A STUDY ON NUTRITIONAL AND HEALTH STATUS OF SALT WORKERS

THESIS SUBMITTED TO
SAURASHTRA UNIVERSITY FOR
THE DEGREE OF

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IN
HOME SCIENCE

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I hereby declare that,

- The research work presented in this thesis entitled "*The Study of Nutritional and Health Status of Salt Workers"* 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.

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Date:

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Date:

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:

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CHAPTER 1
INTRODUCTION

It is admitted that the health efficiency and longevity of a race depends chiefly upon good nutrition, which is derived from appropriate food. Human body is a working machine that derives the driving force mainly from the fuel of food. It is an aggregation of innumerable living cells in which diverse chemical change are continuous. The body can neither perform its vital function nor repair the constant wear and tear of body without the proper balance of chemical compounds in all its tissues and fluids. These compounds must be derived from a well balanced diet.

Diet plays an important role in formation of blood, bones and muscles. Thus iit is rightly said by Dr. Rath Leverton “Food Becomes You”. If you eat wrong food you become wrong. Nutrition has been defined as “the food you eat and how your body uses it.” The physiologic need for food is actually the need for nutrients. Nutrients are the chemicals obtained from food that allow proper functioning of the body.

Nutrition may be defined as the science of food and its relationship to health. It is concerned primarily with the part played by nutrients in body growth, development and maintenance The word Nutrient or ‘food factor’ is used for specific dietary constituents such as proteins, vitamins and minerals. Dietetics is the practical application of the principles of nutrition; it includes the planning of meals for the well and the sick. Good nutrition means “maintaining a nutritional status that enables us to grow well and enjoy good health.

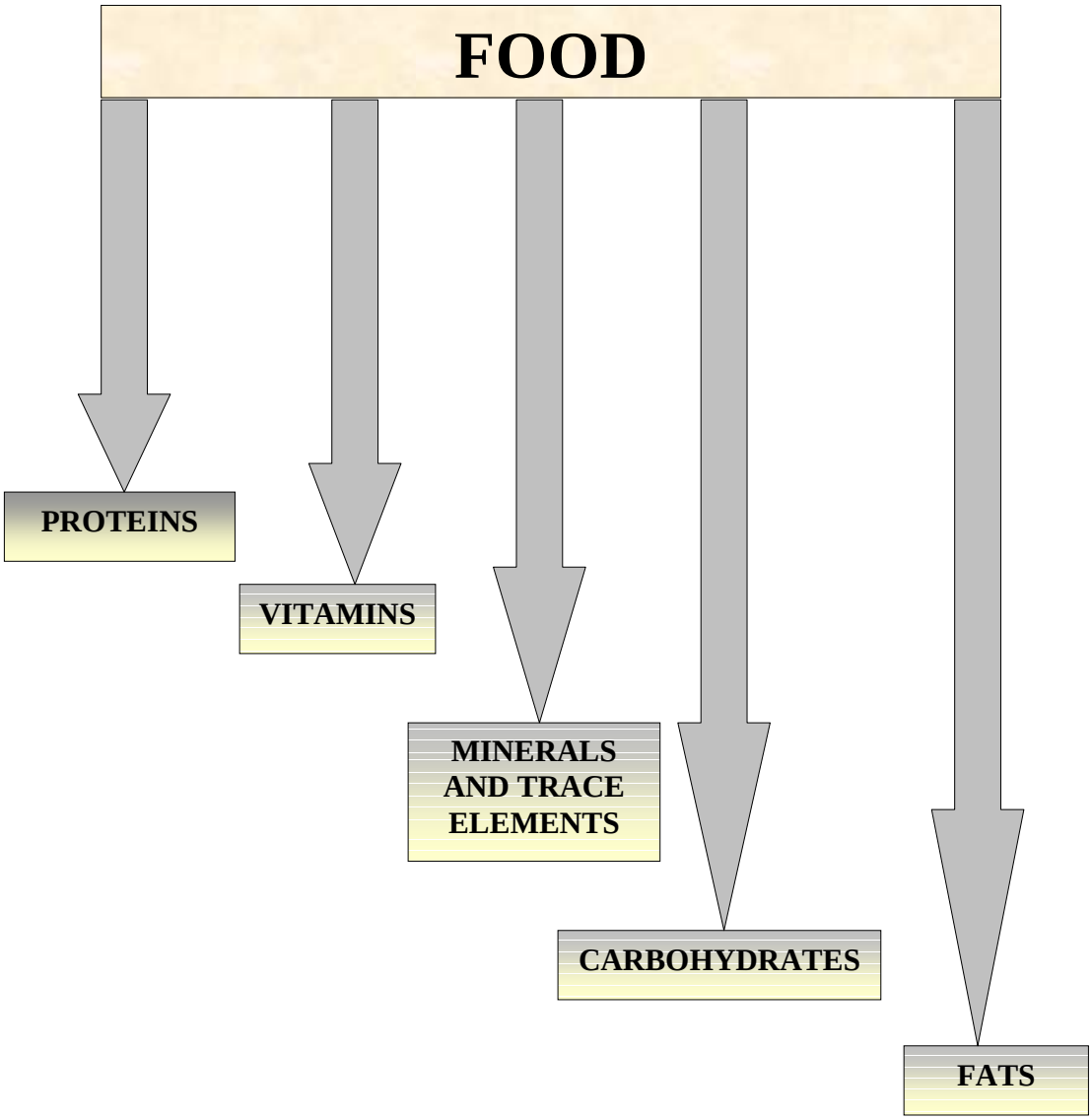
Nutrition is the science of foods, the nutrients and other substances therein, their action, interaction and balance in relationship to health and disease, the process by which the organism injects, digests , absorbs, transports and utilizes nutrients and disposes of their end products. Levoidsier, father of nutrition during end of 18th century, founded the science of nutrition. He believed that a good and healthy diet is essential for optimum health.

Nutrition plays a major role in the prevention and management of many diseases. It also helps to maintain and individual's physical fitness required for carrying out day-to-day activities. Human diseases are mostly a result of heredity, environment, culture, economy, food habits and psychological implication f food and eating.

The nutrients or fuels available for energy metabolism are broken down in the working muscles to provide energy in a usable and transferable form ATP. During moderate to high intensity of work, what is required is to delay the onset of fatigue as long as re-synthesis leads to slowing down of the activity of muscles and thus causes fatigue. Thus nutrients are necessary to replenish the ATP in order to derive fuel stores of the body, which are provided by daily food intake. The main nutrients can be understood in four forms.

FIGURE 1

MAIN NUTRIENTS DERIVED FROM FOOD



1.1 FUNCTIONS OF NUTRIENTS

A: Carbohydrates

It is the most important component of a healthy diet. It provides energy for muscular activity. Carbohydrates are a major source of energy in human diet. About 4Kcal of energy is provided by each gram of carbohydrates. It is chiefly

obtained from grains and vegetables. Some calorie is essential for brain, nerve and lung tissue.

Grand jean in 1989 while conducting experiments with carbohydrates quotes:

> *Carbohydrates as glycogen are recognized as the major source of fuel for the working of muscles. The contribution of carbohydrate to exercise metabolism, through influenced by numerous factors, is inevitable.*

Carbohydrates is the most important energy source and thus is broken down into polysaccharides disaccharides and monosaccharide for fast absorption into blood. Besides the fact that carbohydrates is the only fuel for anaerobic metabolism, it is also the most efficient fuel for oxygen system because less oxygen is required to metabolize one molecule of carbohydrate than fat. One liter of oxygen yields about 5.05 Kcal in case of glycogen providing energy and fat gives only 4.69 Kcal. Thus carbohydrates appears to be a more efficient fuel than fat by about 7% and also carbohydrate is able to produce ATP for muscular contraction more rapidly than fat.

B: Fat

About 30 to 40 percentage of the calorie consumed in normal diet is derived from fat. In addition, some of the carbohydrates are converted to fat and are used later for energy.

Anderson in 1982 reports that, fats, as a form of stored energy in animals is as important as carbohydrates in plants. They serve multiple purposes in the diet. In addition to their high energy value, they contain essential fatty acids and act as carriers for the fat soluble vitamins. Fat makes a meal more satisfying because of its slow gastric empting time as well as due to the flavor it gives to other foods.

Fat is stored in the adipose tissues and in skeletal muscles as triglycerides. The average adult male has about 15% of his body weight as fat whereas even the lean female has about 20 to 25% of her body weight as fat. A relatively large proportion of this stored fat is available as fuel during exercise with the breakdown of free fatty acids (FFA) and glycerol released into the blood. The free fatty acids are transported to various tissues and glycerol to liver. In the tissues, the free fatty acids are broken down and enter the Krebs's cycle to produce energy via oxygen system.

C: Proteins

Proteins have long been recognized as the fundamental structural element of every cell of the body. More recently, specified proteins and protein derivatives have been identified as the functional elements in certain specialized cells, glandular secretions, enzymes and hormones. In their role as enzymes, proteins control the breakdown of food for energy and the synthesis of new compounds for maintenance and repair of body tissues. When they are supplied in amounts greater than necessary for growth and maintenance, proteins contribute to the energy pool of the body and similarly if carbohydrates and fats are not sufficient to meet energy demands, proteins will be diverted for this purpose.

Proteins are nitrogen-containing compounds formed by amino acids. They are required primarily to form the structural basis of muscle tissues, antibodies, enzymes and many hormones. Proteins are necessary for growth, repair and maintenance of body tissues, the production of hemoglobin (iron and protein), the production of normal osmotic balance and protection from disease through antibodies.

Proteins may also serve as significant source of energy of muscular contraction under certain conditions, but they are generally spared when fat and carbohydrates are available in ample supply.

D: Vitamins

Vitamins are essential in small amounts and are involved as co-enzymes in almost every metabolic process in the body for the supply of energy. Thus, an adequate intake of vitamins is important for optimum performance.

Passmore in 1987 reports:

"The Vitamins are organic substances which the body requires in small amounts for its metabolism, yet cannot make itself at least in sufficient quantity. They are not related chemically and defer in their physiological action."

Vitamins are in form of A, D, E, K, B complex and C. The first four of them are fat soluble while the later two are water soluble. The stress of exercise intensity can increase the utilization of some water soluble vitamins, but these can be replaced easily with extra foods with high nutrient density. A well balanced diet contains all the necessary vitamins.

E: Minerals

Although mineral elements constitute only a small proportion (4%) of the body tissue, they are essential as structural components and in many vital processes. Some form hard tissues, such as bone and teeth; some are in the fluids and soft tissues. There are functions in which the balance of mineral ions is important for example for bone formation, the amount and the ratio of calcium and phosphorous, and for normal muscular activity, the ratio between potassium and calcium in the extra cellular fluid should be maintained. Electrolytes (of which sodium and potassium salts are the most important) are the major factors in the osmotic control of water metabolism. Out of the many minerals required by body, iron, and calcium and phosphorous are the most important ones.

Iron is one of the most critical nutrients. Besides helping to deliver oxygen to the muscles, it is also a component of myoglobin . It is needed for proper utilization of oxygen in the cell itself and in regulating the acid base balance of the blood.

TABLE 1

STATEWISE AVERAGE CONSUMPTION OF NUTRIENTS

1988-90

Nutrients	Tamilnadu	Andhra Pradesh	Maharashtra	Gujarat	Madhya Pradesh	Pooled	RDA
1	3	5	6	7	8	9	10
Protein (g)	45.6	55.7	61.7	69.3	82.5	61.8	60.0
Energy (Kcal)	1871	2340	2211	2375	2614	2283	2425
Calcium (mg)	472	432	461	550	502	556	400
Iron (mg)	21.4	25.8	29.6	29.0	35.2	28.4	28.0
Vitamin ‘A’(µg)	240	286	311	286	374	294	600
Vitamin ‘C’(mg)	39	36	37	36	38	37	40
Thiamine (mg)	0.70	0.98	1.67	2.08	2.68	1.53	1.20
Riboflavin (mg)	0.60	0.72	0.94	1.22	1.35	0.94	1.40
Niacin (mg)	10.5	14.4	16.3	17.3	23.9	15.5	16.0

SOURCE : NNMB Repeat Survey,(1991)

* RDA : Recommended Dietary Allowances for Indians(ICMR,1989)

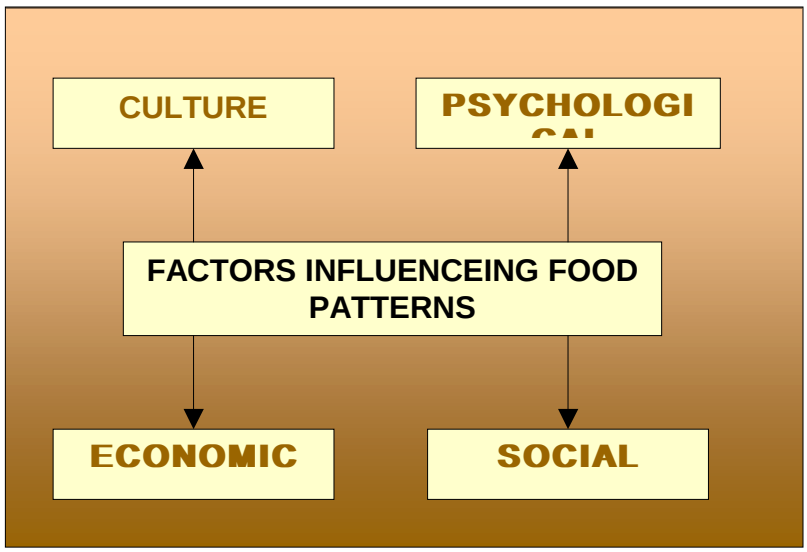
1.2. FOOD PATTERNS

Indian food habits vary from region to region. Many Indians are non-vegetarians while many do not consume meat, fish, and poultry; although milk, milk products and eggs are included in their diets. Indian meals are not served in courses but many different dishes are put at same time. A great many combination of spices are used in Indian cookery. Rice, beans, peas and lentils are used extensively. Ghee, clarified butter and yogurt are a part of many Indian recipes. Chutneys made form different fruits and vegetable accompany the meal. Fruits and vegetable are used in different preparations and combinations form region to region and state to state.

1.2.1 FACTORS INFLUENCEING FOOD PATTERNS

FIGURE 2

FACTORS INFLUENCEING FOOD PATTERNS



The factors that determine individual food habits are varied and complex. They can be divided into four major categories.

1) CULTURAL FACTORS

Culture may be defined as the way a group of people think and behave. Anderson (1982) opines that one culture may consider food only as a means of satisfying hunger; another may feel eating is a means of family or social sharing. Culture is transmitted form one generation to another by institutions such as family, school and other religious institutes. The preservation of individual cultures is an important goal of many minority groups.

2) ECONOMIC FACTORS

Poverty is one of the most responsible factors for underfeeding and malnutrition. Passmore in 1982 reports that poverty in general is not deficiency or insufficiency of acceptable material needs of the people. The environment of poverty is conditioned by malnutrition which increases vulnerability to disease as well as reduces learning capacity, mental development, physical growth, productivity the span of working years; all of which significantly influences the economic potential of men and women.

Poverty results in lack of education, which in turn increases ignorance and reduces the scope of self-improvement. It also affects the norms and value system. Illiteracy and fertility is a viscous combination and peer housing with lack of amenities and physical environment results in high incidence of mental and physical deficiency. At last, poor health also reduces the ability to absorb food.

In this context Mitchell (1982) opines that rising cost of food and food shortage has had their impact on the food patterns of many families. Increased prices make the selection of food for the family a real challenge.

3) PSYCHOLOGICAL FACTORS

Food habits are an important part of human behavior. Individuals are motivated to it in terms of what they perceive as being relevant to meet their needs. They may consider a food item to be tasty and thus prefer it whenever possible. Some people also associate prestige value with various foods. They may select food items, which according to them are prestigious to consume. Because of these factors the food choices of any two economically or physically similar individuals is not same.

4) SOCIAL FACTORS

If one recognizes that individuals belong to various social groups, the effect of group behavior cannot be overlooked, when considering the factors that influence food habits. The organization of society with its many structures and accompanying of society systems plays an important role in the acceptance or rejections of food patterns.

The effect of religious customs on food habits may be important on many communities. Celebrations may be done either by feast or fast. Many families also practice traditions of eating particular foods, prepared in specific manner. Some religions prohibit their followers to consume particular food items. Thus, religion also influences what one eats.

1.2.2. MALNUTRITION

Adequate nutrition is a vital need for every one of all ages. According to WHO estimates, there are a billion and a half women, men and children in the world today suffering form severe, moderate and mild malnutrition. Impaired growth will result when intake of nutrients is not sufficient to meet the needs of the body. If the dietary intake is deficient for a short time, it is called acute malnutrition. In this case growth in height will continue but weight will be

reduced. If malnutrition is present for a long period, it is referred to as chronic malnutrition. Here, both height and weight will be affected.

Malnutrition is like an iceberg; most people in the developing countries live under the burden of malnutrition. Pregnant women, nursing mothers and children are particularly vulnerable to the effects of malnutrition. The adverse effect of maternal malnutrition has been documented as maternal depletion, low birth weight, anemia, toxemias of pregnancy post-partum hemorrhage, all leading to high mortality and morbidity. The effects of malnutrition are also frequently more serious during the formative years of life.

However, some groups are more prone to malnutrition than others on account of various factors. It has more effect on children. Poor nutrition also affects the mortality rates of young children. On other hand the capacity for work of malnourished adults may be significantly reduced and their potential as family providers and as child bearers is equally affected.

Malnutrition may develop gradually or rapidly. The speed with which nutrient deficiencies develop depends on the severity of nutrient deprivation, the extent of the body's reserves, and the body's need for nutrients. With either decreased intake or increased utilization of nutrients, the body draws on nutrients stores. Nutrient reserves dwindle, tissues become desaturated, cells are deprived of essential nutrients and biochemical disorder appears if the nutrient deficit persists. Early biochemical disorders are characteristic of sub clinical malnutrition, that is, malnutrition presenting no clinical symptoms.

