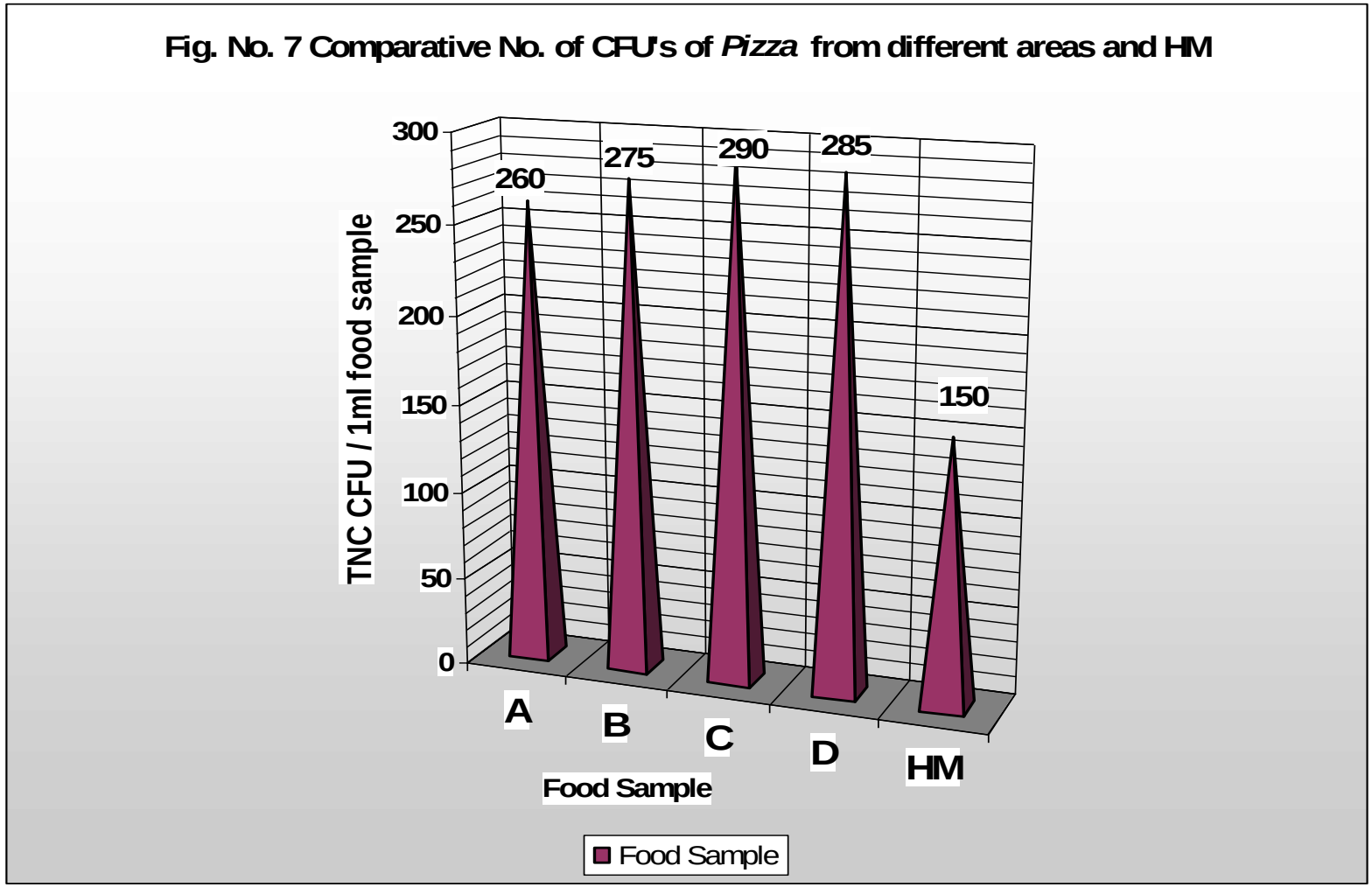


Fig. No. 7 Comparative No. of CFU's of *Pizza* from different areas and HM
TNC CFU / 1ml food sample
300
250
200
150
100
50
0
260
275
290
285
150
A
B
C
D
HM
Food Sample
Food Sample

Microbial analysis of pizza samples collected from 4 different places was carried out. pH of vended food was very acidic more than that of home made food.

Here the presence of living microbial organisms was verified almost all samples as well as home made food shows presence of

They are present as a resistant dormant form. Generally acquired from air, may be dust, dirt. The basic food material used in pizza bread, if not stored properly or unhygienic practices are employed in the handling; storing and its transportation may result in its getting contaminated with these organisms.

As homemade *pizza* is also showing presence of these organisms, improper packaging, storage & place of storage before it's marketing may be responsible for entry of these organisms.

As show in Table No. 97 – 96 and Figure No. 7

The vended food spore formers quantity is more than home made, that may correlate to the improper, unhygienic condition during its preparation and is adding to overall microbial population. These organisms may also enter via the salad, dressings, which are made on *pizza* bread, various other toppings made.

Presence of yeast cells in all the samples including home made is due to the use of these organisms in preparatory stage of bread for fermentation and well as desired sponginess in bread.

If these organisms are not pathogenic their presence may not be a matter of much concern.

The gram negative rods are a clear indication of presence of coliforms which is confirmed by their growth on MacConkey's agar medium, 'these generally enter in the food via water which is main cause of its spread. Unclear, no potable water which is unfit for human consumption is deployed in preparation of food and is responsible for contamination of such food items (If further their specificity is checked by growing them on other selective &

biochemical media, they do not belong to infectious / pathogenic group, then it may not be much concern. But if pathogenic contaminants are found, they are to proliferate with time and such food if left over, simply lead to increase in overall population & when consumed may result in enteric disorders.

Gram positive Cocci are found to be in family of Micrococaceae. Not all members are pathogens, they may be saprophytes also. These organisms are normally found as an inhabitant of human skin and mucous membrane. They may get entry into food via unhygienic practices of the persons who are responsible / involved in the preparation of such foods.

4.2.5 Burger

Table No. 98

STANDARD PLATE COUNTS IN *BURGER*

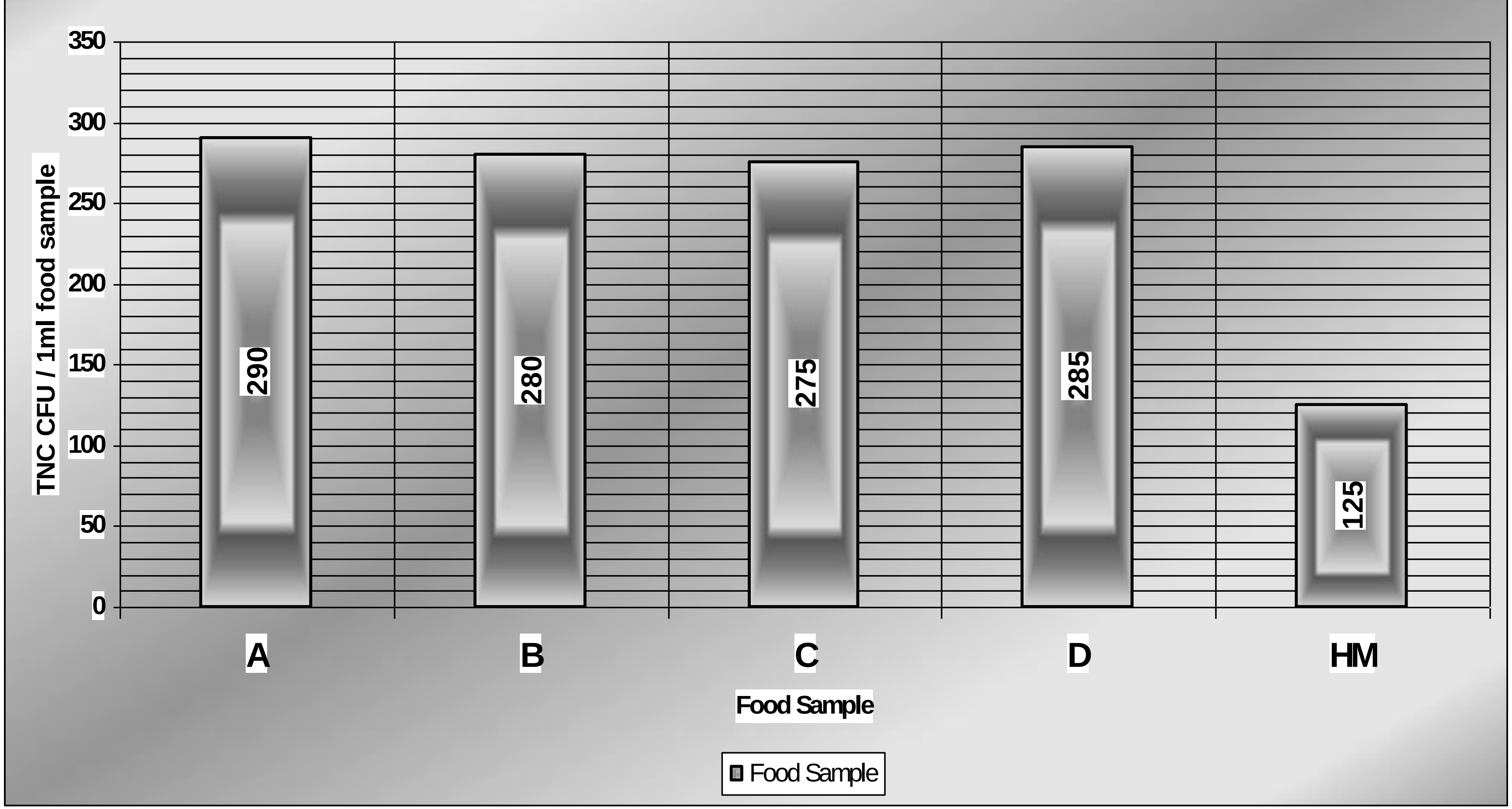
Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	3.9	290 $x10^2$	30	08	45	10	20
B	4.1	280 $x10^2$	25	09	60	15	18
C	4.0	275 $x10^2$	27	10	55	17	19
D	4.1	285 $x10^2$	32	09	50	20	20
HM	5.0	125 $x10^2$	20	08	35	05	07

Table No. 99

COLI FORM COUNTS IN *BURGER*

Food Sample	TNC CFU / 101 ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	10 $x10^2$	100
B	7 $x10^2$	100
C	9 $x10^2$	100
D	10 $x10^2$	100
HM	2 $x10^2$	100

Fig. No. 8 Comparative No. of CFU's of *Burger* from different areas and HM



Sample of *burger* were collected from 4 different places and they were analyzed for the presence of quantity and quality of microorganisms in them. All the samples exhibited less pH as compared to homemade food. The high acidity of these foods at first glance makes them inappropriate for human consumption on regular basis.