Persons who are highly vulnerable to a shortage of nutrients are those with high requirements relative to their calorie need and people who have small or no nutrient stores. Infants, young children, pregnant and lactating women, elderly person, and ill -persons are particularly susceptible to developing nutrient and/or calorie deficiencies. Diseases of many types can lead to malnutrition by interfering with food intake, increasing nutrient demands or losses, and/or interfering with the absorption or utilization of nutrients.

Psychological and psychiatric problems may be partially expressed by eating disorders, some of which may lead to deficiency states and some of which may lead to over nutrition. Either under or overeating may result from depression. Anorexia nervosa and bulimia are psychiatric disorders that may lead to life-threatening malnutrition.

Community nutrition surveys provide information about groups of people. Information from these surveys may identify environmental, cultural, and epidemiological factors that leave some people especially vulnerable to malnutrition or to other nutrition-related disorders. Surveys may provide information about nutritional status and nutritional resources of a given community and its members. Ideally, such a study includes data regarding prevalence of malnutrition, levels of income, the food supply, cultural practices, and the kinds of health care available.

To implement nutritional care of ambulatory clients, health professionals often develop nutrition education programs for individuals and groups and have a system for attracting or referring clients to these programs. They also provide supportive services and direct care for client who cannot completely care for himself or herself. Ideally, outcomes of care are frequently evaluated and the findings are used as a basis for improving future care. Careful documentation promotes consistent quality care and aids interagency and interagency referral.

The above discussion regarding diet and health of an individual leads us to the following :

- Appropriate quality and quantity of food is important for all individuals.
- Adequate food is must for, optimum physical and mental health.
- Consumption of food depends on many factors.

The combined effect of all these factors determines the food choices of individuals. Irrespective of the reason, if an individual suffers from malnutrition, he or she needs immediate attention.

Among many influencing factors, occupation of an individual also influences his or her health, the living style, daily routines, preferences, value systems as well as food habits of an individual may be influenced because of his or her occupation. Thus, while studying any aspect of health, its correlation with occupation must be studied.

1.3. OCCUPATION AND HEALTH

In Indian society up till recent past, the selection of occupation was not a matter of choice; by and large it was governed by the caste norms and traditions. The children had to adopt the occupations of their fathers, sanctioned by caste. The higher occupations, the remunerative and sophisticated jobs were the monopoly of the higher castes and well to do sections of the society. As the scheduled and other down trodden castes were deprived of education, they would not enter higher occupations. (Pandey 1998).

In modern times due to impact of industrialization, education, urbanization, modernization and secularization; there has been much of diversification of occupations .The situation of occupational mobility between individuals belonging o different social, economic and ritual status is found to very fluid (Singh 1987).

In modern industrial society with increased varieties of occupations, the chances of occupational mobility have multiplied. The contemporary youth is progressively taking up the challenge, which is bounded to influence their occupational aspirations. In a highly competitive society where the status of an individual is achieved rather than ascribed, the present urban youth would naturally aspire for material comforts and socially prestigious occupations (Gore, 1968).

Occupational health is essentially preventive medicine. The Joint ILO/WHO Committee on Occupational Health, in the course of its first session, held in 1950, gave the following definition:

Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from

health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance adapted to his physiological and

physiological equipment ,and, to summarize -the adaptation of work to man and of each man to his job.

An industrial worker may be exposed to five types of hazards, depending upon his occupation:

a) Physical hazards
b) Chemical hazards
c) Biological hazards
d) Mechanical hazards
e) Psychosocial hazards

There is no internationally accepted definition for the term Occupational disease. However; occupational diseases are usually defined as disease arising out of or in the course of employment. For convenience, they may be grouped as under:

- Diseases due to physical agents :

- Heat -Heat hyperpyrexia, heat exhaustion, heat syncope, heat cramps, burns and local effects such as prickly heat.
- Cold -Trench foot, frost bite, chilblains
- Light -Occupational cataract, miner's nystagmus
- Pressure-Caisson disease, air embolism, blast (explosion)
- Noise-Occupational deafness
- Radiation-Cancer, leukaemia, aplastic anaemia, pancytopenia
- Mechanical - Injuries, accidents
- Electricity-Burns

- Diseases due to chemical agents :
  - Gases: CO_2,CO,HCN,CS_2,NH_2,N_2,H_2S,HCl,SO_2- these gases are poisoning
  - Dusts (Pneumoconiosis):

i. Inorganic Dusts:

(a) Coal dust- Anthracosis
(b) Silica-Silicosis
(c) Asbestos-Asbestosis, cancer lung
(d) Iron-Siderosis

ii.Organic (vegetables) Dusts:

(a) Cane fiber- Bagassosis
(b) Cotton dust- Byssinosis
(c) Tobacco- Tobaccosis
(d) Hay or Farmers' lung- grain dust

  - Metals and their compounds: Toxic hazards from lead, mercury, cadmium, manganese, beryllium, arsenic, chromium etc.
  - Chemicals: Acids ,alkalis ,pesticides

- Solvents: Carbondisulphide, benzene trichloroethylene, chloroform, etc.

- Diseases due to biological agents :
  Bucellosis, leptospirosis, anthrax, actinomycosis, hydatidosis, psittacosis, tetanus, encephalitis, fungal infection etc.
- Occupational cancers : Cancer of skin, lungs, bladder
- Occupational dermatosis : Dermatitis, eczema
- Diseases of psychological origin:Industrial neurosis, hypertension, peptic ulcer, etc.

The trend in India is towards industrialization. As industries develop, both in size and complexity, occupational health will pose new and more difficult problems. The National Government has recognized the need for protecting the health of the workers. The Directive Principles of State Policy, in the Indian Constitution are important in this context. The relevant portions are:

(a) The State shall, in particular, direct its policy towards securing that the health and strength of the workers, man, woman, and the tender age of the children are not abused ,and that citizen are not forced by economic necessity to enter avocation unsuited to their strength.
(b) The state shall make provision for securing just and humane condition of work.

Most of the occupations have undergone tremendous change giving rise to diversification of occupations. But these changes are largely confined to urban developed areas. In contemporary society there still exist occupations, which are traditional and conventional. Most of the people in rural and remote areas of our country are still confined to their hierarchical occupations. Lack of education, awareness, infrastructure and funds worsens the situations. Still there are occupations where workers work irrespective of health hazards.

There are many factors that come across the occupation that causes health hazards to workers knowingly. They may be working condition, atmosphere, chemicals, equipments, working posture, etc. Sometimes workers are forced to work beyond their capacity which gives rise to stress and strains, resulting in lower efficiency, lower productivity and ultimately leading to health hazards.

TABLE 2
PERCENTAGE DISTRIBUTION OF DEATHS DUE TO TEN SELECTED DISEASES BY AGE GROUP AND SEX, INDIA 1993

	Below 1 year			1 yr.- 4 yr.			15+		
	M	F	T	M	F	T	M	F	T
Asthma & Bronchitis	2.1	2.6	2.3	1.4	1.4	1.4	96.0	94.7	95.5
Hear attack	0.3	0.2	0.2	0.2	0.2	0.2	98.9	98.9	98.9
Pneumonia	56.9	51.5	54.2	20.8	26.8	23.7	13.2	11.9	12.7
TB of lungs	0.8	0.5	0.7	1.1	0.9	1.1	97.0	94.8	96.2
Cancer	0.2	0.2	0.2	0.8	0.7	0.8	97.0	96.7	96.8
Anaemia	15.1	15.2	15.1	13.6	15.2	14.5	64.3	61.4	62.7
Paralysis	0.4	0.5	0.5	1.1	0.8	0.9	97.5	97.1	97.1
Gastroenteritis	18.5	14.9	16.5	19.7	20.0	19.8	48.5	51.9	50.1
Vehicular accidents	-	0.6	0.2	3.2	9.9	4.8	90.1	69.0	83.0

M= male, F=Female, T=Total.

SOURCE: Survey of Causes of Death (Rural), India, Annual Report 1993, Office of the Registrar General, India.

One such occupation is salt production, which leads to various health problems at various stages. Kutch is an area where salt production is the chief

occupation. Thus, the researcher wanted to know the status of occupation and health of salt workers and their effects on each other.

Therefore, in light of above discussion the researcher decided to undertake a study entitled the following.

1.4. STATEMENT OF PROBLEM

"A STUDY ON NUTRITIONAL AND HEALTH STATUS OF SALT WORKERS."

1.5. UNDERSTANDING KUTCH

Kutch is and ancient land possessed of great antiquity, which takes its name from its geographical characteristics and topographical features resembling a tortoise. The crescent shaped region called Kutch forms part of northwest Gujarat. Prior to the dawn of the Christian era, the region lying between Sindh and Saurashtra has been described as Abhir by which name it has also been referred to in Mahabharata. Till the 3rd and 4th century A.D and even thereafter, it came to be referred to by as Abhir form its original inhabitants, the Ahirs, who resided in this area, it later on came to be known as Kutch.

The district stretches roughly form 22 - 41' 1" to 24 - 41' 25" north latitudes and 68 - 09'46" to 71 - 51'47" east longitudes. It is bounded on north and northeast by Pakistan, on northeast Rajasthan, on the east by districts of Banaskantha and Mehsana, on the south east by Surendranagar, on the south by the Gulf of Kutch and the Rajkot district and on the southwest and west by Arabian sea.

Kutch has a very long coastline of 322 km, which is about one fifth of the total coastline 1600 in the state. It also consists of hilly area, which is dry land

farming area. The district has a very vast amount of mineral deposits like lignite, bauxite, limestone, etc. Out of the total 18028 inhabitant villages in Gujarat, 884 inhabited villages i.e. about five percent are located in Kutch district. Out of 264 towns in the state 10 towns i.e. about four percent are in the Kutch district.

With an area as large as 23% of the total are of Gujarat, Kachch supports only 3.1% of the total population of 12.36 lack according to census. The density of population has increased from 23 persons per sq. km. in 1981 to 28 in 1991. 211 persons per sq. km. was density for the state in 1991.

The literacy rate among males increased from 33.34% in 1961 to 44.14% in 1981 and to 64.26% in 1991. Whereas literacy among females went up to from 16.90% to 40.89% during the same period.

The 1991 census reveals that :

- 32.63% of total population is main working
- 03.65% was marginally working
- 63.72% was economically non active
- 26.57% were cultivators
- 25.85% were agricultural laborers
- 47.85% were engaged in livestock, forestry, fishing, mining and other occupation.

(Yearly souvenir of Chamber of Commerce,2000-2001)

1.6 SALT PRODUCTION IN KUTCH

In spite of several odds, the social and economic factors have stimulated the growth and development of various need based industries in India. The salt is one of them. Salt is one of the major food items for human being and raw material for many industries like soda ash, caustic soda, chlorine, sodium metal and hydrochloric acid, which are in turn required by other large industries.

Besides, salt is also used for fish curing and tanning of hides and skins, water softening, salting out of soap, ore dressing and food preservation.

Having realized the importance of salt, Government of India has taken many measures to boost the salt production in the country. The requirement of salt is likely to be increased to 140 to 150 lacks mt. by end of century which is at present 136 lack tones. This would require serious efforts in increasing salt works.

Among the various states in India, Gujarat has vast areas which are arid and semiarid; Kutch district is the highest salt producing district in Gujarat. Most of the factors relative to salt production are favorable in the district and thus production during last 10 years has increased about 27016 lacks mt. The favorable factors are:

- Suitable climate conditions
- Low rain fall
- Long period of dry weather
- Fairly high temperature
- Suitable soil conditions
- Abundance of raw material
- Longest seas shores, not diluted by river.

Salt is manufactured by solar evaporation of sea water and sub soil brines. In certain areas high degree sub soil brines are also available. Thus at present, Gujarat is on the top of salt producing states contributing about 70% of the total salt production and out of which 40% is being produced in Kutch region.

1.6.1 METHOD USED FOR SALT MAKING

The poor tastemakers try hard at least for 20 to 25 days working with saline water to get salt for us. They along with their family are engaged in salt production. The steps in salt making are as follows:

- Location:

The government on leasehold basis selects a land along the sea with black and greasy soil.

- Fencing:

The soil is hollowed out from the land through digging and land is enclosed with a mud wall which is called agar sagar.75% of the area of the land is filed with water and termed as sagar.

- Watering:

After erecting a fencing wall by the side of the land, water is filed up. By giving strong and jerky movements the degree of water is increased. A pump having 10 to 15-horse power is installed at the tank of the creek for drawing out the seawater of the area. The seawater is stored at time of high tide and stopped with help of *saluj*, the salt level of the seawater is only 2.11 degrees.

- Channeling:

In order to increase the degree of this water up to 24 degree it is made to pass through a channel where it absorbs the heat of ground and sun and gets the required density. A discharge channel is prepared between both the *mafars.* The water is released through this discharge channel before taking out the ready salt. Fresh water is started for making salt again. If this is not done the quality of salt thereof is badly affected.

- Base making:

A pond is dug for construction of *mafar* at the level of 0 to 12 degrees. The leveling of the land is carried out at the time of digging by filing up small quantity of water in it. The laborers treat this land with help of their feet for making it hard. Now a days cement rollers are used to make plane and flat land. Thereafter water is filled up through the channel.

- Ploughing:

The water accumulated in the pond gradually gets evaporated from the heat of the sun .A layer is settled in form of iron sheet on which *khapari* (mattock made of iron with teeth)is operated upon.

As a result, the salt grains get separated and become bigger in size with help of water. This process continues until the salt is crystallized. This process has to be maintained for 30 days in summer and 20 days in winter.

- Lifting:

The salt is lifted by the mattock and spade and tagara.

- Loading:

The ready salt is filled in tagara and lifted by female workers on their heads. These tagaras are brought from mafer to the salt rocks, which are at a distance of 50 to 100 meters.

- Making of salt rocks:

The female workers carry the tagaras of salt on their heads and are thrown on the platform for making rocks of salt. The salt rock is generally one meter high and three and half feet wide. It contains 10 tons of salt

- Cleansing:

Mafer of the pond is cleansed. If it has to be reused for salt manufacturing. Cleansing is a must to maintain quantity and quality of salt. The heap of salt is dehydrated for 3 to 4 days before supplied.

1.6.2 EQUIPMENTS USED FOR SALT MAKING

A brief description of the major equipments used for salt making is given as under:

- Tagara

It has 30cm diameter and has a capacity to carry 30 to 35 kg salt.It it used to carry salt from agar to chatta or heap.

- Pavadi

It is a special type of big frying pan like instrument. It is used for lifting the salt from agar to tagara.

- Scraper

It is a sharp edged and long handled span used to scrap salt from base.

- Plough and Khapari

It is a fork shaped device made of iron. It has length of 1 feet and width of 2 to 3 feet. It has a 5 feet long handle. It is used to plough the salt during production for maturation to make granular salt.

- Cement roller

It is a special type of instrument made of cement, iron and wooden handle. Cylindrical cement roller is attached with iron bearing and wooden handle to turn as roller used for base making.

1.7 CHARACTERSTICS OF AGARIA COMMUNITY

(1) Population Based / Related Characteristics

According to he 1995 Census, the population of Agarias is one Lac of the total number of Agarias, 70 percent of them are in Gujarat State and 30 percent Agarias are engaged in Salt – works in Kachchh. These Agarias visit their native place for a period of two months in order to perform their customary rites such as marriage, festivals etc.

Since their caste and business are same, the religious beliefs deity, languages and dresses are common among them. Early-marriage is a common feature in this community. As a result, the birth-rate as well as death-rate is always on the increase. Non – availability of Primary Health Center and Hospitals is one the major factors involved in it.

(2) Educational Characteristics

Indian villages shows a state of very low level of literacy due to dearth of schooling facilities, Agarias remain uneducated and illiterate. Some factory owners have made arrangements for providing educational facilities to the Agaria children but they, being economically backward, instead of sending their children to school, they often engage them in their traditional business at a tender age. The causes for growing illiteracy among Agarias are traditional caste system, early – marriage, poverty that lead them to live in isolation. Besides this, they also remain stuck to their customs and are reluctant to accept the changes taking place in the modern world. As a result, they are conservative, superstitious and suspicious by nature.

(3) Occupational Characteristics

The economy of Agarias mainly depends on salt-farming. They earn their livelihood in close contact with nature and man – power remains in the pivotal

position salt farming is seasonal phenomenon. In summer salt is produced considerably but it takes much time to produce salt in winter season. During rainy season salt is hardly produced. Sometimes unseasonable rain effects the production of salt causing great losses to the Agarias, for they are not paid wages for the said periods. Since the Agarias are in the habit of doing this very job only and do not have any interest in diversion of job, they have to face poverty without having any chance of enhancing their standard of living and status. Having stayed far from sweet water and greeneries, they find it impossible to diver from the job to cattle breeding and agriculture. Due to poverty Agaria children do not get adequate milk and milk products. Sometimes Agarias take salty fishes from sea – water.

(4) Circumstantial Characteristics

There are two aspects of circumstances as far as Agaria community is concerned.

(a) Geographical aspect.
(b) Local Living pattern and relation with village – folks.

(a) Geographical aspects include Sun, Moon, Day and Night, Land, vegetation, Season and Sea which impose Limitations on the life of Agaria community but some geographical conditions provide them with many facilities as well as matter of fact, their lives are out and out dependent on heat, cold, favourable conditions and density of water. They constantly remain in the lap of nature and lead a hard life, full of struggle. Sea – water is accumulated a full moon night so as to facilities the production of salt at ease without much toil and labour. This is the reason why their religion is nature – dominant one and because of this, they gradually develop fatalistic attitude towards life.

(b) Local living pattern : The living patterns of Agarias varies from region to region. They are of two types (1) Centralized and (2) Decentralized.

Where salt – farming is done with he help of foot – well, Agaria – families live unitedly in close proximity but the place where salt is produced by accumulating the sea – water, only one Agaria family stages at a salt field so as to work comfortably and easily. In order to avoid working in the blaze of sun during summer season. They work between 4 A.M. and 8 A.M., 5 P.M. and 8 P.M. While in winter season they work from 9 A.M. to 2 P.M. at a stretch. They start their household chores after sun rise and complete the same before sun set during to non availability of electricity.

(5)Cultural Characteristics and attitudes

Agaria's is a male dominate society. The traditional culture is on the upper-hand. The males are he heads of families. So they get due recognition in the society with a dominance. The females are looked down upon in the families and engaged in household chores only the child marriage is burning problem / issue of this community. The children are put into marriage at a tender age of 14 16 the number of female – baby as prevalent in this community. Ignorance in respect of family planning programmes, the females in this community are faced with many type of health problems.

The Agaria women are compelled to do laborious jobs during pregnancy period. In stead, they are not supplied required with proper nutrition and rest it. These mothers feed their babies over a period of two to three years. Which results in growing weakness in their body and increasing vulnerability varies diseases.

The Agaria children are not provided with better environment, food, and nutrition and proper care. Even a baby aging 6 months is given Rotla (Loaf, Chapati, Made of Bajra) and Khichri (preparation of Rice and Pules) The females are also not given proper care, food and living environment whiles

males enjoy every rights. Hence females are found to be anaemic and looking old in their youth.

The clothing of this community also differentiate from other. Agaria's man wear a short Dhoti and shirt and cover their head with a piece of cloth called 'Faliyan' (small trouban) where as women's wear 'Gagra Choli' and small 'Odhni' with silver ornaments. The silver ornaments are of much significant as dowory given at the time of marriage ceremonies. A sweet dish "Mattar" is prepared during the marriage and presented to the family deity. Traditional married women wear big silver earring and nose ring as a symbol of marriage.

There is also a practice of 'Gauna' (a ceremony of the bride's going to her husband's house after a past marriage intervals) in the Agaria society. They also worships "Dariyalal" (Sea) Maled Mata and 'Amba Mata" on occasion of 'Navratri' (Garba), Birth of first child, they prepared "Nived" or "Jar" (Gudpapdi) and presented to the them.

1.7.1 PROBLEMS OF AGARIA COMMUNITY.

The cultural structure of the Agaria community and he polices of the British government in this regard, is responsible for the aforesaid problems being faced by the Agaria community. In the Agaria's joint families, child marriages, growing population, zamindari, giving much importance to the birth of male baby are the main factors involved in aggravating the problems such as poverty, freedom and human rights has also played and important part in increasing the problems of this community/The Agarias being Koli, belong to a lower – caste.

a) Problems relating to Population

The problems relating to growing population is a complicated one in this community. The birth rate as well as death rate is very high due to early

marriage, giving importance to the birth of female – baby, poverty, super – station, illiteracy and ignorance of family planning programmes.

b) Economic Problems

Agarias are the poor class people and salt production in the only source of their livelihood. Due to death of modern and latest mechanical devices in the salt industries, the production of salt is slow and minimum and the old process of producing salt is still prevalent. As such, Agarias do not have any interest in diversion of business to other field, their living standard continues to be lower.

c) Social Problems

The customs e.g. dowry systems early marriage, inequality among males and females, lack of leadership are the main problems of this community.

d) Cultural Problems

Since the culture of the society is a traditional one, the Agarias possess he attitude of getting stuck to the customary habits and rites and having remained isolated from the rest of the world, they indulge in the habit of gambling intoxication using cigarettes, tobacco etc. This leads to their miseries as well as hampers the development of the society at large.

e) Health Problems

This community does not have the facility of getting nutritive food and proper and adequate medical treatments. The presence of humidity in their surroundings, animal – corpses latrine processes, dirt of houses, non – airy rooms, (without ventilation) improper arrangement of drinking water, undesirable habits, non – wearing of foot wares etc. contribute to heir sickness. The open and old system of cooking lack of preservation of food and presence of rats and insects, in their huts is responsible for enhancing their diseased conditions. Their dependence on home – remedies and superstitious measure of curing diseases

also add to their ill – health because they often appear to be reluctant to go for medical treatments. The common ailments generally found in this community are loss of weight, lack of proteins and calories Anemia, respiratory disorders, diseases of skeleton system dystrophy of muscles skin diseases.

Death of communication is one of the major problems of his community. They are hardly connected with the outer world on socially, cultural, political plan. So, they are found to be conservative, static and fatalistic by nature. In addition, non – availability of transport facility is also one of the greatest obstacles in their development.

In order to bring a solution to the problems of Agaria community. The salt producers as well as the government should come forward with some concrete programmes making involvement of some technical and skilled persons to this task. Besides this, some diversification of business should be encouraged such as embroidery, fisheries, poultry forms so that they can earn their livelihood by some other means and at the sometime schooling facilities should also be extended to the Agaria children. As Mahatma Gandhi observed, “Until the villages of India are uplifted, no actual Swaraj be achieved”. He had started some concrete programmes such as education, untouchability, cottage industries and cattle farming in 1938 for the all round development of the villages is India.

1.8 JUSTIFICATION OF THE STUDY

In traditional society where the stratification was caste based, one’s position was ascribed rather than achieved. In such system, the son of chief had automatically high status in the society where as lower castes were deprived of education as well as other social, cultural ands economic facilities. This was due to growing technical education, industrialization and money economy in the society. People would like to involve in some more lucrative occupation. Salt production is one of the hereditary occupation largely accepted as traditional occupation from generation to generation. To study the extent of change in

occupation pattern is one of the focus of the present study. It gives an idea about:

- Socio economic profile of community
- Participation and involvement of family members in salt production
- Problems faced
- Occupational mobility pattern

1.9 JUSTIFICATION OF THE STUDY IN HOME SCIENCE

Home Science has a vast field of study. The present study is associated with nutritional status of salt workers, which is associated with biochemistry as well as social economics.

There are many communities studied by different groups or researchers. But this community particularly in desert area of Kutch. This community demands such research, as it is very backward, poor and illiterate. Here, in dessert, away from city, the community is deprived of market, communication, school and hospital. There are very few other business opportunities other than salt production. Thus such a study will help to understand the community better and search for new approaches and avenues for their betterment and development.

1.10 JUSTIFICATION OF THE SELECTED AREA

Every society in this modern world is divided into villages and towns. India is not an exception to it. In India, 76% of the total population lives in villages. Thus mention of village life occupies central place. So far as work on India's reconstruction research or planning is concerned, it is due to industrialization that people migrate from villages to towns in search of their livelihood.

Similarly, Salt industries in Kutch attracts laborers from neighboring region because they are the main component of the salt industries as above the operation at work from production to transportation is handled by the laborers only. The cultural structures of the Agaria and the policies of the British in this regards is responsible for the aforesaid problems by such community. In Agaria joint family, child marriage, jamindari, importance to birth of male child are main factors involved in aggravating the problems such as poverty, unemployment, exploitation, illiteracy, etc. which indirectly effect the health and work capacity of the communities. This reduces production to loss to our nation. To increase the production modern and latest equipment, high wages, good material facilities, education and food should be provided by Kutch district for prosperity of Kutch and Agaria.

1.11 JUSTIFICATION OF THE SAMPLE

In al there are about 15000 salt workers living in Kutch. From them some are near to city like Gandhidham and near to sea. Others are away from city and sea but they draw water from the land (underground), make pond and produce the salt. Out of them, the researcher selected subjects from both the categories. Total 300 samples was selected out of which 150 were male and 150 were females as salt production is done by both male and female equally. They have migrated to Kutch in search of employment. Since they are illiterate they have finally resort to salt production for earning their livelihood and making it a tradition from generation to generation. Children as well as old people above 45 years of age also work there according to their capacity. So it is necessary to take them as subjects.

1.12 OBJECTIVES OF THE STUDY

1. To study socio economic background and work condition of selected salt workers.

2. To study the nutritional and health status of selected salt workers.
3. To determine the nutritional and health status of selected salt workers in relation to their dietary consumption.
4. To determine the nutritional and health status of selected salt workers in relation to their anthropometric measurements.
5. To determine the nutritional and health status of selected salt workers in relation to their clinical assessment.
6. To determine the nutritional and health status of selected salt workers in relation to their energy balance.

1.13 RESEARCH QUESTIONS

1. How is the socio economic background and work condition of selected salt workers?
2. What is the nutritional status of selected salt workers?
3. What is the health status of selected salt workers?
4. What was the status of dietary consumption in relation to nutritional and health status of selected salt workers?
5. What was the status of anthropometric measurements in relation to nutritional and health status of selected salt workers?
6. What was the status of clinical assessment in relation to nutritional and health status of selected salt workers?
7. What was the status of energy balance in relation to nutritional and health status of selected salt workers?

1.14 OPERATIONAL DEFINITIONS

The term health used in the study is used with respect to physical health of an individual only. Here mental or social health is not taken into consideration.

CHAPTER 2
REVIEW OF LITERATURE

Review of literature is an essential part of any research study. It familiarizes the investigator with the previous work related to the field of interest, various methods and procedures, which can be persuaded. It also strengthens the need for further research and throws light on some other related areas. Accordingly, an attempt has been made to make a review of the relevant literature concerning the following aspects:

- 2.1 Studies related Health and Hygiene
- 2.2 Studies related to Nutrition
- 2.3 Studies related to Malnutrition
- 2.4 Studies related to Occupational Health

2.1 STUDIES RELATED TO HEALTH AND HYGIENE

2.1.1 HEALTH STUDIES IN INDIA

Nagi (2000)[:] studied that in almost all the selected villages of Delhi, the drains were open .Further it was found that:

- In 94% villages drains were Kuchha and some of them were stagnant.
- In 42% and 20% villages the drain water was connected to mains and kitchen garden respectively.
- 52% drains were never cleaned .
- 81% were never be treated with larvicide .
- Such treatments were done in 17.6% villages.

He showed that about 80% villages had sufficient water. However in summer, the percentage of such villages goes down to 57.9% The highest percentage of villages having sufficient drinking water in summer is found west Garo Hills (89.3%) The quality of drinking water was muddy in 32% villages.

BIMLA AND BINDA (1998) anthropometrics measurements (body weight, height, sitting and standing) chest and arm circumferences of 207 boys of7-10 years, from rural schools in district of Hissar, Hariyana. Boys in this study had the highest percentage of increase in arm circumference followed by body, weight, height and standing posture, height in sitting posture and chest circumference. The over all health status of the boys was better then national average.

Gopalen C. and S Kaur (1989) demonstrate that there is no evidence of secular trends indication improved growth of all successful developing societies. Women in India take insufficient dietary intake of calories, proteins, calcium, iron, and vitamin A. As per estimation; two thirds of Indian pregnant women are anemic. They do not take accurate nutrition's food intake, nor do they accept the health facilities provided for them on caloric intake and nutrition .Assessment reveals that poor nutrition standard is a constant headache of health and

morbidity status of girl in India. These needs special care and action or intend programmes. The mass immunization and regular health checkup of school children are necessary.

Mass S. (1989). studied eight healthy active male subjects. The mean age of the group was 24 (+2) & the range was 20-27 yrs. The mean body height (cm) was found to be 183.6(+4.0) & the range of body height was 179.0-191.5 cms. Lean body mass was calculated from body weight and the sum of the four skin fold thickness (Durinn& Rahaman1967)[36].

Dhesi and Dhariwal (1982): reported evaluation of influence of health promoting factors on the labour supply and productivity of agricultural workers in Amritsar district of Punjab . Health is shown to be a significant detriment of productivity in terms of caloric intake, housing, clothing, personal and medical care expenditure. It proves more productive than certain investments in physical capital in the early stages of development.

Mudami, S. (1987) studied Hindu prohibition of the consumption of beef and slaughter of cattle. In India the cattle are the crops, transport us, and provide milk for the family and fuel for the hearth. The origin of the taboo on the slaughter of cattle is uncertain, but it was not a part of the dravicliar and earliest Hindu cultures.

Ghosh (1980) reviewed in his study that the main reason of Indian valetudinarian is polluted environment, unsafe water supply and undesirable garbage disposable.

Vergheese M.A.(1980) altogether 79 different body dimension were measured on 147 urban house wives of age range varying between 21 to 56yr. The findings showed the following:

- The average stature & weight of Indian housewives as observed in this study was 153.2 cm (±5.7) and 55.1 (±9.7) kg respectively.

- Average value along with 5^{th} percentile values for all measurements have been determined .Values were compared with other Indian studies.
- A correlation matrix between all measurements we developed with the help of a PDP 11/23 micros computerize. Based on the existing data ratio scale relationships of Indian women.

Anthropometric characteristics among industrial workers in India were studied by Saha P.N. The subjects of the studies worked in electronics, pharmaceuticals,garment, textile, engineering and safety industries. Children were selected as the subjects of the study. The result shows some difference, excepting hip breadth, was found to be smaller in females. And there seems to exist a high correlation between stature and other body dimensions.

2.1.2 HEALTH STUDIES IN OTHER COUNTRIES

Victoria Hosegood (2003) studied and reported there are “J” and “U” shaped relationship between body mass index (BMI in kg/m^2) and mortality rate. Person with extremes of BMI experience increased mortality. In contrast, little is known about populations in developing countries, where nutrition status is lower. The mortality also increased 22% more than normal in Bangladesh women, in their longitudinal study.

Dr. Weston (1992) studied the diseases seen in labours of Singapore.It was found that they faced the following:

1. Athlete’s Foot: A troublesome fungal infection The only cause is failure to observe the necessary personal hygiene, along with carelessness in drying the feet .It than provides the soggy skin on which fungus likes to settle and cause inflammation and damage to skin.

2. Bites: Many insects, some plants and marine creatures can sting were dangerous .Death from such bites or strings were rare but prompt action was important to control poison . During hot, dump weather insects breed most rapidly, which bites caused fever and inflammation of skin. Snake bites were much more dangerous. It caused sweating, vomiting and diarrhea.
3. Seaurchiness: They were found in coastal waters of warm countries and were considered tasty to eat. However their spikes can break off into human skin causing intense pain and the risk of infection
4. Blisters: The most common blister is caused by friction and heat, walking long distances. A person or manual labourer with thin skin had sun burn blisters. In winter if the cold was severe and skin was exposed to excess sunlight, the virus multiplied and crops of blisters around the lips or side of the mouth appeared. The false corns also develop in laborers and bare foot walkers.
5. Dermatitis: A red itching inflammation of the skin, may be caused due to oversensitive skin. The commonest form –eczema and contact dermatitis were wide spread. But though uncomfortable and unattractive, most types of dermatitis were temporary, not dangerous and not contagious.

Zhu Zuniang and Zhan Zhijun (1990)conducted study on eight Chinese male subjects whose mean values are as follows:

- The body weight (kg) was 54.74(+2.68), the body height (cm) was four to be 165.19(+5.37).
- The functional upward arm reach (cm) was 1981(+9.17). The Shoulder height (cm) was found to be 138.69 (+5.73), function hand height (cm) was 71.00(+2.54) & the functional forward arm reach length (cm) was found to be 69.38(+4.26).
- There were significant correlations between the maximum acceptable workloads and anthropometrics

measurements suit as stature, functional hand height, forearm length & functional forward and reach length.

- The mean body surface area (m^2) for this group was found to 1.58(+0.06) m^2).

2 .2 STUDIES RELATED TO NUTRITION

2.2.1 CARBOHYDRATES

Hultman (1989) reviewed that the body's glycogen store of 350 to 360 gms which will deliver +-1400 to 1440 Kcals, will get emptied after +- 60 mins of intensive exercise, after which the body can no longer continue delivery of energy even if desired. Because energy deliverance from fat is too slow ,the body starts using up functional proteins like enzymes and muscle proteins via the alkaline glucose cycle, which is reported to be for athletes. To avoid this situation it is suggested that a high level of glycogen is stored in the muscles and the carbohydrate should be supplied to the body as much as possible during exercise and to ensure optimal nutritional effects on work performance.

Leaf et al (1989) reported that increasing the carbohydrate intake after a period of prolonged exercise will increase glycogen and improve endurance capacity during continued exercise. Carbohydrate intake during exercise has glycogen sparing effects and to prevent the effect of fatigue from low blood glucose level. carbohydrate intake of 525 to 648 gm lead to maximal replenishment of muscle glycogen from exercise.

2.2.2 FATS

Anderson (1982) on the basis of his research reports that fats are a form of stored energy in animals ,as important as carbohydrates are in plants. They serve multiple purposes in the diet. In addition to their high-energy value, they contain essential fatty acids and act as carriers for the fat-soluble vitamins. The fat makers a meal more satisfying is partially due to its slow gastric emptying time and therefore its satiety value, and partially due to the flavor it gives to other foods.

Studies carried out by Essen (1978), evaluated the carbohydrate and lipids contribution to oxidative metabolism during intermittent intense exercise as compared with 60 minutes of continuous exercise. Results indicated that less glycogen and more lipids were used when exercise was performed intermittently.

2.2.3 PROTEINS

Grandjean, (1989) conducted several research studies and reported that aerobic exercises increase the mitochondria and oxidative enzymes, which are composed of protein an are necessary for energy production in the oxygen system. Whereas weights training synthesizes more of contractile muscle proteins, thus improving performance.

According to Williams(1988) research it was revealed that there is a significant contribution of protein as a source of energy during high intensity exercisesStudies show that aliening as a n indicator of protein metabolism is made available both from the branch chained amino-acid in the working muscles and also from the trans-animation of pyruvate. Short term activity leads to increase the alinine levels while in prolonged activities it enters the urea cycle and thus increase the urea levels.