The microbial population was analyzed, by counting of number of CFUs which was almost triple in these samples as compared to the home made food. Such samples if left unattended and consumed after a gap of few hrs after preparation can be very harmful for health.

As show in Table No. 98 - 99 and Figure No. 8

The number of spore formers is again high in samples but spore formers are also present in home made food. The presence of spore formers can be attributed to the presence of raw vegetables, cheese etc. in it. May be presence of pau, which if not stored properly before use can also be responsible for gathering them from air dust of the environment, or from the environment where they are prepared & marketed.

The number of yeast cells present per sample is round about same to that found in home made samples. This may be due to baker's yeast used for fermentation during preparation of pau (bread) used in burger. Further analysis carried out on selective, biochemical Medias can help us to know if any pathogenic / infectious yeast is not present.

The number of gram negative short rods present in samples is higher than those present in home made food. These organisms are further grown on MacConkeys agar medium, exhibiting 100% viability and sufficiently high count of CFU's.

These organisms can be enteric pathogens, which can enter via contaminated water used for preparation of food at different stages.

Presence of gram positive Cocci in bunches & chain is also high in samples as compared to home made food. It ranges from 3-4 times more number of organisms. This indicates unhygienic conditions as well as unhygienic manual practices that may occur during its preparation & handling.

4.2.6 *Kacchi Dabeli Bread*

Table No. 100

STANDARD PLATE COUNTS IN *KACCHI DABELI BREAD*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.2	310 $x10^2$	12	25	42	35	50
B	4.8	295 $x10^2$	15	24	40	38	48
C	4.5	300 $x10^2$	17	22	45	37	49
D	4.9	315 $x10^2$	16	24	48	34	50
HM	5.3	150 $x10^2$	07	20	10	15	20

Table No. 101

COLI FORM COUNTS IN *KACCHI DABELI BREAD*

Food Sample	TNC CFU 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	50 $x10^2$	100
B	55 $x10^2$	100
C	58 $x10^2$	100
D	57 $x10^2$	100
HM	10 $x10^2$	100

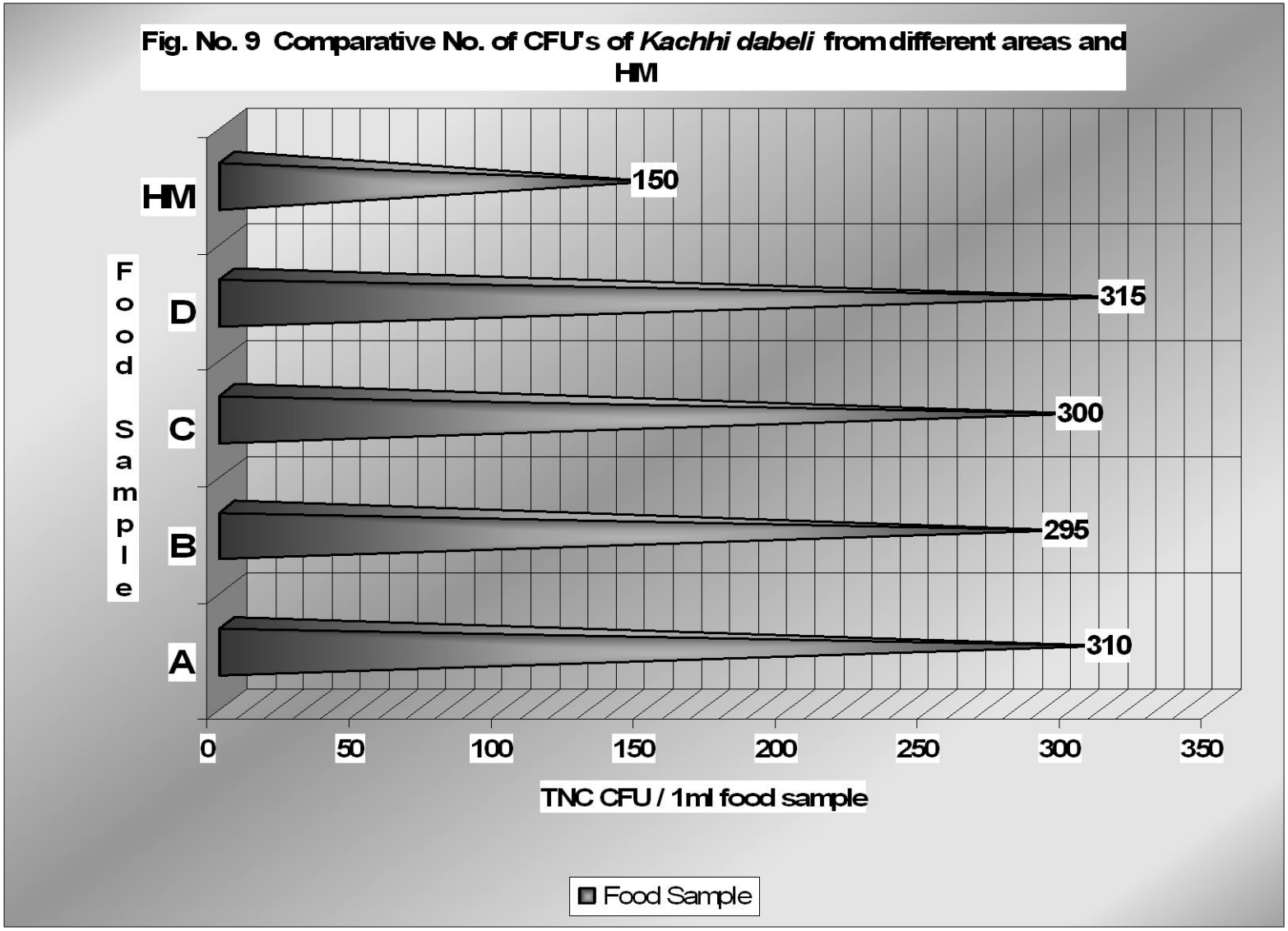


Fig. No. 9 Comparative No. of CFU's of *Kachhi dabeli* from different areas and HM
HM
D
C
B
A
Food Sample
150
315
300
295
310
0
50
100
150
200
250
300
350
TNC CFU / 1ml food sample
Food Sample

It is a type of food, which is quite famous in all age groups as well as it is cheaper.

When analysis of this food was carried out again pH of vended food was low as compared to home made food. The microbial analysis showed presence of large number of CFU in vended food, almost double of what is present in home made food.

As show in Table No. 100 -101 and Figure No. 9

The number of spore formers was high a clear indication of it's contaminated from dust and air, dirt. This type of contamination is found more in food sold from road stalls found in (rural) area where concrete roads are not present. Dust & mud is more, because of it chances of contamination by air borne microorganisms increases.

Yeast is found in almost all of the preparation. As in this food bread is used. Bakers yeast is used in the preparation of bread to bring about fermentation. Therefore presence of yeast (if baker's yeast) is not of much concern.

But if apart from it any other pathogenic yeast is present, then it can make food unfit for human consumption.

The gram positive rods present are in vended food quite high in number as compared to home made food. It is 5 times more in vended food. When these organisms are further grown on MacConkey's agar medium it shows 100% viability. Here gram negative rods are also present in home made food which is further confirmed by growth on different selective / biochemical media. It can give us clear picture regarding the organisms present and its nature (pathogenic or non pathogenic).

But presence of gram positive shorts rods indicates use of contaminated water in its preparation.

Presence of gram positive Cocci in bunch & Cocci in chain is high in vended food as compared to home made food.

Here as compared to Cocci present in bunches, the number of Cocci in chain is high. Indicating streptococci may be present which are generally present in fermented food. Here due to use of bread, presence of streptococci may be relevant.

Further investigation can help us to ascertain that if they are non pathogenic, can't be of a lot concern. Their presence can be considered as normal.

4.2.7 *Chinese Rice*

Table No. 102

STANDARD PLATE COUNTS IN *CHINESE RICE*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	5.0	175 $x10^2$	05	-	10	45	28
B	5.1	180 $x10^2$	03	-	15	40	30
C	4.9	190 $x10^2$	02	-	25	35	32
D	5.1	185 $x10^2$	05	-	22	38	29
HM	5.5	70 $x10^2$	-	-	01	10	08

Table No. 103

COLIFORM COUNTS IN *CHINESE RICE*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	5 $x10^2$	100
B	8 $x10^2$	100
C	10 $x10^2$	100
D	8 $x10^2$	100
HM	-	-