Lancet (1987) reported that excess protein had nothing to performance (leaf ,1989) but is simply used as a substrate for oxidative metabolism either directly or as a precursor of glucose and the excess nitrogen will be lost .

During (1944) studied the effects of a low protein diet (53 gm/day) on endurance performance. Compared with diets containing normal (95-113 g/day) and high (151- 192 g/day). No significant differences were found between the diets.

2.2.4 VITAMINS

Tylavsky F.A. et al (2000) studied 56 girls aged 8 to 13 years. They found that girls who are constantly more than three serving of fruit and vegetable daily had greater bone area and lower serum pear thyroid hormone and girls who ate lesser fruit and vegetable had fine less bone area and high urine calcium and serum pera thyroid hormone. They conclude that childhood is critical time to accumulate bone calcium specially for girls who eventually be of risk for bone loss after menopause.

Kotze.H .F et al : (1977) reported by research for four days on ten consecutive day performed block stepping at an external work load, the positive part of which was 35 w environment of 32.2 day. 6 wet blub and 33.9 day of the men four given 250 mg Vitamin, 5 men 500 mg and 3 to 4 hours before each heat exposure . Rectal temperature hear rate and sweat rate were estimated hourly during exposure. Venous blood was collected before ascorbic acid given on days 1,2,3,5, and 10 and blood was collected just after two to four hours. Exposure plasma ascorbic acid increase three to four times than increased ascorbic acid was associated with a reduction in total sweat output, independent rectal temperature and increased work capacity and reduces fatigue.

Bunnett R.H. et al (1975) have studied thirty healthy men ,20 to 40 years old engaged in hard labour work and diet low in vitamin E. Supplement with 402 safflower oil daily for 13 months was given against control group with 9.4 mg Vitamin E, they found blood tocopherols declines progressively from 0.42%to 0.8% mg/100 ml. When in experiment group with 88 gm polyunsaturated fat, 2.3 mg Vitamin E have 1.01 to 0.5 mg Vitamin E within 5 months. No muscular weakness or lower work efficiency or other physical symptoms are reported.

Sebrell and Butler (1938): Reviewed the clinical effect of feeding human subjects for four months on a diet providing about .5 mg/day of riboflavin. Their subjects developed angular stomatitis, cheilosis and nasolabial seborrhea which responded to the administration of riboflavin. Two years later sydenstricker (1930)[69] firs describe among pellagrous patients in southern USA an invasion of the cornea by capillary bood vessels similar to that seen in rats suffering from riboflavin deficiency.

2.2.5 MINERALS AND WATER

R. Bandhu et al (2003) reports that iron deficiency anemia in children has been associated with retardation in growth and cognitive development .Anthropometric parameter such as height, weight and chest circumfences , body mass arm circumferences and hematological parameter such as hemoglobin, hemate MCV, MCH serum iron, total iron binding capacity and percentage of saturation. Pre supplementation values of parameter were taken in anemic and control group after deworming all the children with albenctazole (4—mg) and anemic group along with this ferrus iron 3-4 mg/kg weights per dayand vitamin C 100 gm. for 90 days .After therapy both groups shown improvement. It is concluded from the study that the IDA children less behind the control children in terms of anthropometric parameters and they benefited relatively more in terms of anthropometric improvement and hematological improvement after iron supplementation.

Vijyalaxmi et al(1986) studied performance of men, women and adolescent volunteers before and after iron supplementation .About 20% showed one or more nutritional deficiency. The common deficiency was ora lingual manifestation of vitamin B complex deficiency , ocular lessons, prynoderma and anemia before supplementation.

Brouns (1984) reported that dehydrated individuals are quite intolerant to exercise and heat stress that has an impact on cardiovascular system. Eg distance runners are forced to reduce the pace due to dehydration. Distributed fluid and electrolyte balances in the muscle cell, affecting energy processes and increased heart rate. It has been suggested that dehydration with cold water is an effective nutritional factor to help control body temperature during exercise in the heat.

2.3 STUDIES RELATED TO MALNUTRITION

Nagi (2000) reviewed that the deficiency symptoms in rural area like night blindness, visible goiter, and anemia, in different districts of India was due to malnutrition and deficient diet.

Satyanaryanan et al (1988) A team from NIN in Hyderabad has conducted a longitudinal study and collected growth data over 17 years, for 410 boys who were working from 5 years of age (one fifth of the boys had worked wages forat least 4 years. One half were in school until (at least age 14) .Their growth record was then compared with non-working children.In analyzing data, the boys were grouped according to the nutritional status at the beginning of the study as normal, mild and moderate under nutrition and severe under nutrition. It was observed that child labourers suffered from deficit in both height and weight when compared to non-working children . The deficits were most apparent among those who were in the best (normal) category at age 5.

Mehta et al (1985) ., NIN (1980), International Labour Review in 1980. A longitudinal study on 788 boys and 742 girls aged 12-18 years, from rural Hyderabad. Complete record of nutritional and anthropometric data were available when they were 1-6 years old.It suggested that work capacity and health status are complementary. There was a similar longitudinal study carried out in Japan, which is quoted in the International labour review (1980).

The study demonstrates a difference of 40 m in height between those who began the work before the age of 14 years and who began the work after 18 years of ages.Whereas their heights as studied by Mehta et al (1985) reports that only 4 working children had heights less than the 5^{th} percentile where as 4 children had heights above 45^{th} percentile when compared with ICMR standards.

A study by Mehta(1985) on 73 working children in restaurants revealed that most of children (about 80%) received adequate meals from the employer. The diet both in quantity and quality was adequate and there was hardly any evidence of malnutrition. This was probably because children working in restaurants get at least two or three meals a day. Early PEM was detected only

in 2 children due to familiar poverty. Vitamin A deficiency was found in 8 children, vitamin B-complex deficiency in 6 children and probably nutritional anemia in 8 children.

Swaminathan (1985) responses that tuberculosis, whooping cough, diarrhea, measles common cold and malaria were the nutritionally, relevant infections, malnutrition affects adversely affecting various defense mechanisms in the human body. Since frequent infections causes an increase in the requirements of calories, protein and some vitamins and decrease weight and growth rate of children, supplementary feeding of malnourished will help to improve the nutritional status.

2.3.1 MALNUTRITION AMONG WOMEN

Natrajan et al. (1995) studied the effect of iron supplementation on the iron status of pregnant women. The prevalence of anemia was 77.5% , out of this 34.3% were mildly anemic, 23.6% were moderately anemic and 19.5% were severely anemic. The mean Hb level was 9.56$\pm$ 16% and ferritin was 24$\pm$ 15.39 mg. Koilonychias was a more common sign of anemia (72%) as compared to pallor of conjunctiva shown only 28%.

George et al (1994) reported the nutritional status of working and non working Maharashtrian women .It was found that 10% of the working women and 15% of non working women had weight loss than 38 kgs and height less than 1.4 m .Severe under nutrition was mostly seen in the working women while obesity was more prevalent in the non working group. The mean calorie intake in non working, 1686 Kcal was lower than in working women (1787 Kcal) 50% working women and 67% in non working women .The intake of b complx,calcium and iron was less than 80% of the R.D.A.

Shah (1993) had studied socio economic psychological and nutritional effects of aging and reported a assessed in relation to health .It was found that:

- Most of subjects were socially active and 75% lived with their children
- 19% had a poor psychological status.
- 50% were inadequate with regard to energy intake.
- Dietary intake of women was more deficient than men with respect to protein and vitamin A.
- One third of the subjects had poor nutritional status.
- One fourth of both males and females were anemic more than 50% have normal.
- Serum-calcium, cholesterol and blood sugar about 15% of the subjects had low blood glucose levels as they had only two meals in a day.
- More women suffered from Cordial diseases than men.
- Only 2.7& of the subjects were health conscious and under went medical checkup regularly.

Satyavani et al (1990) reviewed in their study that urban women even if they contributed to economic security had no say in the financial management In rural area. This done by the women regards to food liking by head of the family and children got first and second preferences respectively. Irrespective of the socio-economic and socio-cultural levels, 90-95% of urban and 70%-85% of rural women did not have likes and dislikes of their own with regard to food. In more than half of the families, the housewife consumed the left over food, and women waited for their husbands for lunch or dinner.

According to Satyarayan (1988), there are some reports which have shown that malnutrition in early childhood contributes in adolescence .It could be considered to have adversely affected their bodyweight. However, it was shown that even sever malnutrition during childhood had no effect on work performance when expressed in terms of unit weight. But for the same work load, undernourished subjects had to use significantly higher heart-rate then well nourished subjects.

Rajlaxmi (1984) observed that in regions such as Gujarat, the child was offered the foods prepared for the family and this consisted mainly of tea, thick hard roti and highly spiced dal and vegetable which the child is unable to eat enough .This resulted in serious under nutrition. Their skeletal development was also found to be retarded. They were not play full and active.

Rajlaxmi reviewed factors such as those listed below:

TABLE 3:PROBLEMS AMONG CHILDREN IN GUJARAT

NO	PROBLEM	CONSEQUENCES
1	Poor absorption	Iron in hook worm infection Vit A in protein deficiency Vitamin B12 in Pernicious anemia. All nutrients in diarrhea.
2	Loss in the alimentary tract	Vitamin A with ingestion of Paraffin oil or repeatedly heated fats. Carotene and vitamin A with a relative excess of poly unsaturated fatty acids A relative deficiency of tocopherols.
3	Excessive loss from the body	Nitrogen losses during fever Acute infection and following injury Iron and carotene in hemorrhagic Hemolytic condition
4	Poor utilization	Vit A deficiency in protein malnutrition. Iodine deficiency caused by biochemical abnormalities.
5	Increased Requirement	Treatment with antibiotics Condition of surgery, injury

2.3.2 EFFORTS TO REDUCE MALNUTRITION

Taylor et al (1978) studied four groups of children aged 0 to 3 years. In order to irradicate malnutrition among them,one group received nutritional care, another medical care with emphasis on the treatment and prevention of infections diseases The third group received both nutritional and medical care and fourth group acted as control group.Analysis of growth rates, morbidity and mortality rates at different ages shows benefits derived from both nutritional and medical care.

Champakam et al (1968) followed up 19 children successfully treated for Kwashiorkor to see the effect of early malnutrition on growth and

mental function as compared with matched controls selected from the same locality and school.Result showed that there was a significant differences between both groups in regards to intelligence tests. The retardation was noticeable in experimental group.Thus one can say nourishment of human, nourishes the mind and increaseS intelligence for development of person and nation.

2.3.3 MALNUTRITION IN OTHER COUNTRIES

Bengoa (1974,WHO Report) reported that nutritional anemia as a world problem.Nutritional anemia, particularly iron deficiency anemia, were wide spread . It was responsible for considerable ill health and some mortality in most area.The groups most at risk for iron deficiency anemia were pregnant women, infants and young children. It was estimated that 20% U.S.A. population and 10% to 20% of European women were affected by iron deficiency anemia . In Africa 6 to 7% adult men, 15% to 5% adult women 30% to 60% children under 15 year age suffer from , Iron deficiency anemia. Similar figure was reported in Asia and also 92% of children under 2 years are affected by same. Mortality rates as high as 10,20 and 40 per 1,00,000 respectively were found in Asia.

Katsukis (1962) found in his study that Japanese obtained about 93% of their calories and 72% of their protein from vegetable foodstuff. ;mostly rice.They noted that single-crop farmers retired about 10 years earlier than double-crop farmers and suffered from lack of muscle strength, nervous disorders and metabolic disturbances to a greater extent than double-crop farmers .

2.4 STUDIES RELATED TO OCCUPATIONAL HEALTH

Sommerich C.M. et al (1993) in a review of recent investigation in the literature of occupational risk factors associated with soft tissue disorders of the shoulder, reported that, the studies have identified the following risk factors as being associated with particular shoulder pain syndromes:

- awkward or static postures
- heavy work
- direct load bearing
- repetitive arm movements
- working with hands above shoulder height
- lack of rest.

Baidya K.N. and Stevenson M.G. (1988) reported that, extensor muscle were found to fatigue faster with an increase in the maximum wrist extension but there was no significant effect attributable to lunar deviation, in a study local muscle fatigue in repetitive work carried out in ten male and six female university students was studied. The female subjects fatigued earlier than the male subjects. This was consistent with the association of wrist hyperextension with repetitive strain injuries and the higher incidences of repetitive strain injuries among female workers.

A laboratory study was conducted by A.Garg and J.Banerjee (1988) to determine the effects of repetitive asymmetric lifting on psychophysical .It determined maximum acceptable weights and resulting heart rate and rating perceived exertion (RPE). Eight male collage students in the plane and at 3 different angles of asymmetry (30.60 and 90) from the floor to an 81 cm high table and from 1 cm high table to a 152 cm high table at a rate of 3,6and 9 lifts min for a period of one hour .The results shows that even though there was a decrease in the maximum acceptable weights, heart rate increased in the angle of asymmetric lifting for all 3 lifting frequencies and 2 lifting height .It highlighted that:

- Φ On average, heart rate increased by about 6 beat min while the maximum acceptable weight decreased by 5.9kg to 90 compared to 0 in general
- Φ Heart rate were lowest in lifting sagittal plane (0) at a low frequency (3lifts min) and at a height of 0.81-1.52 m and the

highest for lifting at 90 asymmetry at a high frequency (9 lift min) and at a floor to o.81 m height.

- Φ The heart rate for the 0.81 m to 1.52 m lifting height were consistently lower than those for the floor level to 0.81 m height though heavier weights were selected at the higher height.
- Φ These was an increase in heart rate with an increases in lifting frequency for all 4 angles of asymmetric lifting and 2 height .
- Φ A mixed model analysis of variance of heart rate with repeated measure showed that there were significant difference ($p<0.010$ between the 4 angles the 3 frequencies and 2 heights.

In study of Garg A and Bannag G (1988), the result showed that rate of perceived exertion for wrist, shoulder, lower back, lower body and whole body increased with an increase in the angle of asymmetric lifting. Among the body parts studied, the maximum increase was for the lower back and lower body.

Lee Gung-Ho and Chen Yi-Lang (1995) carried out a study with the objective, to analyze physiological responses of horizontal lifting tasks performed in sitting and standing potions. The results of five male students showed that a mean heart rate of 85 beats/min (SD=7.6) for standing-forward lift; 83 beats/min (SD=6.4) for standing-twist lift, 81 beats/min (SD=7.3) for sitting-forward lift and 78 beats/min (SD=6.4) for sitting-twist lift. The subjects mean resign heart rates ranged from 68 to 75 beats/min. The results showed that seated position could be recommended while performing horizontal lifting tasks at workloads < 4.6 kg-m/min Heart rate was a sensitive measure for evaluating the effects of task, in the cardiovascular system in this investigation.

Benerjee (1985) reported that workers were exposed to numerous health hazards, which were mainly a result of bad working environment. These health problems are not only of immediate development to the workers but are likely to interfere in the future and may even reflect on the next generation.

Tatsuo Sana (1969) expressed inhalation of dust rich in large size particles over 5-10 microns .Repeated bronchial infection are inclined to

cause strong bronchial changes. Mostly silicosis was found in cases over 50 years old .

2.4.1 AGRICULTURE

W. Gandhi et al (2002) conducted study to determine the time and activity profile, physiological & biochemical stress of women cutting fodder and effect of environment 20 women with 20-40 years of age were selected.Observations were recorded for 30 minutes, at the start and end of activity .Women carry 43.8 kg. head load, traveled for 3.7 kms in 3 hrs.She consume 11.7 kg/m energy during back journey and it increased with age. 20% deviation formed in lumbar region during cutting Musculosketcal problems were quite high both in cervical and lumbar region , with severe pain in shoulder and neck and lower extremities. Environmental temperature and heart rate showed positive correlation.

Sawkar P. (1998) reported in his study that ergonomics research in agriculture is to have safe, healthy and productive labour force. To evaluate workload and evaluation of physiological and psycho-physiological occupational workload, physical fitness, posture and prevalent musculosketal problems were sever pain in low back, shoulders, legs, knees, thighs, elbows, ankles in all age groups were the occupational hazards developed over a period of time due to the heavy physical work.Abnormal posture at work and the other associated factors, the hourly work rest pattern by workers was not adequate or rationalized for increasing productivity .To make effective use of human energy by appropriate technology to suit their economic status ergonomics and anthropometrics consideration were the thrust area that needs to be concentrated.

Rao S (1997) reported in the study of workload of farm and agriculture female workers .Average heart rate responses of the subject while performing different agricultural activities varied from 93 to 134 beats/min .The maximum being observed in the operation of “Lifting and carrying” of the bundles and minimum in tying of bundles .

Ghugare S.D.et al (1991) in the study of ergonomics evaluation of a level operated knapsack sprayer reported that, during the spraying operation, all the regions except buttocks were reported to have discomfort. The maximum discomfort scores were processed, according to Cornett and Bishops (1976), and were in the left clavicle region. The discomforts were primarily due to carrying the sprayer load in rucksack mode. The postural discomfort data indicated a need for better mounting of the knapsack sprayer on the operators back.Other parts which had high discomfort scores were:

- lower back
- neck
- left thigh
- right clavicle
- right thigh
- chest
- mid back
- left leg
- left shoulder

Hagen K.B.et al (1993) carried out a study on physical workload perceived exertion and output of cut wood as related to age in motor-manual cutting on 15 younger and 16 older lumberjacks. Mean heart rates for all working phases were 138+10 beats/min (younger) and 126+17 (older). The heart rate differed between the working phases and was significantly higher for both group during bunching than during the other operations.RPE values and heart ratein the field showed a slighter correlation(younger)and not at all among older.