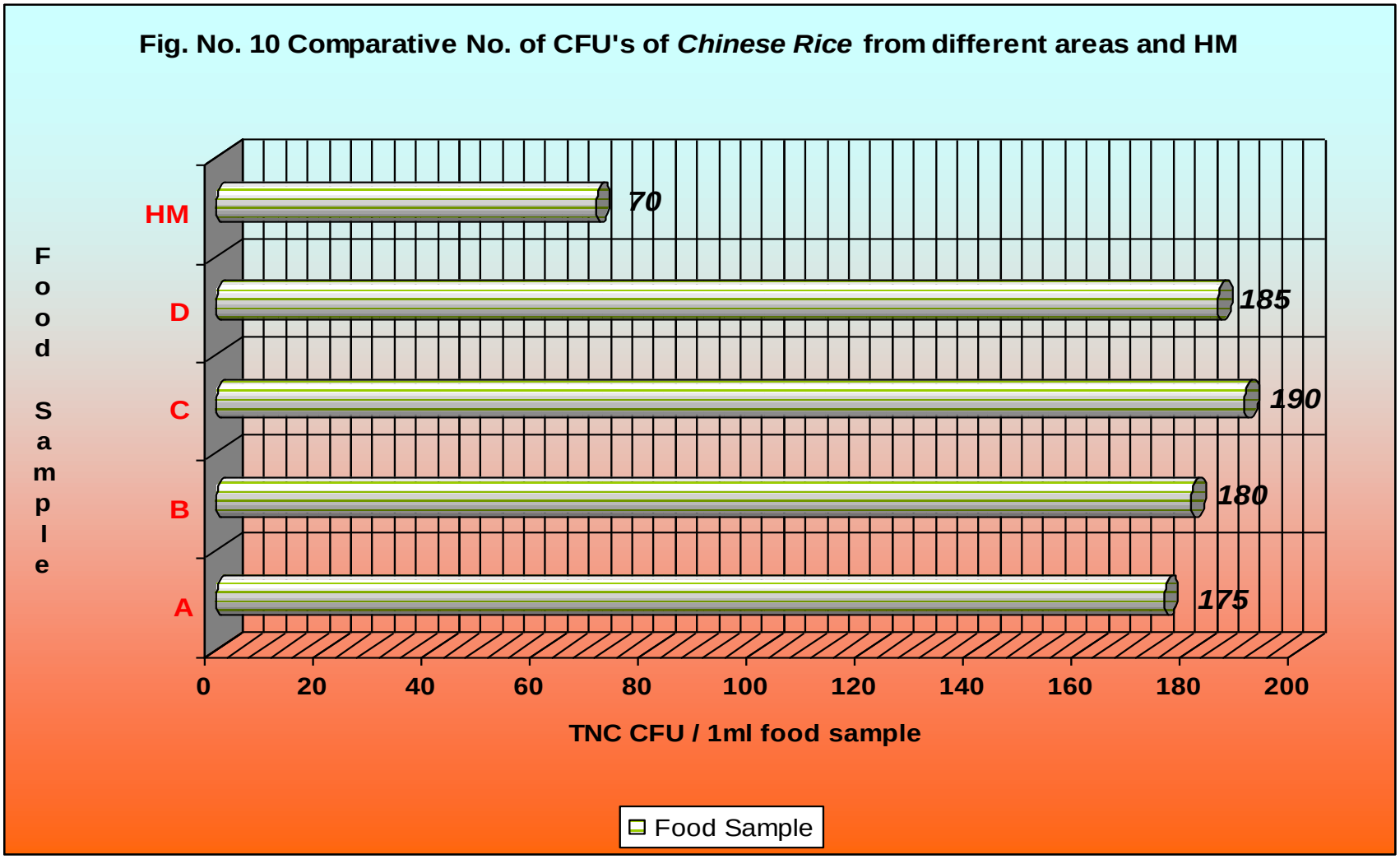


Fig. No. 10 Comparative No. of CFU's of *Chinese Rice* from different areas and HM
Food Sample
HM
D
C
B
A
70
185
190
180
175
0
20
40
60
80
100
120
140
160
180
200
TNC CFU / 1ml food sample
Food Sample

One of typical food product, widely consumed is *Chinese rice*. The product if home made has less acidity as compared to vended samples. The microbial assessment, gives a general idea of different types of microbial organisms that are present along with their amount.

All the vended samples show as usual a high count of CFU's as compared to home made food. At first glance it is not suitable, unsafe for human consumption. Although they all may not be infectious & / pathogens, but will contribute to an overall increase in human flora of intestine.

As show in Table No. 102 -103 and Figure No. 10

Spore former in vended food shows presence of spores, a clear indication of its being contaminated with dust. As this food, method of preparation involves, partial cooking in advance, which may be hours before it is actually consumed. This partially cooked food if not properly stored, not only will get contaminated, but also will serve as a good source or platform for breeding of these organisms. The spores can germinate as partial cooking (boiling) may serve as a heat shock helping (by serving as a stimulant) in germination of otherwise dormant spores. These spores germinate in-between time, which serves as incubation period may increase in population.

As the remaining process of cooking involves just tossing of partially cooked food, may not eliminate these organisms, vegetative cells that can easily withstand temperature of cooking 80-85^{o}C for 5-7 minutes.

Yeast cells is not present, indicating temperature of its storage 30^{o}C or above not suitable for growth, as pH of partially cooked food may also be (between 6-7) not suitable for their growth.

Gram negative rods are present in a large numbers in vended food, again a clear-cut indication of use of unsuitable unsafe or use of non-potable water in cooking of food.

Organisms' further growth on MacConkey's agar gives us a proof of presence of coliforms. Although completed confirmed test for detection of coliform is not done. But still chances of presence of coliforms can't be omitted, as non-potable water is one, which is contaminated with fecal contaminants.

Gram positive Cocci is present of in large numbers in vended food almost 3-4 times of what is present in home made food. This gives us a clear indication of unhygienic practices by manual staff involved in preparation of food. These unhygienic practices are one of most common reason for contamination of such food material by these organisms.

4.2.8 *Chinese Bhel*

Table No. 104

STANDARD PLATE COUNTS IN *CHINESE BHEL*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.5	200 $x10^2$	07	-	25	40	45
B	4.8	210 $x10^2$	10	-	20	38	40
C	4.6	180 $x10^2$	09	-	22	37	38
D	4.8	210 $x10^2$	10	-	24	34	42
HM	5.0	90 $x10^2$	-	-	10	12	15

Table No. 105

COLIFORM COUNTS IN *CHINESE BHEL*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	15 $x10^2$	100
B	17 $x10^2$	100
C	18 $x10^2$	100
D	17 $x10^2$	100
HM	5 $x10^2$	100

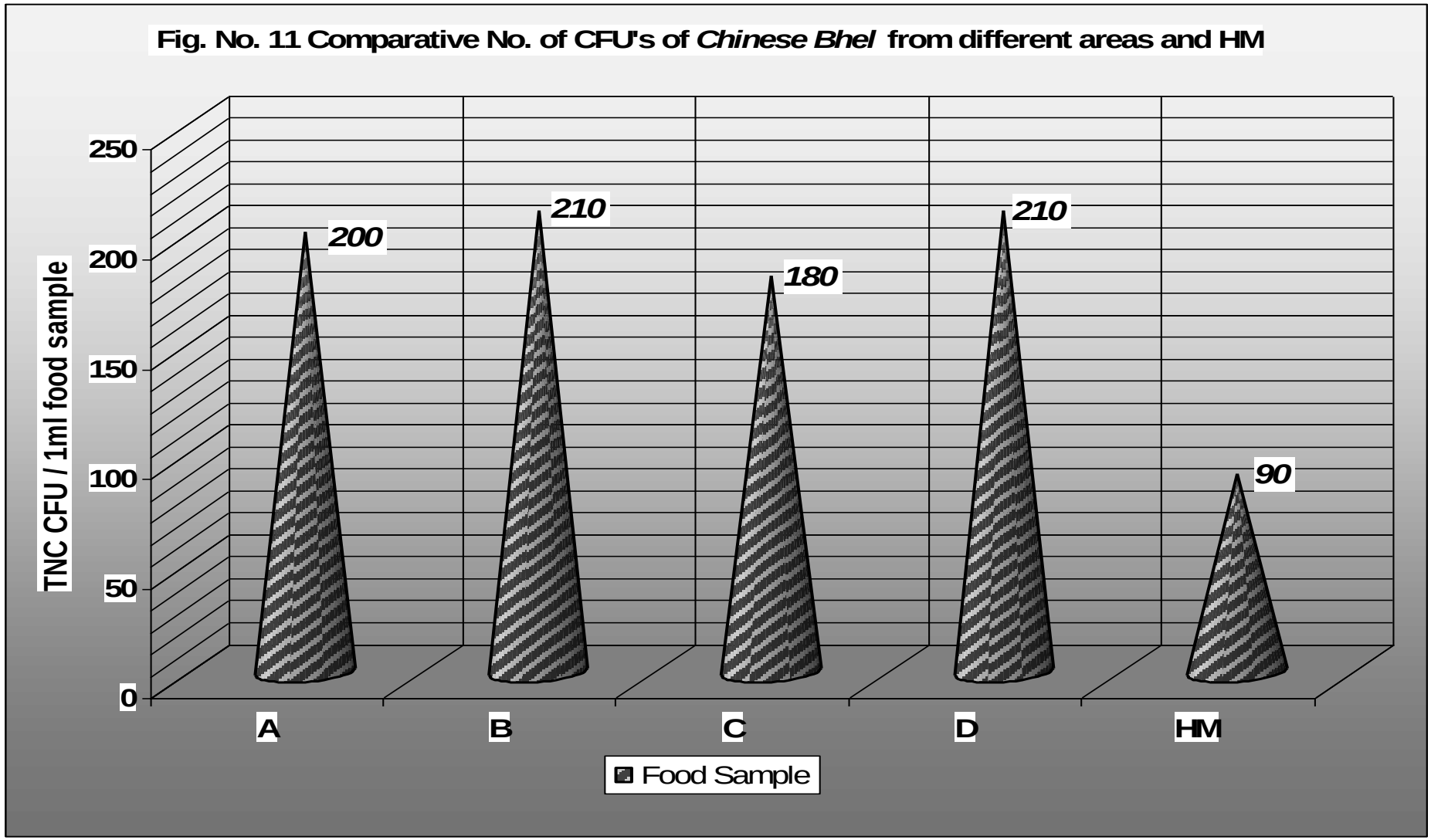


Fig. No. 11 Comparative No. of CFU's of *Chinese Bhel* from different areas and HM
TNC CFU / 1ml food sample
250
200
150
100
50
0
200
210
180
210
90
A
B
C
D
HM
Food Sample

Samples collected from different area of city were analyzed and correlated with home made sample.

Acidity of vended samples was high (pH low) as compared to home made. The total number of CFU, viable cells present in these samples was very high, on an average almost double of that of home made samples. The presence of viable organisms in itself is not a matter of large concern as not all microbial organisms are pathogenic majority of this is simply saprophytes. Saprophytes as such are not harmful, but they may affect alter the chemical constituents of food. Thereby reducing the nutritive value of food.

As show in Table No. 104 -105 and Figure No. 11

Spore formers in case of homemade food were completely absent as compared to vended food. These spore formers as mentioned earlier generally are air borne and enter via dust & dirt which may come in contact with food during course of its marketing. As a dormant, resistant, they can easily survive on dry material during its storage and later on act as a culprit in human body (cause infections).

Presence of gram negative road is a matter of concern, a clear indication of use of non-potable water. But if not pathogenic, their presence can be simply ignored.

Yeast is not found in these particular food samples. May be yeast being a mold, requires dampness, low temperature. As all the ingredients used in this preparation are dry, therefore stored in dry conditions where temperature is more than $30^{o}C$. So chances of proliferation of molds are very less.

Presence of gram positive cocci is a clear indication of unhygienic practices during its course of preparation and serving. Although most of them are saprophytes some potent pathogens also belong to this group and their presence cannot be completely ignored until and unless confirmed.

4.2.9 Mendu Vada

Table No. 106

STANDARD PLATE COUNTS IN *MENDU VADA*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.9	300 $x10^2$	15	08	25	40	60
B	4.6	290 $x10^2$	17	07	32	42	67
C	4.7	295 $x10^2$	18	07	35	44	65
D	4.6	280 $x10^2$	17	06	28	41	62
HM	5.1	170 $x10^2$	05	-	10	11	15

Table No. 107

COLIFORM COUNTS IN *MENDU VADA*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	10 $x10^2$	100
B	9 $x10^2$	100
C	15 $x10^2$	100
D	25 $x10^2$	100
HM	8$x10^2$	100

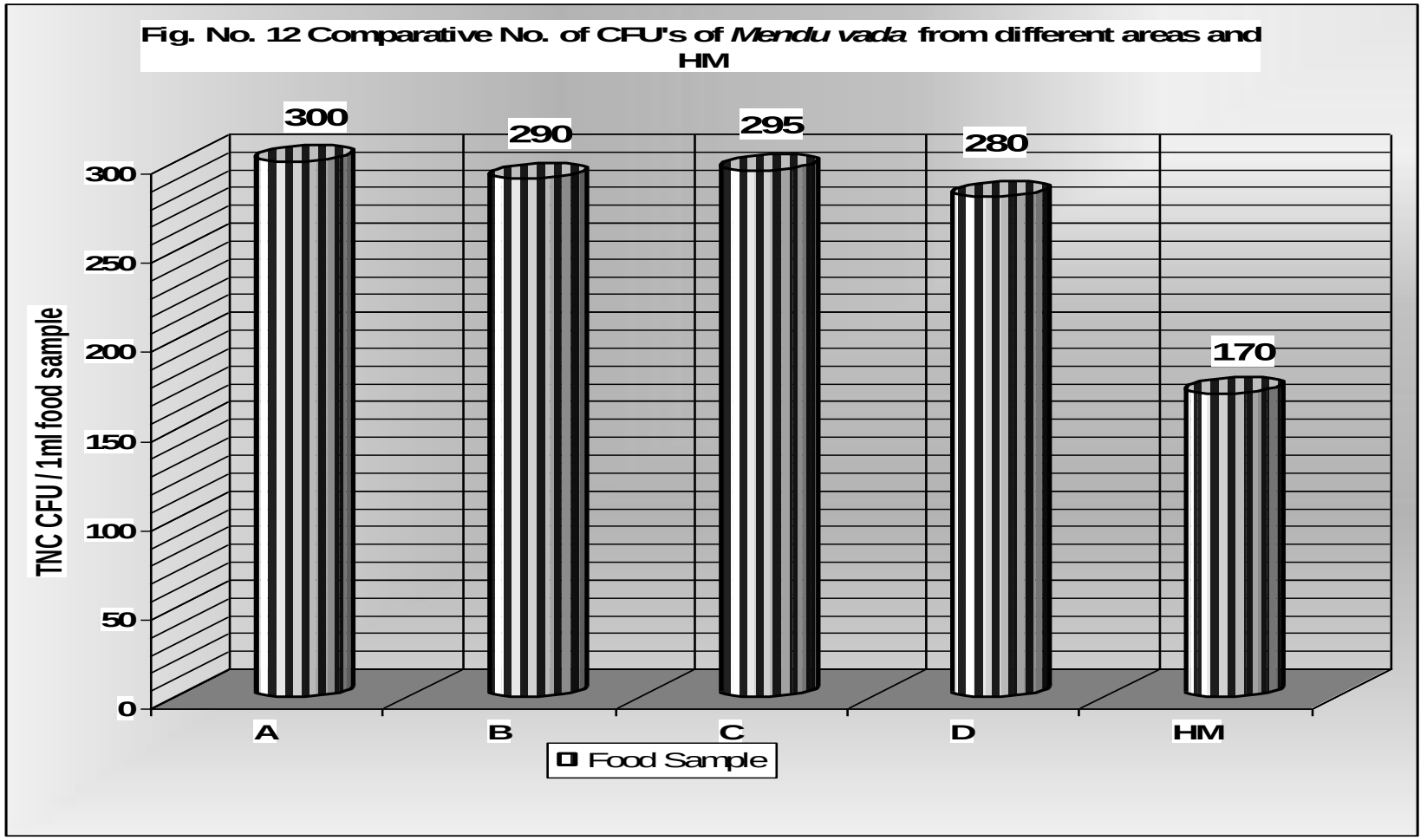


Fig. No. 12 Comparative No. of CFU's of *Mendu vada* from different areas and HM
TNC CFU / 1ml food sample
0
50
100
150
200
250
300
300
290
295
280
170
A
B
C
D
HM
Food Sample

Samples collected from different parts of city were analyzed for its overall acidity and microbial counts. The foods available from market were more acidic as compared to home made food. The more acidic taste is not good and harmful for human consumption.

The microbial analysis indicates presence of around double number of CFU's in these samples as compared to home made food. Again being fermented food living organisms may be presented in completely prepared food, if not harmful – does not matter much. But as number of CFU's in food samples from different places is high it indicates, its quality either not freshly prepared dough or may be not properly store, handled in a unhygienic manner. Again further investigation for absence of any pathogenic or infectious organisms may help us to know, whether it is fit or unfit for human consumption.

As show in Table No. 106 - 107 and Figure No. 12

The number of spore formers present in different food samples was almost 3-4 times of what was in home made food, clear indication of improper storage during course of preparation and utilization and consumption. As they can generally gain entry from air, dust where they may be present as dormant form. But presence of few spore forming organisms in home made preparation is a matter of concern and the reason & its source of entry into food needs to be ascertained so that it can be prevented.

Presence of yeast cells in different food samples, and its presence in homemade food is a clear indication of utilization of commercially available products for fermentation. Where as in home made food it is allowed to ferment by itself by help of normal flora which may be present in it.

Presence of gram negative short rods is a matter of concern. Almost all the samples showed their presence. The quantity was higher in vended samples compared to homemade food.

These organisms were further confirmed by growth on MacConkeys agar medium. They belong to coliform group. But as all organisms belonging to this group may not be pathogens. Further biochemical test and growth on selected media can help us to know exactly which organism is present. But the chances of this type of contamination, which is generally passed on by use of water unsafe for drinking, can't be ruled out.

Presence of these Cocci in vended sample was 4 times more than in home made food. The common reason behind it is the unhygienic practices of manual staff that is responsible for handling of the food during its course of preparation, storage and distribution.

4.2.10 *Masala Dosa*

Table No. 108

STANDARD PLATE COUNTS IN *MASALA DOSA*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	3.8	275 x10^2	25	05	42	36	50
B	4.1	270 x10^2	23	10	45	39	45
C	4.1	290 x10^2	20	08	47	40	49
D	4.5	275 x10^2	24	06	43	38	48
HM	5.0	90 x10^2	10	-	25	20	15

Table No. 109

COLIFORM COUNTS IN *MASALA DOSA*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	34 x10^2	100
B	40 x10^2	100
C	46 x10^2	100
D	38 x10^2	100
HM	-	-

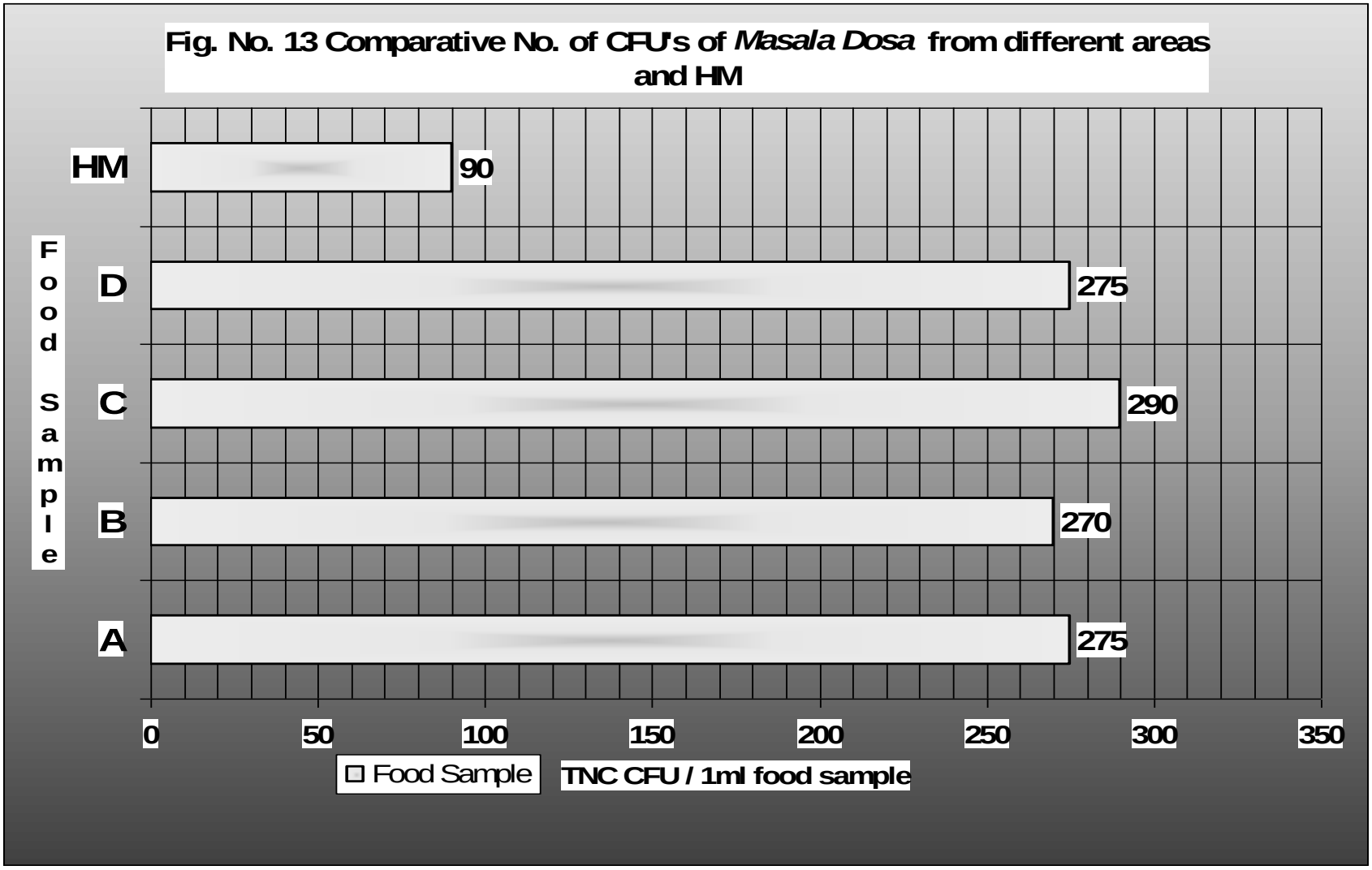


Fig. No. 13 Comparative No. of CFU's of *Masala Dosa* from different areas and HM
HM
D
C
B
A
90
275
290
270
275
Food Sample
0
50
100
150
200
250
300
350
Food Sample
TNC CFU / 1ml food sample

Masala Dosa is light in digestion and is one of major food article of some parts of our country. As such fermentation food products have been included in our diet as they contain helpful, microorganisms, which are friendly to our stomach; intestine and they help in digestion.