2.4.2 INDUSTRY

Punnet L., Fine L.J and keyserling W.M. (1998) carried out a study of back disorders in automobile assembly plant with the objective to study if non –neutral trunk postures were risk factors for musculoskeletal disorders of the back. One hundred and eighteen cases and 259 referents were interviewed

and examine .The results showed that 83% of all workers were required to work at least briefly during each job cycle in trunk flexion greater than 45 degrees, and 45% in trunk twist lateral bend posture. The findings report:

- All three of these postures were significant predictors of low back disorders among cases with positive findings of interview.
- The odd ratio for low back disorders among workers who used bold mild and serve flexion was 5.1 (P=0.02) among these who used both mild flexion and twisting was 7.3(p=0.0003).
- Peak low back forces were relative low among all subjects and did not appear to be confounding variables for the above measures of association.

A study was carried by Shruti Garg S.(1995) on 100 female assembly operators having the job experience from 5 to 20 year to identify the magnitude of cumulative trauma disorders. The results showed that with the increase in duration of employment and age the incidences of problem increase. Of all various cumulative trauma disorders only 3 were identified symptomatically among the workers viz Tendonitis, Carpal Tunnel syndrome and De'quervains disease.

Leino Paive and Hassan Jeddi(1995) in a study of physical workload and musculoskeletal disorders in engieering industry of 627 employees, reported that musculoskeletal morbidity as indicated by rheumatic symptoms, clinical findings and chronic disorders, was higher in both male and female blue-collar groups than, in the respective white-collar groups at baseline. Similarly, the increase in symptoms and findings and the incidence of chronic disorders during follow-up were higher in the blue –collar groups that in the white-collar ones.

Marianne Torner et al (1991) conducted a study of workload and musculoskeletal problemsas a comparison between welders and office clerks (with reference also to fisherman) on total 91 male workers. The study confirmed that symptoms and signs from the shoulder were common among the welders,

who also had more subjective symptoms and clinical signs from other parts of the musculoskeletal system. Range of motion in different joint system was, however similar in the two groups except in external rotation of the shoulder, where welders had a more limited range. The degree of co-existence of subjective symptoms and clinical signs differed between different parts of the musculoskeletal system and was low particularly in the low back hips and ankles. Atrophied shoulder muscle was more common among welders than among fishermen. This indicates that heavy dynamic work and prolonged static work may both induce shoulder injuries, but of different types.

Pitt(1985) reports that there is much dangerous machinery and many substances in the working environment of worker developing countries .The effects of these situations on adult health is well known and described in WHO technology reports and it would be surprising that the effects on children were much less .

2.4.3 DOMESTIC WORK

Kanunga, (1991), ILO 1983reports that those girls who live 24 hours in their place of employment become depressed when they compare their conditions with their masters daughter.It affect their mental development.

Burra. et.al. (1990) suggested that economic conditions the workers could not maintain proper peritoneal hygiene. It was observed that full time workers maintained better hygiene and had less health problems then part timers (Ohyango, 1981) .Many times boys and girls working as a domestic helpers are sexually assaulted.

Das (1987) observed that domestic workers were vulnerable in many ways, each of which is serious. They were open to above because of their age, sex, their consignment, their invisibility to the outside world, their total dependence on their employer and their lack of familiarity

Mehta et .al (1984)quotes that Many times health condition of working girls are not satisfactory. As mentioned in survey conducted in the city of Bhuwneshwar it was observed that out of 50 girls (domestic worker) 20% had stomach problems due to irregular intake of food and high consumption of tea. Almost all the workers said that they suffered from cold and cough.

2.4.4 OTHER OCCUPATIONS

Montreuil S. et al (1996) in the study of profile of the muculoskeletal pain suffered by 114 male textile workers handling thread cones according to work, age and employment duration reported that the workers were divided in to 4 classes. In all classes, an important proportion of worker WHO reported work related body pain and over half of the worker were suffering pain indicated that their work related pains affected their daily life. The results show that most of the workers in this study have been on the job market for at least 6 yrs. And that 64.9% of them feel at least one musculaskeletal pain and 50% at least two of lower back, lower elbow, wrist hand, shoulder, neck and upper back. Studies also show that as people grow older they develop more symptoms from neck and shoulder in tufting workers.No worker from the youngest group (class 1) was found to suffer from pain in the shoulder and neck (first and second pains.) Twice as many workers in class 2(where the majority were 40 years old) feel pain in the shoulders and neck. However the groups of workers from 25 to 35 years of age (class 3) appeared to be the most seriously affected by musculoskeletal pain, as much by the frequency of symptoms (last seven days) This suggests that the turning point in the professional life of tufting workers would occur between the age of 25-35 years. (Relatively early)

The physiological workload of the different activities involved in the construction work was studied by Bhatnagar A.(1995). The average working heart rate varied from 116 to 140 bpm, the highest (140bpm) being observed during stone crushing activity and the lowest (116bpm) in lifting and carrying activity performed during shift. The corresponding energy expenditure varied between 15.0 and 19.5kg/min. Based on these values, workload was classified as ’very heavy’ to ‘extremely heavy’. The results also showed that physiological cost of work was not affected by the body weight and the age of the workers.

S. Blader et al (1991) carried out a study on sewing machine operators to concern the occurrence of neck-shoulder problems among this group. This occupation involves monotonous and repetitive task, performed in work position equivalent to a static component of muscular load on the neck and shoulder.

- The results showed that daily problems were experienced by 26% some 27% had problems leading to restraints in work time and 37% in leisure time.
- The result of specific clinical examination showed that the tension next syndrome (TNS) was most frequent, followed by the cervical syndrome.
- A positive correlation between the TNS and working hours per week suggests a daily-prolonged static load on the neck shoulder to be of importance for neck- shoulder problem among the sewing machine operations.

Chauhan .M.K (1991) in the study of occupational work load of women basket makers, reported that average heart rate responses, were within 90 beats/min indicating that there does not seem to have any physiological stress on basket makers due to their occupational work. And based on working heart rate, the work load was graded as very light-to-light category in bits/min .The energy expenditure for 7mode was as follow m =4.83 ,m =4.99,m =5.27,m =5.54,m =5.93,m 6.22,m =6.96 kcal/min .Analysis of variance on the data established were significantly ($p<0.01$) different in the values of the physiological parameter of energy cost, cardiac rate and pulmonary ventilation due to change in the mode of carrying. The double pack mode (m) was ergonomically the best mode followed closely by the head mode(m) .Carrying by the hands (m) was the worst method.

Kulkarni (1985) examined 974 and 2360 adult workers in textile industry in Ahemdabad. They found out that workers had under weight vitamint A deficiency and B_{12} deficiency and have lower work capacity.These finding shows that even among the adults of lower socio economic strata manifest sign of malnutrition were found in appreciable number.

A comparative study of seven modes of carrying an identical load on the level ground was conducted on seven normal healthy volunteers by Dattas r and Ram Nathan N.L (1971) .The mean age was 36.1 height 166.35.3cm weight

50.03.33 kg and body surface area 1.530.05m2 The mode of carrying were front and back, head shoulder pack, Nepali porter type ,rice bag, yoke and hands. The volunteers marched with 30 kgs at the rate of 5km/hr and the rate for 7different modes found was m=136.5,m=144.9, m=146.2m,m =137.1,m=142.5,m=148.8,m166.0 bits/min .The energy expenditure for 7mode was m =4.83 ,m =4.99,m =5.27,m =5.54,m =5.93,m 6.22,m =6.96 kcal/min .Analysis of variance on the data established were significantly ($p<0.01$) different in the values of the physiological parameter of energy cost, cardiac rate and pulmonary ventilation due to change in the mode of carrying. The double pack mode was ergonomically the best mode followed closely by the head mode) .Carrying by the hands was the worst method

Costa Giovanni (1993) conducted a study of evaluation of workload in air traffic controllers and workload was measured by taking into consideration various measures like Fussiontest, Questionnaire etc.along with Heart rate responses. The heart rate responses during morning, afternoon & night shift were 83.3+5.1,87.2+7.1 and 82.1+5.0 beats/min. respectively. The heart rate was related to the workload index (i.e. number of aircraft controlled by ATC). It was slightly higher on average during afternoon shift than during the morning and night shift. The cardiac cost showed a moderate level workload during the day shift and ‘low’ during the night shift.

J Nieves Serrator (1993) carried out a study on 143 Mexican men who were operators of sewing machines in eight shoe factories. 132 of them operated flat-type machines and 11 operated column-type machines. The findings showed:

- 47.5% of the subjects declared current musculaskeletal disorder. Statistical difference was found when the two groups wee considered separately.
- Low back pain was most frequent at a rate of 18.25%for both groups.The shoulder was a site of complaint for 14% of the subjects, being three times more frequent among column machine operators.

- The back as a whole was mentioned also by 14% of the subjects, all of them flat- machine operators
- 4.9 %of the subjects companied of neck pain and again none of the column-machine operators was affected.

In the study of physical work and strain involved in manual sorting of postal parcels, Louhevaara V., Hakola T. and Olalla H. (1990), reported that, local rating of perceived exertion of legs, back, and arms during the work shift did not exceed, on over age.The 'some what strong level' in the beginning of the work shift perceived exertion on the cardio respiratory system, legs, back, and arms were estimated as 'nothing at all' (0) or 'very weak'. During the shift the sensation of exertion increased and reached the levels from 'weak' to 'somewhat strong'. In the study of physical work and strain involved in manual sorting postal parcels, they reported that

- The sorting centers the average HRs for different parcel sorting tasks various from 89 to 114 beats min.
- During the sorting work HR was 101+18 beats min among the 5-sorting center.
- HR was the higher (111+17 beat min^{-1}) corresponded to a VO_2 of about 1.01 min^{-1} according to HR-VO_2 relationship assessed during the parcel sorting simulations .During actual sorting average cardio respiratory stress and strain was classified moderate or acceptable with quite rare peak load situations.

Ann-Sofie Ljungberg, Asa-kilborn and Conan M Hagg (1989) conducted a study on nursing aides (18 women and 6 men) at one traditional and one modern geriatric ward and warehouse workers (16 men) at 2 different types of warehouse departments were studied during occupational work . The vertical load during manual handling were measured using strain gauges built into wooden shoe of warehouse workers .Warehouse workers performed four times as many lifts as the nursing aid lifts and transferred five times as great mass per unit time. Less than 25% of the lifts were carried out with the load evenly

disturbed on both feet during bothering the upper lift and lowering. In the warehouses the lifts were short, while the nursing aides were exposed both to lift of longer duration and to carrying a well as a greater frequency of unexpected, sudden a high peak load .The HR 02 uptake values recorded were relatively low. The mean working HR in traditional nursing aides was 113 (not equal 130). And in modern nursing aids it was113 (+13). The mean among warehouse worker were 96(+12) & 110(+12) respectively. The maximal workload HR in Traditional nursing aides was 181(+10) & in modern nursing aides were 186(+11). The maximal workload HR (beats/min) in grocery & fresh food ware house worker were 186(+70 & 185(+8( ) respectively.

Johansson S.E.and Ljungbreg G (1989) carried out a study of percieved exertion during a self-imposed pace of wok on female cleaners. All clean reported “strong” symptoms on a Barg C.R.scale from difficult work postures fatigue after work, high work rate and stress. Eight of the nine subjects also reported strong symptoms from monotonous work movements. All of them mentioned heavy lifts as giving ‘rather strong’ to ‘strong’ symptoms. Most subjects had back symptoms and more than half of them reported symptoms involving the neck, shoulder, wrist and hands. The varying intensities indicate where the problems were most critical.

Swaminathan (1984), F.A.O. (1962) quotes that there is , remarkable co-relation between work output and calorie intake in Ruhr districts of Germany in relation to the production of coal. “Miner’s rations provided an average of 4500 Kcal of which 2200 Kcal were required for B.M.R. and various activity, the remaining 2300 Kcal for occupational work. For 1.9 tons of coal output. As was proceeded and food situation became worse, only a 1700 work calories, out diminished slowly. On the average of all food consumed, the amount of coal produced per 1000 Kcal fell from 0.42 ton in 1939 to 0.40 ton in 1944.

2.4.5 STUDIES RELATED TO ENERGY EXPENDITURE

Varghese and Bhatnagar (1989) studied energy balance of housewives .They reported that the energy balance expenditure on household tasks ranged from 1.35Kcal/min to 3.50 Kcal/min and the average energy spent was 1045 Kcals ranging from 480-1539 Kcals.He reported in ergonomics for home activities and energy expenditure as below

TABLE 4 ENERGY EXPENDITURE FOR HOME ACTIVITIES

Sr. no	Classification of Work load .	Physiological energy expenditure Kcal/min.	Variable heart rate bits/min.
1.	Very light	<1.5	<80
2.	Light	1.5-2.3	80-100
3.	Fairly light	2.4-3.1	101-115
4.	Moderate	3.2-3.9	116-130
5.	Heavy	4.0-4.7	131-145
6.	Very heavy	4.8-5.5	146-160
7.	Extremely heavy	7-8.5	>160

Rao (1987)[1] in study on physiological cost of home and farm workers showed that the energy expenditure for household activities ranged from 1.48 to 3.04 Kcal/min and farm activities ranged from1.93 to 2.88 Kcal/min.

Nag and Chaterjee (1981) determined the physiological reactions of eight female workers in household work. The energy requirement while sitting on floor level, washing clothes, sweeping floor, bending and holding weight upto2 kg, bending and moving around kitchen and spreading grains and vegetables was 1.20, 1.29, 2.14, 2.43 and 3.58 Kcal/min respectively.

Ganguli et al (1975) had reported prediction of energy cost from peak heart rate in lower extremity amputees and physiological cost of work and energy expenditure based on the formula

Energy expenditure/kcal/min. =0.068 x peak heart rate-4.59

TABLE 5

CLASSIFICATION OF ENERGY EXPENDITURE

Activities	Light	Moderate	Heavy	Very heavy
Energy expenditure/kcal/min.	Up to 3.5	3.50-5.25	5.26-7	Above 7

Anderson (1982): reported the maintenance component of the total energy expenditure is quite constant for an adult. There are normal variations of which lie within the body itself the size the shape and composition of the body age activities of certain internal glands that variation from 10% to 15%. The major dermination of Variable in the rate of energy among people is composition of physical activity and occupational activities or recreation activities.

Geissler (1981): measured the energy cast of Indian carpet weavers and villagers. The mean age, weight and height of the subjects were 31 yrs, 52.8 kg and 155 cm respectively. The energy requirement during sitting, standing walking and preparing meals was 1.14, 1.24, 2.49 and 1.58 K cal/min respectively.

Nimajiri K (1963)experience that, the daily energy expenditure in calories is an expression common to every country and also in important information for nutritional considerations. Along with progress of technical innovation, the daily energy expenditure of industrial workers decreased markedly and the majority of workers is it now less than 1000 kcal/hrs and less than 2,300 kcal per day.The daily expenditure is 2,400 to 2,600 kcal and upper limit is 2,800 kcal. This finding suggests that the actual working hours closely related with intensity of work, physique of worker and time and day of work.

TABLE 6

ENERGY EXPENDITURE

Type of work	Criteria	Energy expenditure Kcal/day

1. Farmers	Man { Spring Autumn Woman { Spring Autumn	4041 3532 2837 2970
2. Civil Engineering	Cutting soft weed with hoe Pushing the trolley Conveyance of materials	3341 3340 3417
3. Postman	Using skiing Walking	4028 3797
4. Coal miners		2997

2.4.6 STUDIES RELATED TO FATIGUE

Das A. V. (1988) said that physical stress is measured by pain and aches in the body- headache, backache, pain in chest, neck, hand, legs, etc. Pain in hands and legs was reported by 80% of working children in Ankodia village, Baroda.

Pitt D.C. (1985)[174] showed that long hours of work may result in extreme fatigue which sttops growth and leads not only malnutrition, anemia and associated disease patterns but many undesirable changes in endocrine and nervous system. Possibly the energy for this long and sometimes hard work is significantly greater than calories available.

2.4.7 STUDIES RELATED TO POSTURE

Sang wan, Gupta (2002) reported in their study that an average mops 1375 sq.ft. Area with chops floor (74%) daily using squatty and bending posture results in high physiological stress in home makers in

terms of pulse rate, respiration frequency and grip strength, whereas improve mop has more working efficiency and less physiological stress due to long and light handle besides its squeezing system.

Nag et al (1986) studied the occupational stresses as women engaged in making beedis and the adopted sitting posture at work. There were, however, variations in the sitting posture adopted so far as the position of the upper and lower limbs in relation to trunk is concerned sitting on the floor with cross legged with right or left leg bend at knee or with the legs extended .it was found that sitting on the floor with legs stretched were most comfortable sitting posture as far as beedis rolling is concerned back was prevalent among 68% of their women.

Bhargva, (1985) reported that a poor working environment was responsible for most of health problems of worker which ultimately lowers the health standard of the nation. The harmful environment manifests through excessive fatigue, poor nutrition, infections ,stunted growth and exposure to toxic chemicals. These toxic chemicals have effects ranging the immediate death to delayed reaction for resistance, to effects or mutagenic effects and genetic defect that were transmitted to the next generation.

Weiss c. (1980) said that the number of occupational diseases due to the allergenic substance is extremely high or the posture adopted during working for the long time is not proper for most of the occupational disorders.

Nag and Datta (1979); studied the physiological responses during weeding operation. The energy required for weeding, was 2.90 Kcal/min. After comparing work performance and physiological demand of worker, the wheel heo-type of weeder was found to be the best for Indian worker.

Grandjean and Hunting (1977) studied various problems of standing and sitting positions. Long lasting static posture with heavy load impairs the blood supply and the waste products were accumulated in the muscles. This was the cause for acute pain in the statically loaded muscles.

Garg in (1976) disclosed that leg lifting from a squat position is metabolically more demanding thus possibly leading to more fatigue related injuries and high forces in the spine.

Deshi & Chahal (1974) studies the effect of sitting and standing posture on the heart rate during chapatti making. The finding showed that in sitting position heart rate was lower.