But many times if food batter is left unattended, it may get contaminated with other unwanted harmful organisms also, which may not only affect the nutritional quality of the food, but at the same time affect digestive system of its consumer.

These food contaminants may enter from surrounding environment, and then flourish, bloom easily as there is availability of appropriate environment suitable for their growth.

The overall acidity of food may increase and chances of other contaminants to flourish. These contaminants may remain as dormant forms but become activated on decrease in pH of medium.

The number of CFU is almost 4 times higher in vended food as compared to home made preparation. A clear indication that batter, which is prepared, is not fresh, as compared to home made batter. The more is time lapse between its preparation and consumption, more & more bacteria or other fermenting organisms will be produced. The quantitatively it will be giving us a very high microbial count.

As show in Table No. 108 - 109 and Figure No.13

The population of spore formers in vended food is high 2 to 2.5 times more as compared to home made food. This may be an indication of its being contaminated with dust / dirt or any other air borne organisms.

Yeast cells are completely absent in homemade food, but present in the entire commercially available food sample. This indicates preparation is allowed to undergo fermentation with help of marketed available fermenting

samples. Where as homemade it is allowed to ferment naturally no artificial fermenting agent are added.

Presence of gram negative short rods indicate use of improper cleaned vessels, clean non potable or water unsafe for human consumption during stages of its preparation & or cooking. All the samples commercially available show CFU on MacConkeys agar medium as compared to home made food where they are absent. This may be because of use of clean water, vessels & prevalence of hygienic condition in environment where it's prepared i.e. home.

Presence of gram positive Cocci is again 2-3 times more in food available from market as compared to home made food, may be because of unhygienic practices of the persons who ware responsible for preparation of food.

4.2.11 *Vegetable Kolhapuri*

Table No. 110

STANDARD PLATE COUNTS IN *VEGETABLE KOLHAPURI*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.7	260×10^2	20	02	40	35	38
B	4.6	265×10^2	22	05	45	37	40
C	4.8	270×10^2	24	04	44	39	41
D	4.5	280×10^2	20	02	41	36	43
HM	5.9	130×10^2	13	03	15	20	17

Table No. 111

COLIFORM COUNT IN *VEGETABLE KOLHAPURI*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	70 $x10^2$	100
B	60 $x10^2$	100
C	65 $x10^2$	100
D	67 $x10^2$	100
HM	12 $x10^2$	100

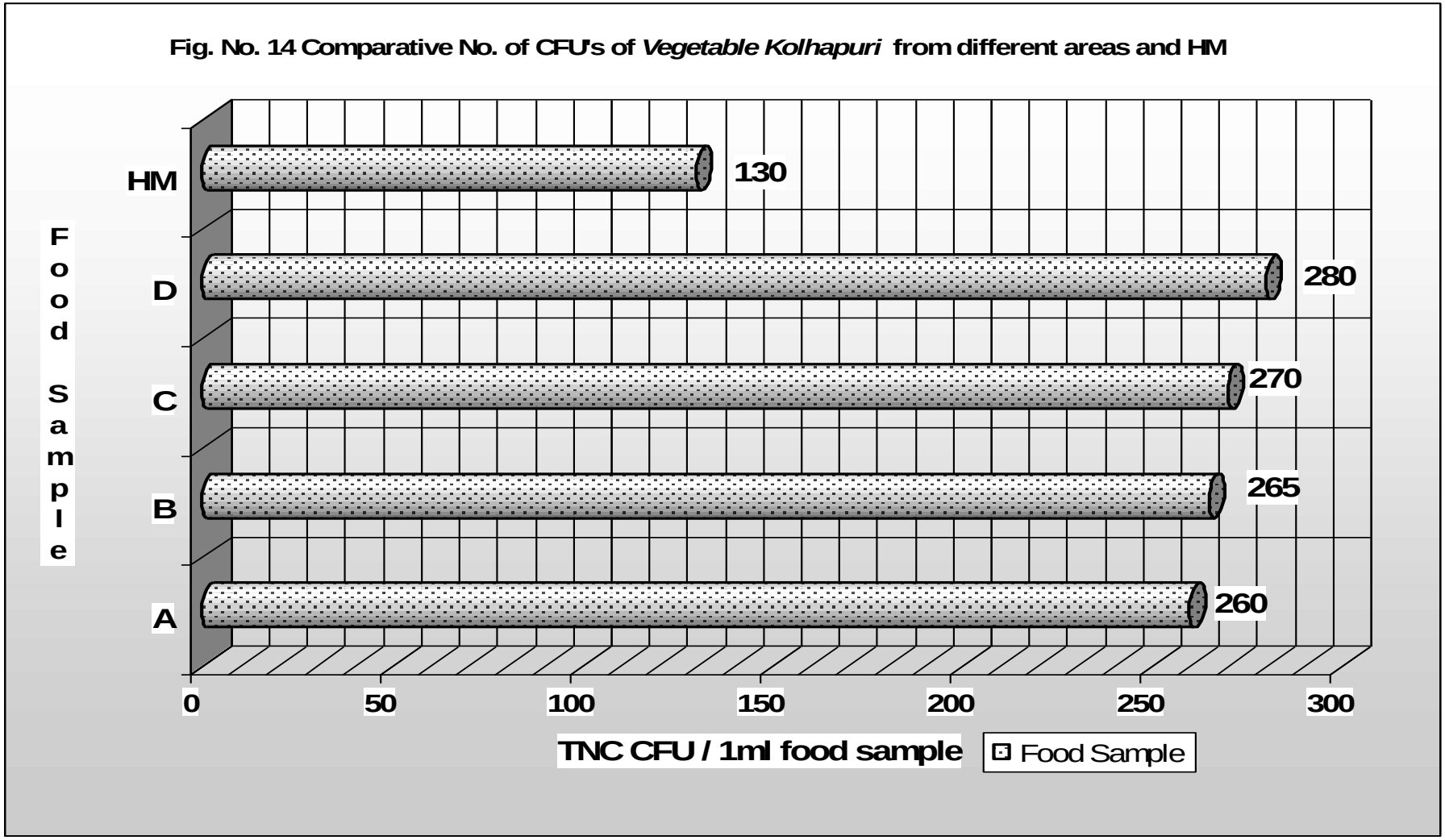


Fig. No. 14 Comparative No. of CFU's of *Vegetable Kolhapuri* from different areas and HM
Food Sample
HM
D
C
B
A
130
280
270
265
260
0
50
100
150
200
250
300
TNC CFU / 1ml food sample
Food Sample

The food sample collected from different locations of city showed high acidity as compared to home made food. A clear indication of more use of acidic ingredients or use of condiments that add to the overall acidity of completed food preparation, making it unsuitable, unsafe for consumption on daily basis. Microbial assessment showed large number of CFU / 1 ml food sample almost twice of that of food prepared at home. The presence of these microbial organisms can also help in contribution of more acidic condition in food. As presence of microbial organisms results in microbial activity utilizing different substrates and their decomposition. In the end products of decomposition are acids there by acidity as well microbial population both increase when there is a time lapse between preparation and consumption of such food.

As show in Table No. 110 – 111 and Figure No. 14

Spore forming organisms are found in almost all food preparation. Only difference is number of spore formers are high in samples commercially available as compared to food prepared at home. It may be contributed to the air borne pollution, dust, and dirt in vended sample. But to ascertain cause of presence of such spores in homemade sample is difficult necessary and a matter of concern. May be improper washing of vegetables used particularly if they are bought from road side stalls, and are stale & gathered dust which may have deposited on them & has not been washed during course of washing. These spore formers can easily withstand high temperature used in cooking and thereby later on affect the keeping quality of food after its preparation. Because food if left over after preparation, stored in inappropriate condition, will only result in germination of spores into vegetative cells, which affect the nutritional qualities as well as making it unfit for human consumption.

Presence of yeast cell in all samples as well as home made food is contributed by the use of curd, cheese, in such type of preparation. As these are fermented food products having fermentation organisms in them. These ingredients are generally added at last stages of cooking, or at end of preparation for purpose of garnishing may contribute to the over all microbial population in food.

Gram negative Rods are again detected in all food samples collected from different city areas including homemade food. Only difference is their population in vended samples is almost 2-3 times more as compared to home made food samples. The organisms are confirmed for presence of coliforms by growing them on MacConkey's agar medium. All vended samples show presence of large number of coliforms as compared to home made were number is few; presence of 1-2 coliform is also not desirable.

Gram positive Cocci is presence of these in large number particularly those in chain in vended food are again contributed to the use of curd, yoghurt, cheese in these foods. Presence of Cocci in bunch is generally due to unhygienic practices of vendors involved in preparation presence of Cocci in chain is also found in home made food, but as said earlier its contributed by use of curd, yoghurt, cheese added at last stages of cooking or garnishing of food.