BIBLIOGRAPHY

- Anderson (1982) : “The rate of energy expenditure among people is composition of physical, Occupational & recreational activity in Dietetic and nutrition 7th edition L-19, Page.386.
- Anne-Sofie-Liugberg, Asa-Killborn and Conan.M.Hagg(1989) : “Occupational lifting by nursing aids and ware house worker’s, 32,1Page.59-78.
- Baidya K N and Stevenson M.G (1988) : “Local muscle fatigue in repetative work”, Eargonomics, 31, 2, 227-239.
- Bengoa (1974) : WHO Report. In nutrition in health & disease by Robinson 28:3 Page-376.
- Bhargva.G.(1958): “Health situation of working children” In child labour and health prospects, edition by Naidu U.S pg-123, TISS series-54, Mumbai.
- Bhattnagar A (1995) : “An eargonomics study of permissible weights and loads for female constructions workers, PHD dissertation, SNDT woman’s university Mumbai.

- Bimla – Binda, Arya-Manocha, Ansu- Aneja (1998) : “Anthropometrics measurement of boys during the age of 7-10 years, J. of Dariying, Food & Home Science 17-3-4 Page.241-243.
- Bround (1984) : Nutritional problems during strenuous physical exercise” Selected bibliography in nutrition, studies for human Vol-2, June Page.105.
- Bunnett R.H, Ritter E.D. Rubin S.H.(1975) : “Effect of polyunsaturated fatty acids with a low vitamin C diet on blood level of Physical Labour. AM J. of Clin Nutri 28/7 Page.115-123.
- Burra N.(1990) : “Children in glass industry in Firozabad, In children of Darkness edition by dingwaney Page-25.
- Champakam S. Srikantia.S.G and Gopalan.C (1968) : “Kwashioker and mental development, Am. J cli: nutri; 21, 844-852.
- Chauhan M.K(1991) : “Occupational workload of women basket makers” MSC dissertation. SNDT University Mumbai.
- Costa Govnani (1993) : “Eevolution of work load in air traffic controllers”. Eargonomics, 36,9,1111-1120.
- Das AV and Adhikary A. (1987) : “Evolution of physical fitness in young players in India” Ind. J. of Phy-2, Allied Science Vol-39, No-4, Page.148-150.
- Das. A.V (1988): “A study of female child domestic workers in Baroda City. A paper presented at the N G O, workshop at New Delhi. Page.18.
- Dattas & Ramnathan N.L (1917) : “Evolution of work load in Indian worker of nail factory”, J. Applied Eargonomics. 25:6:245-256.
- Deshi.J.K and Chahal.H.K (1974) : The effect of stages of body bend on heart rate during sitting & standing postures Vol.2, Page.30-35 The Indian J of home science.
- Dorling R.C, R.E. Johnson., G.C. Pilts, R.C. Consdazio and P.F. Obinson (1944) : “Effect of Variations in dietary protein on physical welt-being of men doing manual work” J. Nutrition 28:273.

- Dr. Trevor Weston (1992) : “The all co lour guide to First aid and family health Marshall Cavendish –Singapore.
- Ganguli S. and Dutta.S.R (1975) : “Production of energy cost from peak heart rate in lower extremity amputees. Biochemical engineering, 10, 52-55.
- Gapolen C. & S Kaur (1989) : “Women and Nutrition in India”. NFI, New Delhi, Page-2.
- Garg & Bannag.G (1988) : “Maximum acceptable weight, heart-rates and RPES for one hour’s repetitive asymmetric lifting”, Eargonomics 31.1-77-96.
- Garg and Banerjee (1988) : “Dynamics of stressful encounter cognitive appraisal coping & encounter out comes” J of personality & Social Psychology Page..50:992-1003.
- Garg.A.(1970) : A metabolic rate prediction model for manual materials handlings Jobs, Phd. Dissertation. Uni of Michigan. H now in TISS.
- Geissler (1981) : Energy expenditure of female carpet weavers and rural women in Iran. Am. J. of clinical Nutrition 34: 2776-2783.
- George Anjula and Dodd. N.S (1994) Assessment of Nutrition status of working and non-working Maharastrian women. A.G. Phd theses. S.NDT> uni
- Ghugaure S.D(1991) : “Eargonomics evaluation of a lever operated knapsack sprayer”, J of applied Eardonomics, 22.4,241-245.
- Gosh R.N(1980)-Nutrition Program for upgrading nutrition status manual for social & preventive medicine, Page-41-46.
- Grandjean (1989) : “Macro Nutrient intake of us athletes compared with the general population and recommendations made for athletes, Am J.Clin Nutri, 49, 1090.
- Grandjeane E Hunting (1977) : “Eargonomics of the home” Taylor and Francis Ltd London-P.22.

- Hagen K.B (1993) : Physical workload perceived exertion and out put of cut wood as related to age in motor manual cutting". Eargonomics, 36,5,479-488.
- Hiderbradth V.H(1995) : "Musculaskeletal symptoms and work load in 12 branch of Dutch agriculture". Eargonomics, 28/12 2576-4587.
- Himabury (1997) : "Kineticmethods of manual handling in Industry" Occupational safety & health series No-10, Geneva (ILO).
- Hultman E. (1989) : "Nutritional effect on work performance AM J. Cli Nutri: 49, 949:57.
- ILO (1980) : Review by Misty H.N. "Type of physical health problems in working children", TISS series no-59, Mumbai, page-135.
- J.Nieves Serrator Perez (1993) : "Musculoskeketal disorders among male sewing operators in Shoe Making". Eargomics, 36,7,393-800.
- Johanssan S.E and Liungberg G (1989) : "Perceived eaertion during a self-imposed pace of work cleaner's", J of Applied Eargonomics, 20.4, 307-312.
- Kanuga (1991) : "The young girls, helping in our household work" In, Rehabilitation of Child Labour in India. Edition Pati R.N. Page.217, Ashish Pub. House No, New Delhi.
- Katsukis (1962) : WHO/ ILO committee on occupational health report no 11-23.
- Kotze H.F, Walt WH, Rogger GG, Strydom N.B, (1977) : "Effect of plasma ascorbic acid levels on heat accumulation in man" J. of applied physiology, Page.42, 5, 711-716.
- Lancet (1987) : "Nutrition in Sport" Page.1297-1298 , The Olympic book of Sports medicine Vol-2.
- Leaf A. and Frisa K.B. (1989) : "Eating for health for athletic performance AM J.Clin Nutrit, 49:1066.

- Lee Gung –Ho & Chen yi ang (1995) : “Comparative analysis of work load in seated and standing horizontal sub maximal lifting task”. Eargonomics- 27-11-2546-2556.
- Lei no Paive & Harsan veddy (1995) : “A study of physical workload and Musculaskeletal disorders in Industry” Eargomomics , 42/2,141-148.
- Louheyaera V. Hakola T. and Olilia H(1990) : “Physical work and strain involved in manual sorting of postal parcels” Eargonomics, 33, 9, 1115-1130.
- Marianne Torner. et at (1991) : “Work load and Musculaskeletal problems a comparison between welders and office clerks with fishermen”, Eargonomics, 343 Page.1179-1196.
- Mass S. Kok M.L.J, Westra HG and Keper H.CG (1989) : “The validity of the use of heart rate in estimating Oxygen consumphon in static and combined static dynamic exercise”, Ergonomics, 32, 2, Page.141-148.
- Mehta M.N., Prabhu S.V. and mistry H.N (1984) : “Types of physical health problems in working children” in child labour and health problems and prospects, TISS, Series No-59, Page-135, Mumbai.
- Mehta, M.N, Prabhu, S.V. and Mistry, H.N(1985) : “Types of physical health problems in working children in U.S.Naidu and Kapadia. K.R.(edi) child labour and health problems and prospects, TISS, series No. 59, page.135 Mumbai.
- MehtaM.N., Mtstry.H.N and Prabhu.S.V.,(1985) : “Types of physical health problems in working children”, in us, TISS series – 59, page.135.
- Montruil S. Laflammel. & Tellier(1996) : “Profile of Musculaskeletal pain suffered by textile workers handling, thread cones according to work, age & employment – Duration”. Eargoomics, 39-1, 76-91.
- Mudami S. C (1988) : Introduction to food , Nutrition & food Storage, 2nd Edition, Page-96, Tata M.C. Grow Hill Publishing Delhi-1100022.

- Nag and Chaterjee (1981) : “Relationship of Perceived Occupational stress with job satisfaction.
- Nag P.K and Datta P (1979) : Effectiveness of some simple agriculture weeders with reference to physiological responses J. of Human, Eargonomics., 8:13-21.
- Nagi (2000) : “ Child survival & Safe-motherhood experiences from India, council for social devt page.26, 141,179,180, Kanshika Pab & Dis, Delhi.
- Nagi B.S.(2000) : Child survival and safe motherhood, experiences from India. Page-26-141, 179, 180-Council for social devt, Kanshika Pub & Dist, New Delhi.
- Natrajan (1985) “Performance of men, women and adolescent volunteers before & after Tran supplementation Indian Job Diet & Nut 23:(10):239.
- Nimijiri K (1963) : “Effect of mechanization of Industrial work on the actual working hours, J of Sci of labour, 39(2)52-58, 1963.
- Patwarthan & Ramligaswamy (1974) : In Diet & nutrition in India by Swaminathan L.20/480/486.
- Pitt D.C (1985): “ Child labour and health-some basic Questions”- In child labour & health problem & prospected. Edi by TISS, series-54, Mumbai.
- Punnet L, Fine, LJ and Keyseriling W.M (1998). “An epidemiological study of postural risk factors for back disorders – In Industry & Musculaskeletal disorders at work.” Page.74.
- R. Bandhu, N.Shankar & O.P.Tandon (2003) : “Effect of iron on growth in iron deficient anemic school going children Indian, J. Physiology & Pharmacology, Vol.1 Jan-2003.
- Rajlaxmi (1984) : Applied nutrition oxford university.
- Rao K.SJ Khan (1997) : “Work load and physical efficiency of college women’. J. Applied Physio 20(20) 263-269.
- Rao.S. (1987) : “Physiological cost and perceived exertion for home and farm activities done by rural women. PHD. Thesis. SVT college of home science SNDT University Mumbai.

- Ray G. Cgatterje S.K., Gokani V.N(1980) : Studies on occupational health problems during agricultural operation of Indian tobacco workers. J. of occupational medicine Jan, 21/1 (45-47) 11 ref.
- S.Blader et at (1991) : “Neck and shoulder complains among sewing machine operator”, Applied eagonomics, 224,251-257.
- Saha P.N.(1973) : “Physiologic Evalution of jobs and workers in an integrated steel plant” Report No.12, TISS Mumbai.
- Sangwan Veena, Gupta Alka and Gandhi Suresh (2002) : “Eargonomic acceptability of an improved mop. J. of Home Science & research, 12/2, Dept. of FRM College of Home Science Hissar, Agri University.
- Sankar.P.P, Sawant PA, Malve DB(1995) : “Consumption pattern of agriculture labour households in the Konkarn region Indian J of Nutrition Dietetics 32:10, Page.250-253.
- Satyanarayan .K, C.Nageswara Roa, B.S.Narasinga Rao and M.S.Malhotra . (1988)- “Recommended dietary intake for Indian sportsman & woman”. NIN, ICRM Hyadrabad.
- Satyanarayan.K (1988) : “Growth and development and physical performance of man in under nutrition-social dimension” proc, nutrition Soc. India. 34/23, Page.28.
- Satyavani. K. and Subhlakshmi.G(1990) “Socio economics and cultural determination of nutritional status of women, SNDT University.
- Sawkar Shusheela P., Vargheese M.A., Saha P.N., Ashalatha. K.V. (1998) : “Eargonomics research and physiological cost” SNDT University, Major UGC Project work.
- Schrell and Butler (1983) : “Nutritional deficiencies in developing countries. J. of AM Diet Assi 42:295.
- Shah P.N (1993): Manual work and work loud in different industries in India. ILO, 58,Occupational safety and health services, 290-295.

- Shruti Garg (1995) : " Incidents of cumulative trauma disorders among female assembly operators", Msc dissertation SNDT. University, Mumbai.
- Sommerich.Cm. Mcglothin James. D, Marras willams (1993) :"Occupational risk factors associated with soft tissue disorders of the shoulder; Eargonomics, 36/6 Page.699-717.
- Swaminathan (1984) : Nutrition in pregnancy & lactation, Indian J med Res 57: Supply P:63.
- Swaminathan.M. (1985): "Essentials of food & Nutrition for Diet for Industrial workers" Lesson-29, Page-343-356.
- Tatsuo Sana (1969) : "Relation between Pneumoconiosis & Lung cancer Vol-45, No-1, 383-396.
- Taylor. C.E. Kielmann A.A, Desweener C. (1978) : The Narangwal experiment on interactions of nutrition and infections. Indian J of medical research 68, supply 1-20.
- Tylaysky F.A, Holiday K., Danish R.(2004) : "Diets high in fruits & Veg preserve bone loss in children" AM. J. of clin Nutri, Page.79, 311-317.
- Vargheese M.A. and Bhatnagar A(1989) : "A rapid a praisal of Occupational work load from a modified scale of perceived exertion" Eargonomics,37,3,485-491.
- Victoria Hose good and Gona M.R. Lompell (2003) : Body mass Index, height, arm circumference and mortality in rural Bangladesh women, of 19 year, longitudinal study. The Am. J. of Clin Nutri-Vol-77/2, Feb-2003, Page.341.
- Vijaylaxmi et al (1986) : Vijaylami P. and Natrajan J.(1986) "Performance of men, women and adolescent volunteers before and after iron supplementation" Indian J. of Nutrition & diet 23(10):279.
- W.Gandhi, K.Rana, M.Dilbagti, Bimla & R.Singh(2002) : "Ergonomic Evolution of farm women cutting fodder" – A Hariyana study. Dept. of FRM. College of Home Science History Agri University Panjab.

- Weiss C.(1980) : “Occupational disease and treatment. J. of occupational medicine (Chicago) Aug-1980, 2218 (527-229).
- WHO and primary health care (1978) & ILO(1983) : “Minimum age for admission to employment”, convention 138. Page.44.
- Willams (1989) : “Diet and endurance fitness” AM J.Clin Nutri:49:10 Page.77-83.
- Zhu Zunlag and Zhan Zhijun (1990) :

CHAPTER 3
METHODOLOGY

The present study was an attempt to study the nutritional as well as health status of selected salt workers residing in Kutch district of Gujarat state. Systematic and scientific procedures were followed to conduct the research. The research procedure can be described as under:

3.1 Selecting the Sample
3.2 Preliminary Survey
3.3 Development of Interview Schedule
3.4 Pilot Testing
3.5 Validating the Tools
3.6 Development of Measuring Techniques
3.7 Data Collection

3.8 Categorization of Variables

3.9 Tabulation of the Data

3.10 Analysis of the Data

3.1 SELECTING THE SAMPLE

The sample for the study comprised of 300 salt workers of Kutch district of Gujarat. The researcher followed the following procedures for selecting the sample.

3.1.1 SELECTION OF THE SAMPLE

The researcher was interested in studying the nutritional and health status of salt workers. Being a native of Gujarat state, the researcher wanted to study the salt workers of the same state. It was found that the population of salt workers was more in Kutch as compared to other districts of Gujarat. In addition to this, the researcher being a resident of Kutch since last many years was familiar with the environment and people of Kutch. Therefore a sample of 300 subjects who worked as salt workers in Kutch was selected as the sample for the present study.

3.1.2 SELECTION OF THE AREA

According to the information available from the census of salt ponds and workers published by Development of Salt Industries, Government of Gujarat in 1982 estimated the total number of salt producing villages in Gujarat were 1879.There were 893 salt works in Kutch with an area of 82244 acres of land. The total number of households was 4939 and salt production was principal activity. Since it was difficult to select salt producing villages from such a large number, it was selected on the basis of the following criteria:

- The selected area was near the coastal area
- The area was near Gandhidham

- The area was easily approachable

On the basis of the above criteria five villages namely Kidana, Padana , Veera, Chirai and Kandla were selected.. A brief description of these villages is given below:

- **Kidana:** This village is situated about 8 km northwest of Gandhidham city in Kutch district of Gujarat state. Village is surrounded by Arabian Sea. This village has 30 salt works with 40 households consisting of 300 people.
- **Padana:** This village is about 17 km southeast of Gandhidham city in Kutch district of Gujarat state. Village is on the coastal line of Arabian Sea touching Kutch. This Village has 50 salt works with 70 households consisting of 500 people.
- **Veera:** This village is about 29 km north of Gandhidham city in Kutch district of Gujarat state. Village is on the seashore of Arabian Sea, but the salt works are away from coast. Agaria (salt works) makes Veera a creek which gives salt waters to them as well as fish to eat. As they are away from sea coast, they are protected by hide on full moon day. This village has 20 households consisting of 200 people.
- **Chirai:** This village is about 22 km south of Gandhidham city in Kutch district of Gujarat state. The salt ponds were only on the edge of the village where the coastal line existed. This village has 200 salt ponds with 1000 salt workers.
- **Kandla:** This is the one of the greatest ports of India.It is about 14 km north of Gandhidham city in Kutch district of Gujarat state. Kandla had about 20,200 population with 500 households but out of them only 100 households had salt ponds with a population of 1000.