4.2.12 *Paneer Tikka Masala*

Table No. 112

STANDARD PLATE COUNTS IN *PANEER TIKKA MASALA*

Food Sample	pH	TNC CFU / 1ml food sample	Gram staining Randomly Selected Colonies (% Viable count)				
			Spore Forms	Yeast Cell	Gram -ve rods	Gram +ve Cocci	
						In bunch	In chain
A	4.7	300 x10^2	10	09	50	18	30
B	4.3	300 x10^2	08	06	55	17	25
C	4.9	290 x10^2	09	08	50	22	22
D	4.7	280 x10^2	10	09	62	20	24
HM	5.1	150 x10^2	03	06	30	10	12

Table No. 113

COLIFORM COUNTS IN *PANEER TIKKA MASALA*

Food Sample	TNC CFU / 1ml Food sample	Gram staining Gram –ve Short rod (Presence %)
A	155 $x10^2$	100
B	65 $x10^2$	100
C	60 $x10^2$	100
D	62 $x10^2$	100
HM	10 $x10^2$	100

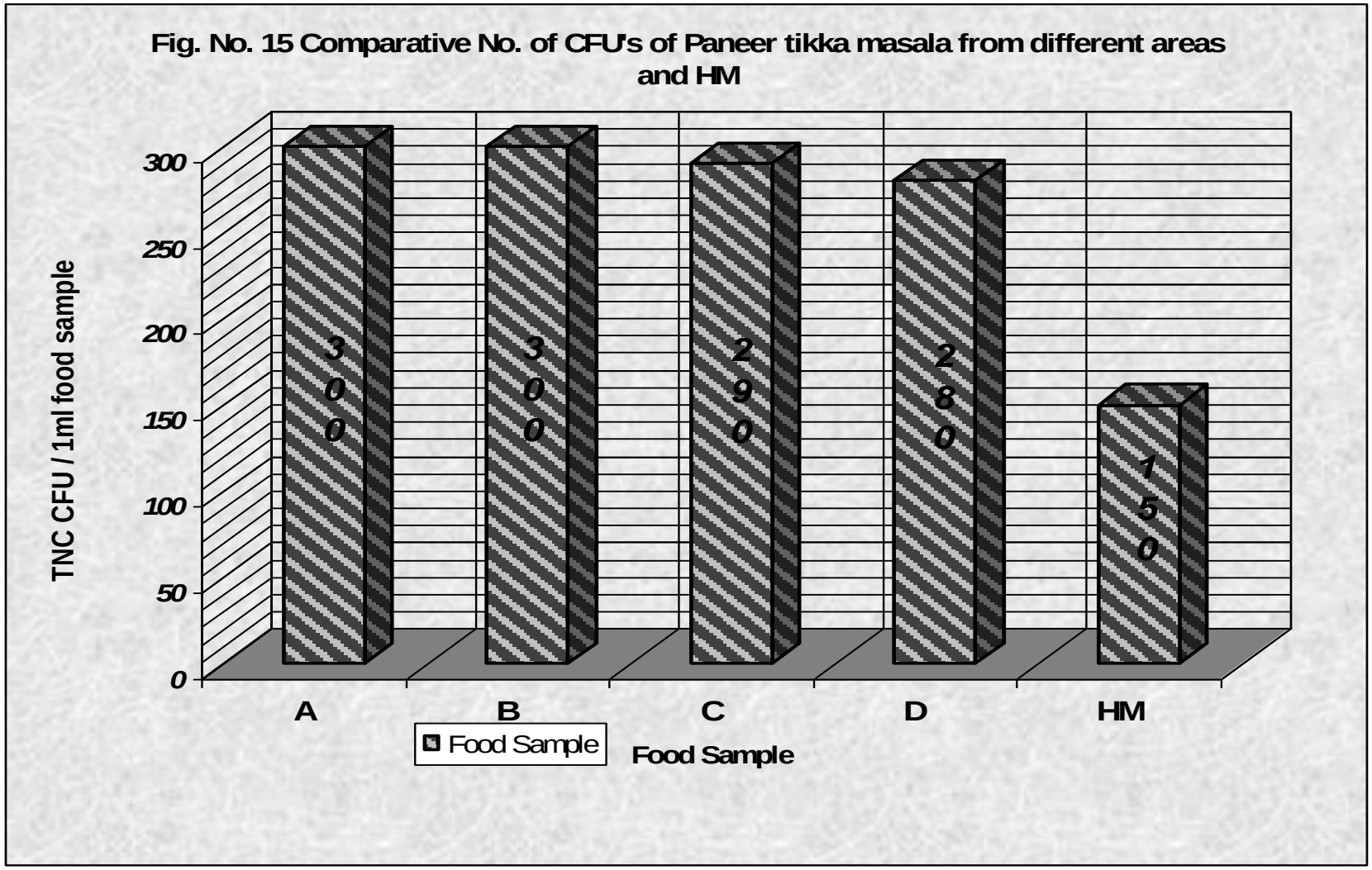


Fig. No. 15 Comparative No. of CFU's of Paneer tikka masala from different areas and HM
TNC CFU / 1ml food sample
300
250
200
150
100
50
0
3000
3000
2900
2800
150
A
B
C
D
HM
Food Sample
Food Sample

Food samples collected from different parts of city exhibited high acidity as compared to home made food. The presence of CFU's is again high in all the vended food samples as compared to home made. It's almost double a matter of concern. Here even home food is showing quite a large number of CFU's. But as one of major constituents is cottage cheese a fermented food product, so presence of living organisms can be attributed to it. Apart from it use of curd, cheese during preparation can also add to the overall microbial population in the food.

As show in Table No. 112 – 113 and Figure No. 15

The number of spore formers is high almost two to three times in vended food as compared to home made sample. Thereby making it undesirable food for human consumption. The cause of its presence in food should be ascertained and efforts should be made to prevent their presence in food.

They are Present in all samples is due to the use of curd, cheese, yoghurt. These organisms present are in vended food more as compared to home made food. But the number is not much high as compared to home made food.

Presence of these organisms itself is a matter of concern. Although not all of them are pathogenic or infectious. They are further confirmed by growth on MacConkeys agar medium all vended samples show a high viability of coliforms. But again if confirmed that they are not pathogenic / infectious, then further thinking can be done whether such food can be consumed & if consumed what are their chances of affecting the general health of the consumers.

These observed in all vended samples. Their quantity is almost double than that present in home made food giving a clear indication of unhygienic practices of handlers, person involved in preparation.

Presence of Cocci in chain may be due to use of curd & yoghurt, cheese in these preparations. All being fermented food products, added in later, last stages or for purpose of garnishing. Therefore may contribute to overall microbial population load in food.

The reason behind the microbial analysis of food is to prevent spoilage & the spread of food borne diseases. Food borne diseases are 2 types.

(1) Food Infections: are those in which microbial organisms are present in food at the time of eating, they grow in host and cause disease.

(2) Food intoxications: are those diseases in which microbial organisms grow in food, producing a substance therein which is toxic to man and animals.

Food poisoning is the toxicity introduced into food by microbial organisms & their products.

People generally do not eat food, which show visible spoilage but sometimes if the appearance, flavors and tastes are normal they do eat them. Certain foods may show no sign of spoilage and yet are responsible for food poisoning. The fact that organisms are present in food does not necessarily mean they are harmful. Most of the organisms that cause spoilage of food are harmless saprophytes.

However, there are some forms of illness caused by organisms, which are growing in foods.

Egs of food intoxications – *Staphylococcal* food poisoning and *botulism* as the ingestion of the toxin causes the diseases symptoms.

Egs of food infection – diseases like *Salmonellosis* and enteritis caused by *Salmonella sp.* and *Cl. perfringes* as these diseases are caused by ingestion of organisms.

4.3 HYGIENIC PRACTICES

Table No. 114
HYGIENIC AND SANITATION OBSERVATION OR SANITARY PRACTICES
(Pau Bhaji)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	-	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	-	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by Scratching/picking nose while work	1	-

Regarding hygienic and sanitation observation one out of four vendors were wearing clean clothes. None of them used apron or hair cap, washed hands before preparing food, nails were not clean and cut and they did not take precautions while coughing and sneezing.

On the contrary they were practicing unhygienic habits like smoking, chewing tobacco and spitting nearby and picking nose.

Table No. 115
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Pani Puri)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	1	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by	1	-
(d)	Scratching/picking nose While work	1	-

Here only 25% vendors were wearing clean clothes. Using aprons, their nails were cut and precautions while coughing and sneezing. None of them had healthy practices of washing hands before preparing food.

Vendors were found practicing one or other unhygienic habit of either smoking, chewing betel spitting or picking nose during work

Table No. 116

HYGIENIC AND SANITATION OBSERVATION OR SANITARY PRACTICES *(Bhel)*

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	1	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by	2	-
(d)	Scratching/picking nose While work	1	-

As a general rule it was observed that none of the vendors had habit of washing hands before preparations of food. While 25% of them were wearing clean clothes or using apron nails cut and taking precautions while coughing and sneezing during preparations.

Unhygienic practices observed during preparation like chewing tobacco, smoking, spitting, nose picking.

Table No. 117
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Pizza)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	2	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by	1	-
(d)	Scratching/picking nose While work	2	-

Only 25% of vendors were wearing clean clothes with nails cut and followed healthy practice of taking precautions during coughing, sneezing 50% of them used aprons and hair cap. None of them had habit of washing hands during preparation.

Chewing tobacco, picking nose was commonly observed and smoking and spitting in near of food preparing zone.

Table No. 118

HYGIENIC AND SANITATION OBSERVATION OR SANITARY PRACTICES *(Burgar)*

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	Nil	1
(b)	Using apron and hair cap	1	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	-	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by	2	-
(d)	Scratching/picking nose While work	1	-

As a general rule it was observed that none of the vendors had habit of washing hands before preparations of food, while 25% of them were wearing clean clothes or using apron. Nails were not clean and cut and they did not take precautions while coughing and sneezing.

Chewing tobacco, picking nose was commonly observed and smoking and spitting in near of food preparing zone.

Table No. 119

HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Kacchi bread)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	2	1
(b)	Using apron and hair cap	3	1
(c)	Washing hands before Preparation	1	1
(d)	Nails cut and while sneezing & Coughing	2	1
2.	**Unhygienic practices**		
(a)	Smoking during work	3	-
(b)	Chewing betel	4	-
(c)	Spitting near by	2	-
(d)	Scratching/picking nose While work	1	-

Only 50% wear clean clothes during preparation while 25% of them washed hands before preparation. Only 50 % were nails cut and had practice of taking precaution while sneezing and coughing while majority of them used apron and hair cap.