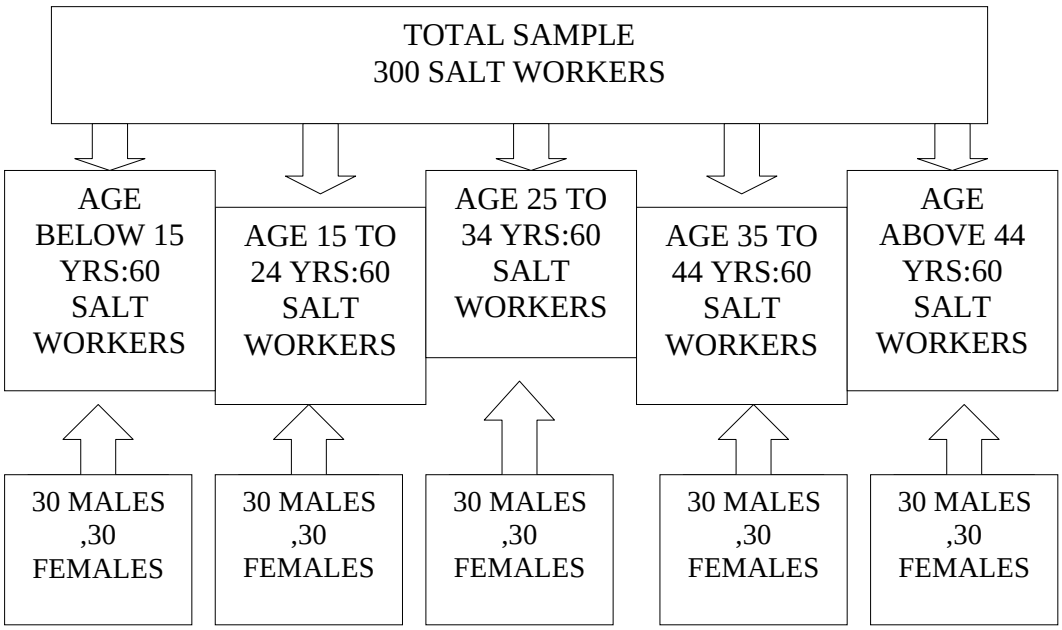
3.1.3 SELECTION OF SALT WORKERS

The researcher aimed to study the nutritional and health status of salt workers of Kutch. The study also aimed to observe the differences in nutritional status of the salt workers in relation to their age. Thus the researcher selected salt workers of different ages. A fixed number of male and female subjects were selected from each age group. Random sampling technique was used to draw out the desired sample from the selected five areas. The distribution of the sample can be understood from given figure. The age groups considered for this sample was as follows:

1. Less than 15 years
2. 15 years to 24 years
3. 25 years to 34 years
4. 35 years to 44 years
5. Above 44 years

FIGURE 3

SAMPLE DISTRIBUTION



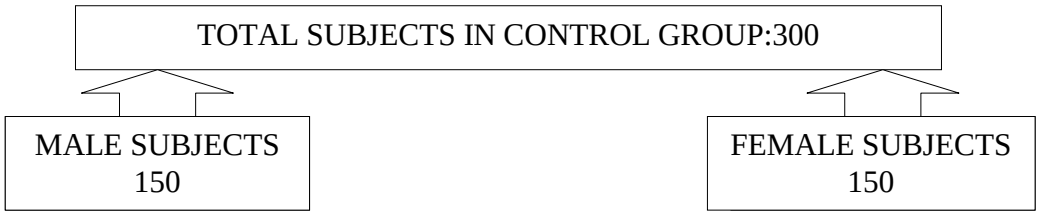
The above figure shows that there were five age groups of 60 salt workers each .In each group there were 30 male salt workers and 30 female salt workers. This leads to a total of 300 salt workers for the sample to study their nutritional and health status.

3.1.4 SELECTION OF THE CONTROL GROUP

The researcher was interested in studying the nutritional and health status of selected salt workers. But the specificity of the problem could be identified in relation to salt workers only if they were compared with the other workers of the same area. Thus the researcher selected a group of 300 subjects and referred to as control group. These subjects were engaged in equally strenuous work and belonged to similar income strata. The distribution of subjects selected for control group was as follows:

FIGURE 4

DISTRIBUTION OF CONTROL GROUP



30	BELOW I5 YEARS	30
30	15 TO 24 YEARS	30
30	25 TO 34 YEARS	30
30	35 TO 44 YEARS	30
30	ABOVE 45 YEARS	30

The above figure shows that 30 subjects were selected from each of the ten groups of male and female subjects according to their age.

3.2 PRELIMINARY SURVEY

In order to get a brief idea about the salt worker community, the researcher undertook a preliminary survey. The informal survey helped the researcher to obtain understanding about the community and made the process of tool construction much more easier. The researcher studied the following aspects about the salt workers:

- Age
- Income
- Sex ratio
- Caste, sub caste and religion
- Leisure time activities
- Celebrations
- Level of education
- Type of family
- Type of house and housing conditions
- Prevalence of diseases
- Diet practices
- Cooking and storage practices
- Beliefs, superstitions and misconceptions

In addition to this general information, the researcher also studied the life, behavior, attitude and knowledge of salt workers. The researcher personally discussed how they felt about their work and what problems they faced. The specificity of the problems in relation to salt workers was found out.

The preliminary survey helped the researcher to get an insight about salt worker community and their life. It also helped the researcher to finalize the content and format of the tool for data collection.

3.3 DEVELOPMENT OF INTERVIEW SCHEDULE

The researcher found out from the preliminary survey that most of the selected salt workers were illiterate or less educated. Most of them were unable to understand and respond to the questions asked to them on their own. Thus the researcher decided to use interview schedule as the tool for collecting the required data. Interview not only helped the researcher to get complete and accurate information but also provided with a chance to cross check by observation wherever possible. It also helped the researcher to probe answers and establish rapport with the selected salt workers.

3.3.1 CONTENT FOR THE INTERVIEW SCHEDULE

The researcher first of all prepared a rough list of questions to be asked on the basis of review of literature and preliminary study. Care was taken so that all important aspects were covered. The total set of questions was further divided into four categories as follows:

- Background information
- Dietary pattern
- Clinical observations
- Medical history/problems

The basic information about the subject, his or her name, age, sex, education, religion, type and size of family, housing conditions etc. were gathered in the first section of background information.

Information about diet of subjects was obtained in the second section. It included food for children, pregnant women and lactating mothers. Special preferences as well as food avoided were also included. Questions regarding

buying, storing, processing and preserving of food items were also asked. Daily food consumption of adult male, adult female and children was obtained.

The third section of interview schedule consisted of clinical observation where details about the following were gathered using scientific measuring techniques:

- Anthropometric measurements
- Body Mass Index
- Blood pressure
- Pulse rate
- Energy consumption
- Hemoglobin
- Body Temperature
- Calcium
- Phosphorus
- Sodium
- Potassium
- Alkaline phosphatase

A list of symptoms for prevailing deficiency disorders was made and questions regarding the same were included in the interview schedule. On the basis of the observation of these symptoms, the deficiency disorders of each salt worker could be found out. It included observation of general appearance, hair, face, eyes, lips, tongue, teeth, gums, glands, skin, nails, and muscles.

Information about pain in the body parts was also obtained from the interview schedule. The body parts under consideration were as follows:

- Stomach
- Neck
- Upper lumber and shoulders
- Spinal cord

- Lower lumber
- Upper arm
- Lower arm
- Palm, fingers, feet
- Knee joints
- Thighs
- Calf

3.3.2 FORMAT FOR THE INTERVIEW SCHEDULE

The interview schedule used for the present study followed a fixed format. All questions were kept close ended and possible options were given. Care was taken to see that all yes no questions, all tick mark questions and all tabular questions were kept together. This was done because it would be helpful during conducting the interview but would also make the analysis of data faster and easier.

3.3.3 LAYOUT FOR THE INTERVIEW SCHEDULE

The whole interview schedule was neatly typed in English language using Microsoft Word software. Equal margins were left on all four sides of all the pages. New section of the interview schedule was started from a new page. Use of bullets and numbering was done wherever needed. Spacing of one and half was done throughout the interview schedule so that the information would not look overcrowded. Same size and type of fonts were used for all questions. Use of tables was done instead of lines to avoid confusion. Care was taken to see that the space given for answers was sufficient. Overall, the researcher took special efforts to see that the questions in the interview schedule appeared neat, systematic, organized, sequential and uniform.

3.4 PILOT TESTING

The researcher had already conducted a preliminary survey to familiarize with their lifestyle. Now, the researcher was interested to find out whether the tool for interview schedule was suitable for them. Thus a pilot test was conducted using the same tool. The researcher had selected salt workers from five areas of Kutch district. Out of them Kandla was the nearest and most convenient. Thus a group of 10 males and 10 females working as salt workers was selected as the sample for the pilot test.

The researcher found whether the questions were understood easily and that there was sufficient space in the schedule to answer them. Care was also taken to avoid repetition. Necessary modifications were incorporated. Final format of interview schedule was finalized and multiple copies were taken for validation.

3.5 VALIDATING THE TOOL

In order to establish the validity of the interview schedule, help of several experts was taken. They were as follows:

- **Sample expert:** It was important for the sample to understand and follow the language used in the interview schedule .Some scientific terminology may not be understood and some regional terminology may also be suggested. Thus the schedule was validated by one of the key leaders in the salt worker community of Kutch. His name was Virjibhai Patel .He had been engaged with this industry since last 20 years and was owner of 10 salt factories in Kutch.

- **Subject Expert:** The tool for interview was also validated by subject experts. They were validated by two doctors practicing in Kutch since last 5 to 7 years. They had been aware about the problems and medical complications faced by the salt workers of that particular area. Therefore theses doctors could easily judge the questions put up in the interview schedule. They were Dr. K. B. Pandit and Dr. Zala.

- **Research Method Expert:** The researcher also found out the validity of the tool in relation to theories of research. For this purpose it was validated by Dr.Nilambari Dave, Reader and Head, Smt. S. B. Gardi Institute of Home Science, Saurashtra University, Rajkot.

- **Language Expert:** The grammar and spelling in the interview schedule were equally important. Thus the researcher got the tool validated by a lecturer, Mrs.Sonu Daryani teaching English subject to students of Tolani College, Gandhidham since many years.

Validation of the interview schedule from the experts of above five areas ensured the capacity of the tool to function as desired. Changes were made as suggested by the experts.

3.6 DEVELOPMENT OF MEASURING TECHNIQUES

The interview schedule was ready by now but how to ascertain clinical observations was still to be worked out. To incorporate the best and the easiest measuring technique, the researcher referred many related books and discussed with many experts. Finally the following measuring techniques were selected:

- **Anthropometric Measurements**

The pattern of growth and the physical state of the body, though genetically determined are profoundly influenced by diet and nutrition. Hence, anthropometric measurement is useful criteria for assessing nutritional status. It should be remembered that the other factors such as frequent illness due to infection or infesaction might also affect the growth and physical status of the body.

Different experts have suggested a large number of anthropometric measurements. These have varying degrees of usefulness at different age periods. Anthropometric measurements commonly used in nutrition survey is given as under:

TABLE 7
ANTHROPOMETRIC MEASUREMENTS IN NUTRITION SURVEYS

NO.	AGE GROUP (YEARS)	PRACTICAL FIELD OBSERVATIONS	MORE DETAILED OBSERVATIONS
1	5-10	Weight Height	Sitting height Bicristal diameter Biacromial diameter
2	Over 20	Weight Height	Arm and calf muscles Skin folds in other sites

- **Height**

Height is a linear measurement made up to the sum of four components: legs, pelvis, spine and skull. The extent of height deficit in relation to age as compared to regional standards may be regarded as a measure of malnutrition. A given deficit in height may represent a short period of growth failure at an early age or a longer period of growth at a later age.

A measuring tape was fixed vertically on a smooth wall perpendicular to the ground. Care was taken to see that the floor area was even not rough. The subject was asked to remove his shoes, stand with the center of his back touching the scale; with his feet parallel and heels, buttocks, shoulders and back of the head touching the wall. The head was held comfortably erect; the arms hanged loosely by the side. A smooth, thin ruler was held on the top of the head in the center, crushing the hair at a right angle to the scale, and the height read off from the lower edge of the ruler to the nearest 0.5 cm. Each reading was taken twice to ensure correctness of the measurements.

- **Weight**

Weight is a measurement of body mass. Weight deficiency appears to be the best indicator of the prevalence of protein energy malnutrition in children of

all age groups. Comparison of weight for age values with regional standards at corresponding ages helps determine the degree of under weight in a community. It is important that the age of the subjects is correctly known and presence of pathological weight due to edema is ruled out.

Weight was measured without shoes and in ordinary clothing on a *Detecto* weighing machine, up to accuracy of nearest half a kilogram. The machine was checked frequently for its accuracy by calibration with known standard weights. The subject was asked to stand on the platform of the scale, without touching anything, and looking straight ahead.

On the basis of obtained height and weight values, the body mass index was calculated. BMI is also one of the criteria for evaluating nutritional status. According to Hecker (1987) in Nutrition and Physical Performance, W. B. Saunders Publication, pg48.

TABLE 8

CRITERIA FOR BODY MASS INDEX

NO.	TYPE	BMI	CRITERIA
1	Ectomorph	<20	Undernutrition
2	Mesomorph	20-25	Balanced Nutrition
3	Endomorph	>25	Overnutrition

$$\text{BMI (QUETLTS INDEX)} = \frac{\text{Wt (kg)}}{(\text{Htm})^2}$$

- **Aneroid Sphygmomano Meter**

This instrument of Dial Company was used to record the blood pressure of the subjects in rest and immediately after working position.

- **Clinical Thermometer**

It was used to record and body temperature of the subjects. The thermometer of Safety Company was kept under the tongue for a minimum period of two minutes.

- **Heart Rate Meter**

A clinical heart rate meter of Dial Company was used to measure heart rate. It is small and light weight instrument used by medical officers and trained nurses to take heart rate during resting and working condition three times. This instrument works with heart rate and counted by hearting.

- **Stop Watch**

It was used to count the accurate time for activities.

**** Serum protein, blood hemoglobin, serum alkaline phosphotase, serum phosphate, serum calcium, serum sodium and serum potassium were read out with help of Semi Auto Analyzer, MicroLab,300, Merck , Germany. The below biochemical measurements were taken for selected sample only.

- **Biuret Method**

Chempak kit was used to measure total protein with help of reagent kit for quantitative estimation of total protein in serum or plasma. It worked on the following principle:

Protein +Cutt Blue – Violet complex

In an alkaline medium,protein reacts with the copper in the biuret reagent causing an increase in absorbance.The increase in absorbance at 540 nm (530-570 nm or with GREEN /YELLOW filter) due to formation of the coloured complex,is directly proportional to the concentration of protein.

- **Hemoglobin**

It was measured by Sahili's Acid Haematino method. It worked on the following principle:

When N/10 HCl is mixed with fresh blood, the RBC's get hymolysed and hemoglobin comes out of RBC. Then diluting the hymolysed blood with distilled water/HCl and comparing the colour with standard bands of Hb, with Hb meter, hemoglobin was determined.

- **Alkaline phosphatase(ALP)**

It was measured by Ecoline PNPP Kinetic kit by Biolab Diagnostics. Elevation of ALP level in blood has clinical indication of liver and bone diseases. Marginal increase may indicate in the cases of congestive heart disease hyperparathyroidism and intestinal bacteriosis. It worked on the following principle:

PNP + H_2O Nitrophenol +PI

On 405 nm or 400 to 445 nm colorimetric gives direct prepositional ALP.Composition of reagent were PNP and dicthonolamine with Mg Cl.

- **Calcium**

It was measured by Arsenazo III,Colorimetric test by Lab Care Diagnostics Pvt.Ltd,Sarigam,Valsad(www. Labcarediagnostics.com). It worked on the following principle:

At neutral Ph,the calcium forms with arsenazo III, a complex the colour and intensity of which is directly proportional to thr concentration of calcium in the sample with help of 1 cm ligut path cuvelte reading at 650 nm.

- **Phosphorus**

It was measured by UV End point colorimetric method by Lab Care Diagnostics Pvt.Ltd, Sarigam, Valsad (www. Labcarediagnostics.com). It worked on the following principle:

Inorganic phosphate reacts in acid environment with molybdic acid to form an unreduced phosphomolybdic acid complex,which absorbs light at 340 nm .The absorbance is directly proportional to the phosphorus concentrate in the sample.

- **Sodium**

Elyte 2 Kit (sodium and potassium colorimetric kit is used for measuring sodium. It worked on the following principle:

Sodium is precipitated as a triple salt with magnesium and uranyl acetate.The excess of uranyl ions are reacted with ferocyanide in an acidic medium to develop a brownish colour.The intensity of the colour produced is inversely proportional to the concentraton of sodium in the sample.

Uranyl ions+mg ions+Na^+ Urayl MgNa precipitate

Free Uranyl ions +$K_4 Fe(CN)_6$ Brown coloured complex

- **Pottasium**

Elyte 2 Kit (sodium and potassium colorimetric kit was used for measuring potassium. It worked on the following principle:

Potassium reacts with sodium tetraphenyl boron in specially prepared butter to form a colloidal suspension. The amount of turbidity produced is directly proportional to the concentration of potassium in the sample.

Tetrophenyl Boron+K^+ white turbidity

- **Serum Creatinine**

Merckotest kit was used to measure the value of serum creatinine. It worked on the following principle:

Creatinine forms a yellow orange compound in alkaline solution with picric acid. At the low picric acid concentration used in this method precipitation of protein does not take place. The concentration of the dyestuff formed over a certain reaction time is measure of the creatinine concentration.

Some physical and biophysical methods complementary to clinical examination should be carried out which includes radiological tests. While routine radiographic studies of population groups are rarely possible or indeed required, it will be nevertheless, desirable to carry out radiological examinations of samples of a population if the clinical signs indicates appreciable incidence of osteomalacia, respiratory diseases, musculo skeletal problems and malnutrition. Such studies may reveal the degree of incidence of mild forms of osteomalacia, etc. Radiological examination may help to be of diagnostic value.