Vendors were found practicing one or other unhygienic habit of either smoking, chewing betel spitting or picking nose during work.

Table No. 120

HYGIENIC AND SANITATION OBSERVATION OR SANITARY PRACTICES *(Chinese Rice)*

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	-	1
(c)	Washing hands before Preparation	2	1
(d)	Nails cut and while sneezing & Coughing	-	1
2.	**Unhygienic practices**		
(a)	Smoking during work	2	-
(b)	Chewing betel	4	-
(c)	Spitting near by	1	-
(d)	Scratching/picking nose While work	1	-

Here vendors 25% were wearing clean clothes and 50% of them washed their hands before food preparation. None of them was using aprons or hair cap and took precautions while coughing or sneezing during food preparation.

All the vendors were found chewing betel, some (50%) also smoked and one -fourth had unhealthy practice of spitting and nose picking during food preparation.

Table No. 121
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Chinese Bhel)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	-	1
(c)	Washing hands before Preparation	2	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	4	-
(b)	Chewing betel	2	-
(c)	Spitting near by	-	-
(d)	Scratching/picking nose While work	1	-

One fourth were wearing clean clothes and had their nails cuts and were taking precaution during coughing and sneezing. One half had habit of washing hands before food preparation but none of them were apron or covered their hair while food preparation.

All vendors were found smoking half of them were also found chewing betel, picking nose, while none had habit of spitting nearby.

Table No. 122

HYGIENIC AND SANITATION OBSERVATION OR SANITARY PRACTICES *(Mendu Vada)*

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	1	1
(c)	Washing hands before Preparation	1	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	2	-
(b)	Chewing betel	3	-
(c)	Spitting near by	2	-
(d)	Scratching/picking nose While work	1	-

One out of four vendors (only 25% vendors) had the habit of wearing apron clean clothes had cut nails or washed hands before preparation.

While only 25% had the habit of picking nose while 50% smoked and spitted nearby and75% were found chewing betel during work.

Table No. 123
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Masala Dosa)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	2	1
(b)	Using apron and hair cap	3	1
(c)	Washing hands before Preparation	1	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	2	-
(b)	Chewing betel	2	-
(c)	Spitting near by	1	-
(d)	Scratching/picking nose While work	1	-

Only 50% were clean clothes during preparation while 25% of then washed hands before preparation and had nails cut and had practice of taking precaution while seizing and coughing while majority of them used apron and hair cap.

One out of four vendors had habit of picking nose and spitting near by while one half of them had habit of smoking and chewing betel during food preparation.

Table No. 124
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Vegetable Kolhapuri)

Sr. No.	Details	No. of Vendor's (Out of four)	Home made (Only one)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	1	1
(b)	Using apron and hair cap	1	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	1	1
2.	**Unhygienic practices**		
(a)	Smoking during work	1	-
(b)	Chewing betel	2	-
(c)	Spitting near by	1	-
(d)	Scratching/picking nose While work	1	-

None of the vendors had the habit of washing hands before food preparation while one of four had habit of wearing apron, clean clothes, keep nails cut and took precaution during coughing and sneezing.

Only one of four had unhygienic practice of smoking spitting nearby or picking nose while half of them had practice of chewing betel during work.

Table No. 125
HYGIENIC AND SANITATION OBSERVATION
OR
SANITARY PRACTICES
(Paneer Tikka Masala)

Sr. No.	Details	No. of Vendor's Out of (4)	Home made Only (1)
1.	**Hygienic practices**		
(a)	Wearing clean clothes	-	1
(b)	Using apron and hair cap	2	1
(c)	Washing hands before Preparation	-	1
(d)	Nails cut and while sneezing & Coughing	-	1
2.	**Unhygienic practices**		
(a)	Smoking during work	3	-
(b)	Chewing betel	4	-
(c)	Spitting near by	2	-
(d)	Scratching/picking nose While work	2	-

None of vendors were wearing clean clothes or washed hands before preparation and had nails cut or practiced safe methods during coughing or sneezing. While one half of them were found wearing aprons.

While all the vendors were found chewing tobacco during the work and majority of them were found smoking. Half of them had habit of spitting here and there and picking of nose during work.

The studies have shown that overall microbial count in vended food samples is high as compared to home made food.

The contaminations of foods are from the natural sources that takes place before food are harvested or gathered or during handling, processing of the raw products before they enter in market. This point if responsible for contamination it is applicable to both vended and home made food.

Additional contamination may come from the equipments coming in contact with food during processing. As a general rule vendors are using equipments haphazardly without taking care of its cleaning, sanitation before and after its use. If not properly cleaned and kept as such the number of microbial organisms present on equipment simply increase and add to the microbial count of the food, for processing of which its used later. Contamination of food during handling and processing is of major concern. It is adds to overall count of microorganisms present in food.

Personnel engaged in food processing, preparation could contaminate food during handling and processing. Studies by various workers suggest that human beings shed from 10^3 to 10^4 viable organisms per minute. The numbers and type of organisms shed is closely related to the working environment.

The role of food handlers in food borne disease outbreaks have been clearly demonstrated, therefore from public health aspect this source of contamination has received considerable attention.

The main reasons for contamination of food-by-food handlers are,

(1) Unhygienic environment where food is prepared.
(2) Use of improperly cleaned / sanitized utensils, equipments during the preparation of food.
(3) Improper care in storage of food during and after its preparation.
(4) Hands and clothing's of workers can serve as intermediate sources of contamination.
(5) Unhygienic practices of vendors.

The hygienic practices used at home are far beyond the reach of vendors. As the environment and the conditions prevailing at both these places are wide apart.

But still the unhygienic practices of vendors can result in overall increase of contamination or microbial count of food.

The practices like smoking, chewing of tobacco, betel Etc. As during this type of activities there is a constant movement of lips, and tongue and talking while doing this work, chances are there that few organisms present in oral cavity of mouth are released in air and from there they can settle on food thereby contaminating it.

During sneezing when droplets in form of fluid are released into environment settle on dust and are dust may later on contaminate food.

Whenever a person sneezes or coughs or spits in that area or in the near vicinity, there are chances of releasing microorganisms, which may directly or indirectly settle on food contaminating it.

Directly when vendors or persons involved, sneeze or cough without taking any precautions like keeping a handkerchief on mouth. The microbial organisms are directly released from mouth & or nose into the atmosphere near by.

Indirectly they may cover their nose or mouth while sneezing or coughing with handkerchief, or their own clothes or with any piece of cloth available. If they later clean their hands with those clothes, they contaminate their hands. Many times same cloth is used as a mop, or a cloth for cleaning of plates, or holding serving spoon etc.

Cleaning their hands with the clothes wore by them also contaminate them. Many times if nothing is available they use them (wore clothes) for cleaning the plates also.

Another such problem is excessive sweating of these people. They are use of same clothes, for cleaning it, or simply draining it of by hands. As sweat is also a type of body secretion, which comes in contact with skin, it gets contaminated with normal flora of skin. Many times this may also fall in food. If there are open wounds, abrasions on skin, it gets contaminated with the organisms present over there also.

One of most prevalent unhygienic practice among vendors is scratching or pricking of nose. With them having long uncut, unclean nails full with dirt and grim. Later on when with same hands after washing or without properly washing or as such used for handling of food. The dirt of nose which may be present on such washed / unwashed or improperly washed hands can also result in overall increase in microbial count of food.

Particularly vendors use their hands at many stages of food preparation for mixing of food, addition of various ingredients, spices by hands also results in overall increase in microbial population of food.

Use of unclean, dirty clothes for cleaning of hands, mopping the platform or their area of work or for cleaning the plates it further contaminates them rather than cleaning and it adds to overall microbial population rather than reducing it.

If persons are suffering from any contagious disease, their body secretions like breath or sneeze may contaminate and infect food with microorganisms. Therefore overall health & personal hygienic of persons involved in handling of food is of importance & major concern.

Chapter – 5
SUMMARY & CONCLUSIONS

5.1 SUMMARY

In the present study, knowledge gained through this study will help people to understand the importance of food they eat. It will help them in changing their eating practices and motivate them to eat nutritious and hygienic foods.

The present study was important for the larger community interest. The present study was conducted in Rajkot city, which is the largest city of Saurashtra region. Vendor's food items are very popular in Rajkot city and various popular food zones. Main four places were selected, as maximum public is taking advantage of these lorries. Researcher has selected twelve recipes from each of the zones and the same food items were also prepared at home to evaluate nutritional as well hygienic profile. Study was carried out considering nutritional importance and microbiological assessment and hygienic assessment of the foods sold by small vendors and home made foods.

The data was collected using chemical methods and observation methods. Assessment of nutritional quality was done by chemical methods. Analysis of carbohydrate, protein, fat, fiber, moisture, thiamine, Riboflavin, Niacin, ascorbic acid, Iron, calcium, sodium, potassium was done. Microbiological assessment was done by developing colonies on nutrient agar and MacConkey's agar and hygienic assessment was done by only observation methods. All vended food was compared with home made foods.

This study's results would help the society choosing proper and qualitative foods. The people of Rajkot city are health conscious and diet conscious. They will be able to take scientific decision what to eat and what not to eat, most people like eating small vendor's foods such foods are frequently eaten by school or college girls and boys and working women. The

counts will thus benefit economically whenever they become health conscious a number of nutritional deficiencies and food poisoning can be kept at bay.

The bulk of food borne illness is associated with microbiological contamination of foods. Same time home made food is rich in nutrients and microorganisms are very less. Most of the people daily eating outside the home, cannot always afford expensive food from hotels, restaurants. Vended food is easily available at cheaper rates. This study will be able to find out nutrients and which microorganisms are present in small vendor's foods. Vendor's food is very cheaper, but does not maintain good health. People will know about difference between home made food and vendor's food by this study. Unhygienic foods items are rich in cholesterol is also identified by this study.

People are provided with scientific knowledge about food they eat; it will be of great help to them and scientific knowledge about vended foods, and making choice of food items.

5.2 CONCLUSION

All the samples, which were collected from different places of Rajkot, showed low pH, or were highly acidic. There may be two reasons for it.

5.2.1 Pau bhaji

The vended food had low pH and presence of various microorganisms. Its preparation was found to be done in unhygienic condition.

5.2.2 Panipuri

Water used for panipuri was highly acidic and containing large number of microorganisms that may act as opportunists and attack the body when overall defence mechanism of body is weak.

5.2.3 Bhel

Although major constituents are dry but it's rich in spore forming microorganisms due to its unhygienic and unhealthy preparation condition.

5.2.4 Pizza

Here although presence of certain saprophytes it's observed which may Serve as opportunists. Their entry into food via unhygienic preparation practices can't be ruled out.

5.2.5 *Burger*

The presences of enteric pathogens into food make it unsafe for food consumption. The unhygienic condition and manual practice are responsible for it.

5.2.6 *Kacchi Dabeli Bread*

Presence of gram negative organisms in food is a matter of concern. If they are not pathogenic it can be simply taken for presence, but if pathogenic, can result in intestinal disorders.

5.2.7 *Chinese Rice*

Presence of specific organisms indicates its unhygienic storage and manual practices in its handling. But presence of coliforms is a matter of concern and should be detected. Whether or not they are serious intestinal pathogens transmitted non potable water.

5.2.8 *Chinese Bhel*

Food materials are not stored and prepared hygienically and its responsible for overall microbial count of food material.

5.2.9 *Mendu Vada*

Presence of gram negative organisms indicates use of non potable water and unhygienic practices are responsible for overall microbial count of food sample.

5.2.10 *Masala Dosa*

Unhygienic preparation of food use of non potable water in all collected samples is matter of concern and thorough thinking is necessary before consuming such products from health point of view.

5.2.11 *Vegetable Kolhapuri*

Use of non potable water during preparation of food harvested unhygiencally or grown in sewage water responsible for coli forms were present in all samples, which is great concern.

5.2.12 Paneer *Tikka Masala*

Presence of coli form indicates unhygienic practices of person involved in food preparation along with use of non potable water.

Use of ingredients like citric acid in food is observed, so as to make them tangy, in taste. The tangy taste of these foods is main reason for their consumption. Although this tangy taste savors our taste bud, changes the taste of our mouth for some time. But all people know that such type of food is very harmful to us and our digestive system. It increases overall acidity and in the long term may be a possible reason for the development of ulcers, that can't be ruled out. Viruses are also potent pathogens, which may be transmitted through air, water.

Whenever fermented foods or fermented products are used in any type of food preparation then chances are there, they may contribute to microbial population of such food preparation.

Fermentation food products are generally stored in refrigerators at low temperature, when these organisms can't proliferate. And in baked fermentation products also they are destroyed at high temperature of baking. And these fermented products have a time specified on them, the time period during which they have to be consumed after their production. But if during storage appropriate environment is not available, it may serve as a source or breeding ground for organisms. When such food products are used in preparation of other food, they contribute to overall microbial population of that food.

Presence of different types of spherical bacteria in bunches / chains – cocci in food is an indication of unhygienic practices. The population or microbial count of such organisms is very less in home made food, clear indication that hygienic standards are maintained when foods are prepared at home as compared to restaurants, hotels or at roadside stalls.

The maintenance of hygienic conditions, during preparation of food as well as cleans and dust free environment of home.

Another reason for an overall high microbial count of different food samples collected from different parts of city. Is that these foods are generally not freshly prepared. At homes foods are freshly prepared and if left over they are stored in proper hygienic conditions, temperature. The conditions of storage generally help in blooming of microorganisms already present, overall microbial count increase as time lapse after its preparation increases.

By using the above mentioned procedures different nutrients were analyzed, nutrient content of all the samples was observed from carbohydrate and proteins were higher in home made sample. Fat is higher in vended food while water soluble vitamins like vitamins B_1, B_2, B_3, vitamin C and minerals like calcium, iron and sodium were considerably lower in food samples prepared by small vendors. This is because small vendors start preparation of foods very early like cutting of vegetables or they may be practicing reheating very often so that water-soluble vitamins get destroyed.

Thus it comes in form of a advice that home made food is better than food available from roadsides in each and every aspect. It is good for health, nutritious and of course economical on our pocket.

5.3 Suggestions

Several studies have been undertaken to determine the nutritional content of street foods. To obtain a better profile of the nutritional aspects of street foods, an additional study may be necessary for different groups of the population, particularly the children and women. This would assist the estimation of the percentage of the daily nutrient requirements met from these sources. Such information could then be used in developing education for the consumers and also for training of vendors to promote preparation of more nutritious foods.

5.4 Recommendations For Further Study

(1) Assessment of food adulterants that may be in food sold by street vendors.

(2) Analysis of typical food borne pathogens that may be in particular food (responsible for various types of food poisoning).

(3) Training of vendors regarding preparation of food and maintenance of prepared food such that its nutrient value is maintained fit for consumptions were after 6-8 hrs. of preparation.

(4) A general survey of people who consume at least 4 times vended food in a week and for type of routine ailments they suffer from.

(5) Nutritional assessment of hot drinks and aerated vended drinks.

(6) Nutritional and hygienic comparison of vended foods with restaurant and star hotels.

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ENGLISH VERSION OF QUESTIONNAIRE

Daxa G. Solanki
Smt. S. B. Gardi
Institute of Home Science,
Saurashtra University,
RAJKOT.

Dear Madam,

Ingredients and weight of your homemade food is important for my research work. So pleases provide me following information.

(1) NAME: _____
(2) Number of Family Members: _____
(3) Monthly Income of family:

More then 15,000 ☐
More then10, 000 ☐
More then 8,000 ☐

INFORMATION AND INGREDIENTS OF HOMEMADE RECIPES

1. Weight of ingredients for paubhaji, for how many persons? _____

Potato _____ gm/kg.
Tomato _____ gm/kg.
Onion _____gm/kg.
Cabbage _____gm/kg.
CauliFlower _____gm/kg.
Beans _____gm/kg.
Brinjal _____gm/kg.
Gourd _____gm/kg.
Oil _____gm/kg.
Butter _____gm/kg.
Garlic _____gm/kg.
Lemon _____gm/kg.
Spices _____gm/kg.
water _____gm/kg.
Refined wheat flour_____gm/kg.

2. Weight of ingredients for panipuri, for how many persons? _____

Wheat flour (refined)	_____gm/kg.
Rava	_____gm/kg.
Bengal gram	_____gm/kg.
Potato	_____gm/kg.
Puddina	_____gm/kg.
Coriander	_____gm/kg.
Date	_____gm/kg.
Oil	_____gm/kg.
Onion	_____gm/kg.
Lemone	_____gm/kg.
Jaggery	_____gm/kg.
Tamarind pulp	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.

3. Weight of ingredients for Bhel, for how many persons? _____

Puffed Rice	_____gm/kg.
Potato	_____gm/kg.
Tomato	_____gm/kg.
Onion	_____gm/kg.
Bengal gram (whole)	_____gm/kg.
Wheat flour (refined)	_____gm/kg.
Green chilly	_____gm/kg.
Coriander	_____gm/kg.
Date	_____gm/kg.
Tamarind pulp	_____gm/kg.
Pomegranate	_____ _gm/kg.
Sev	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.

4. Weight of ingredients for Pizza, for how many persons? _____

Wheat flour (refined)	_____gm/kg.
Chees	_____gm/kg.
Tomato	_____gm/kg
Onion	_____gm/kg.
Potato	_____gm/kg.
Cabbage	_____gm/kg.
Butter	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.
Oil	_____gm/kg.

5. Weight of ingredients for Burger, for how many persons? _____

Wheat flour (refined)	_____gm/kg.
Potato	_____gm/kg.
Onion	_____gm/kg.
Tomato	_____gm/kg.
Green chill	_____gm/kg.
Cheese	_____gm/kg.
Butter	_____gm/kg.
Water	_____gm/kg.
Spice	_____gm/kg.

6. Weight of ingredients for Kacchi Bread, for how many persons? _____

Wheat flour (refined)	_____gm/kg.
Potato	_____gm/kg.
Onion	_____gm/kg.
Groundnuts	_____gm/kg.
Bengal Gram dal	_____gm/kg.
Sev	_____gm/kg.
Green chill	_____gm/kg.
Tomato	_____gm/kg.
Tamarind pulp	_____gm/kg.
Pomegranate	_____gm/kg.
Lemon	_____gm/kg.
Date	_____gm/kg.
Garlic	_____gm/kg.
Water	_____gm/kg.
Spice	_____gm/kg.

7. Weight of ingredients for Chinese Rice, for how many persons? _____

Rice	_____gm/kg.
French Beans	_____gm/kg.
Cabbage	_____gm/kg.
Onion	_____gm/kg.
Cheese	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.
Sauces	_____gm/kg.

8. Weight of ingredients for Chinese Bhel, for how many persons? _____

Noodles	_____gm/kg.
Groundnuts	_____gm/kg.
Cabbage	_____gm/kg.
Corn Flour	_____gm/kg.
Tomato	_____gm/kg.
Onion	_____gm/kg.
Cheese	_____gm/kg.
Spice	_____gm/kg.
Sauce	_____gm/kg.
Water	_____gm/kg.

9. Weight of ingredients for Mendu vada, for how many persons? _____

Black gram dal	_____gm/kg.
Oil	_____gm/kg.
Green gram dal	_____gm/kg.
Onion	_____gm/kg.
Tomato	_____gm/kg.
Potato	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.

10. Weight of ingredients for Masala Dosa, for how many persons? _____

Black gram dal	_____gm/kg.
Rice	_____gm/kg.
Oil	_____gm/kg.
Potato	_____gm/kg.
Onion	_____gm/kg.
Tomato	_____gm/kg.
Green gram dal	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.

11. Weight of ingredients for Vegetable Kolhapuri, for how many persons? _____

Tomato	_____gm/kg.
Onion	_____gm/kg.
Oil	_____gm/kg.
Cheese	_____gm/kg.
Cabbage	_____gm/kg.
Butter	_____gm/kg.
Cauli Flower	_____gm/kg.
French beans	_____gm/kg.
Coriander leaves	_____gm/kg.
Capsicum	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.

12. Weight of ingredients for Panner Tikka Masala, for how many persons?

_____

Paneer	_____gm/kg.
Tomato	_____gm/kg.
Onion	_____gm/kg.
Coriander	_____gm/kg.
Cheese	_____gm/kg.
Spice	_____gm/kg.
Water	_____gm/kg.
Oil	_____gm/kg.

THANK YOU