3.7 DATA COLLECTION

The required data for research was gathered from the selected salt workers by frequent visits to the site and personal meetings with selected subjects. Help of other experts in the field was also taken wherever required. The schedule followed for data collection was as follows:

- **STAGE 1-PRELIMINARY SURVEY**

Day 1	Conducting preliminary survey in Kandla
Day 2	Conducting preliminary survey in Kidana
Day 3	Conducting preliminary survey in Padana
Day 4	Conducting preliminary survey in Veera
Day 5	Conducting preliminary survey in Chirai

- **STAGE 2-RAPPORT BUILDING**

Day 6	Meeting with community leaders of Kandla and Kidana
Day 7	Meeting with community leaders of Padana
Day 8	Meeting with community leaders of Veera
Day 9	Meeting with community leaders of Chirai

- **STAGE 3-DATA COLLECTION**

Day 10	Gathering data in Kandla
Day 11	Biochemical testing in Kidana
Day 12	Gathering data in Kidana
Day 13	Biochemical testing in Kandla
Day 10	Gathering data in Padana
Day 15	Biochemical testing in Veera
Day 16	Gathering data in Veera
Day 17	Biochemical testing in Padana
Day 18-19	Gathering data and biochemical testing in Chirai
Day 20-21	Organizing data and cross checking where needed

The procedures followed for data collection lasted for three weeks. The researcher had trained a team of experts, students and NSS volunteers for the same. This eased the work and doubled the speed of data collection. But the major problem faced by the researcher was that of transportation. No frequent and regular transportation facilities were available to the selected areas. Thus the researcher had to arrange for a vehicle on own at each time of visit. In addition to this, the vehicle had to be left at a particular place and the distance of 2 to 4 km to salt production site had to be traveled by walking only.

Other than these obstacles the researcher experienced great problem to collect blood samples and conduct medical procedures among the selected salt workers. They were hesitant and shy and convincing them was a difficult task. Rapport building by team giving lectures and demonstrations helped overcome this hesitation.

3.8 CATEGORISATION OF VARIABLES

The researcher had selected the following variables for the study:

- Independent:
  - Age
  - Sex
- Dependent: Dietary Consumption
  - Anthropometric measurements
  - Clinical assessment
  - Energy balance

- The variable age was categorized into five categories from below 15 years,15 to 24 years,25 to 34 years,35 to 44 years and above 44 years.
- The sex being a dichotomous variable was categorized into male and female
- The dietary consumption of the selected subjects was measured in terms of calorie, carbohydrate ,fat, protein, iron, calcium, phosphorus, vitamin A ,vitamin C, vitamin B_1 (thiamine),vitamin B_2 (riboflavin) and vitamin B_3 (niacin) .The obtained values of the sample were compared with the same values of control group.

  (Gopalan C,Shastri R,Bala Subramanian S,Nutritive Value of Indian Foods,National Institute of Nutrition,Hyderabad,1996.)
- Similarly the anthropometric measurements in terms of height, weight and BMI of experimental and control group were compared.
- The clinical assessment included serum protein, blood hemoglobin, serum alkaline phosphotase, serum phosphate, serum calcium, serum sodium and serum potassium. Other than these clinical parameters like body temperature, heart rate and blood pressure which indirectly influence the nutritional and health status were also considered. All these values were compared with control group.
- The subjects who were detected to have higher values of alkaline phosphotase or faced severe respiratory or musculo-skeletal problems may have severe problems related to bones. To get a better and clearer picture of the same, radiological tests were conducted among those

selected salt workers. Expert help was taken for taking x rays of hands, legs and chest.

- The energy balance of selected salt workers was obtained using the following formula:

Energy Balance = Energy intake per day -Energy expenditure per day

Here, energy balance is the energy intake counted from diet survey and energy expenditure by records. Energy intake was calculated with help of major nutrients like carbohydrates, fat and protein. Energy expenditure was calculated by 3 day observation of their daily activities and heart rate method given by Verghese:

Physiological cost of work and energy expenditure in Kcal = 0.0695 X working heart rate(WHR)—4.332(based on formula and classification proposed by Ganguli and Datta,1973)

3.9 TABULATION OF THE DATA

The collected data was categorized and arranged in tabular form. The complete data was coded and entered in coding sheet. The data was then transferred to SPSS software package for analysis.

3.10 ANALYSIS OF THE DATA

In order to derive results from the obtained data, the collected data was first transferred in terms of mean values, deviations, distributions and percentages. Statistical tests like t test, f test and ANOVA were used to find out the significance of difference within the group.

CHAPTER 4
RESULT AND DISCUSSION

The below chapter describes the findings obtained after collecting required data from the salt workers. The data is presented in following categories:

4.1 Background Information
4.2 Results Of Preliminary Survey
4.3 Health Practices
4.4 Diet Practices
4.5 Nutrient Intake
4.6 Physical Problems
4.7 Biochemical Assessment
4.8 Clinical Assessment
4.9Radiological Test
4.10 Energy Balance

4.1BACKGROUND INFORMATION

4.1.1 AGE

The selected sample of 300 salt workers was taken from five age groups. The distribution could be seen as under:

TABLE 9

DISTRIBUTION OF SUBJECTS ACCORDING TO AGE

SR.NO	AGE IN YEARS	NO.OF SUBJECTS	% OF SUBJECTS
1	Total	300	100
2	Below 15	60	20
3	15 to 24	60	20
4	25 to 34	60	20

5	35 to 44	60	20
6	Above 44	60	20

FIGURE 5

DISTRIBUTION OF SUBJECTS ACCORDING TO AGE

4.1.2 SEX

The researcher had selected equal number of male and female subjects for the study. The distribution was as under:

TABLE 10

DISTRIBUTION OF SUBJECTS ACCORDING TO SEX

SR.NO	SEX	NO.OF SUBJECTS	% OF SUBJECTS
1	Total	300	100
2	Male	150	50
3	Female	150	50

FIGURE 6

DISTRIBUTION OF SUBJECTS ACCORDING TO SEX

4.1.3 AREA (VILLAGE)

The researcher had selected the salt workers from five areas of Kutch. The names of those areas and their distribution was as under:

TABLE 11

DISTRIBUTION OF SUBJECTS ACCORDING TO AREA

SR.NO	AREA	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Padana	75	40	35	25.00
2	Kidana	30	15	15	10.00
3	Chirai	50	30	20	16.66
4	Veera	75	35	40	25.00

5	Kandla	70	30	40	23.33

The above table shows that maximum salt workers were selected from Padana and Veera villages followed by Kandla, Chirai and Kidana respectively .However maximum number of females were selected Veera and Kandla.

FIGURE 7

DISTRIBUTION OF SUBJECTS ACCORDING TO AREA

TABLE 12

AREAWISE DISTRIBUTION OF SUBJECTS OF CONTROL GROUP

No.	Name of area	Number		N	Percentage	
		M	F		M	F
1.	Gandhidham	120	30	150	40	10
2.	Adipur	30	120	150	10	40
	Total	150	150	300	50	50

The table shows that the subjects for control group were selected from Gandhidham and Adipur of Kutch. More number of respondents were from Gandhidham. There were equal number of male and female respondents in the control group.

4.1.4 CASTE

The selected salt workers mainly belonged to three castes namely Koli Bhil, Thakore and Rajput.. The distribution shows that a high majority of salt workers belonged to Koli Bhil caste. Number of salt workers of Thakore caste were exactly double than that of Rajput caste.

TABLE 13

DISTRIBUTION OF SUBJECTS ACCORDING TO CASTE

SR.NO	CASTE	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Koli Bhil	210	110	100	70
2	Thakore	60	30	30	20
3	Rajput	30	16	14	10

FIGURE 8

DISTRIBUTION OF SUBJECTS ACCORDING TO CASTE

The data of control group reveals that highest number of subjects belonged to Gadhvi caste and lowest number of Muslims were found.

TABLE 14

CASTE OF CONTROL GROUP SUBJECTS

No.	Caste	Number		N	Percentage	
		M	F		M	F
1.	Gadhvi	60	30	90	20	10
2.	Prajapati	60	60	120	20	20
3.	Sindhi	00	30	30	00	10
4.	Muslim	30	30	60	10	10

4.1.5 TYPE OF FAMILY

The researcher found out that majority of the selected salt workers lived in joint family. Nuclear family system was very less prevalent among the selected salt workers. The distribution of the subjects according to their type of family can be seen as under

TABLE 15

DISTRIBUTION OF SUBJECTS ACCORDING TO TYPE OF FAMILY

SR.NO	TYPE OF FAMILY	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Joint	260	130	130	86.67
2	Nuclear	40	20	20	13.33

The data of experimental group shows that higher number of subjects belonged to nuclear family than joint family.

FIGURE 9

DISTRIBUTION OF SUBJECTS ACCORDING TO TYPE OF FAMILY

TABLE 16

TYPE OF FAMILY OF CONTROL GROUP SUBJECTS

No.	Type of family	Number		N	Percentage	
		M	F		M	F
1.	Joint	60	30	90	20	10
2.	Nuclear	90	120	210	30	40

The data of control group shows that higher number of subjects belonged to nuclear family than joint family.

4.1.6 NUMBER OF FAMILY MEMBERS

It was found that a high majority of selected salt workers belonged to joint family. Therefore, it became important to find out the number of family members in each family. The distribution of subjects according to the number of family members can be seen as under:

TABLE 17

DISTRIBUTION OF SUBJECTS ACCORDING TO NUMBER OF FAMILY MEMBERS

SR.NO	NUMBER OF FAMILY MEMBERS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	4 and below	40	20	20	13.33
2	5 and above	260	130	130	86.66

It can be observed that higher number of subjects had their family of six or more persons in comparison to their counter parts in the experimental group.

FIGURE 10

DISTRIBUTION OF SUBJECTS ACCORDING TO NUMBER OF FAMILY MEMBERS

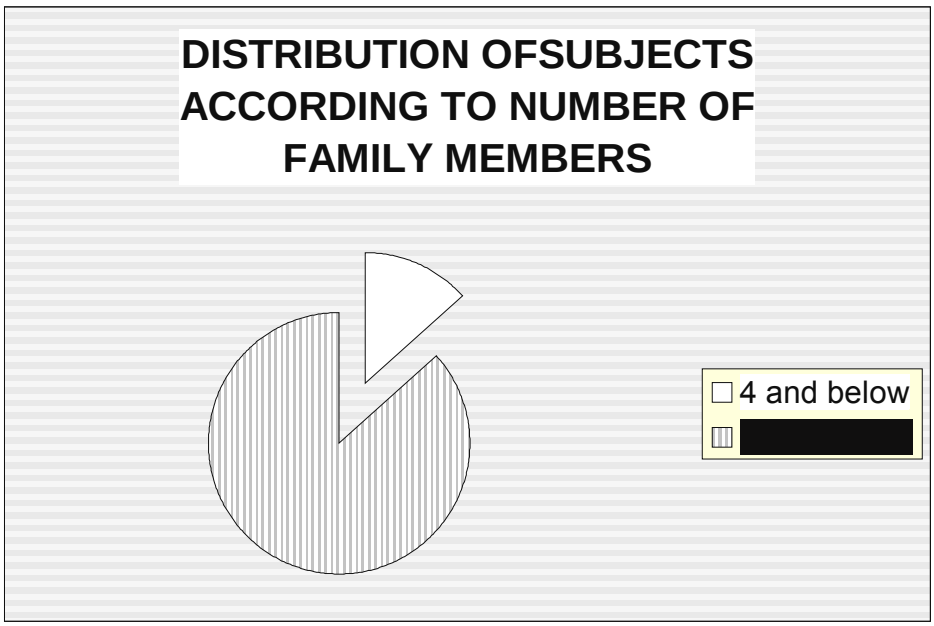


TABLE 18

NUMBER OF MEMBERS IN CONTROL GROUP SUBJECT'S FAMILY

No.	Members in family	Number		N	Percentage	
		M	F		M	F
1.	5 and below	60	60	120	20	20

2.	6 and above	90	90	180	30	30

The data of control group showed that higher number of subjects had more than 6 family members

4.1.7 MARITAL STATUS

The researcher had selected 300 salt workers of Kutch ,out of which majority of them were married. The distribution of selected salt workers with respect to their marital status can be seen as follows:

TABLE 19

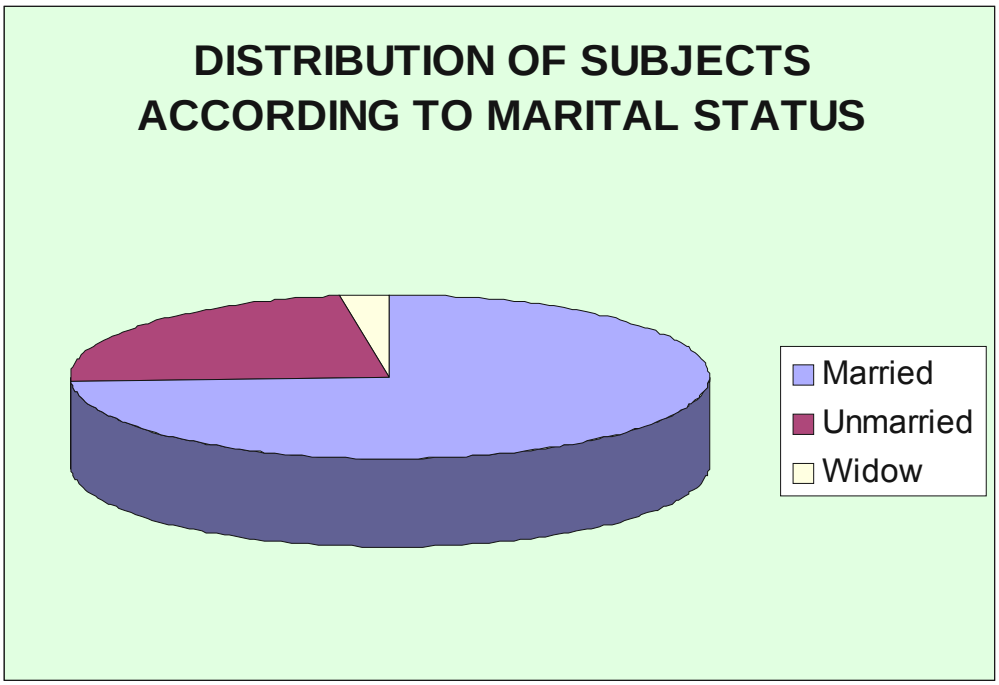
DISTRIBUTION OF SUBJECTS ACCORDING TO MARITAL STATUS

SR.NO	MARITAL STATUS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Married	22	107	115	74.66
2	Unmarried	70	40	30	23.33
3	Widow	08	03	05	02.60

The above table clearly reflects that a high majority of selected salt workers were married. It could also be seen that number of married females was more than number of married males. On other hand unmarried males were more than unmarried females.

FIGURE 11

DISTRIBUTION OF SUBJECTS ACCORDING TO MARITAL STATUS



4.1.8 INCOME

The selected subjects belonged to the same profession but there was a variation in their monthly income. The subjects were divided into five categories on the basis of their monthly income. The distribution was as seen in the below table. The data reveals that a high majority belonged to the lowest income group. It could also be observed that with the increase in monthly income the subjects in that category were found to reduce in number.

TABLE 20

DISTRIBUTION OF SUBJECTS ACCORDING TO INCOME

SR.NO	MONTHLY INCOME	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Below 400	159	33	126	53.00
2	401 to 800	56	32	24	18.66
3	801 to 1200	48	48	-	16.00
4	1201 to 2000	35	35	-	11.66
5	Above 2000	02	02	-	0.66

FIGURE 12

DISTRIBUTION OF SUBJECTS ACCORDING TO INCOME

4.1.9 TYPE OF EMPLOYMENT

All the selected subjects were salt workers but were engaged in work in different ways. The data in the table revealed that the subjects were engaged in work on part time basis mostly. However there were very less subjects who were engaged in this work on full time basis.

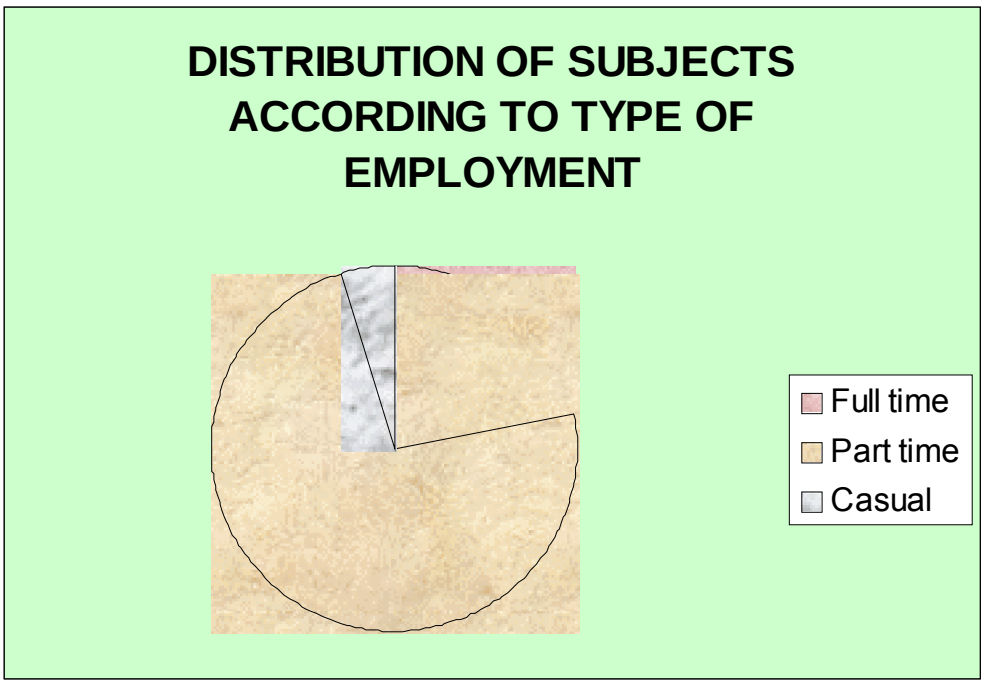
TABLE 21

DISTRIBUTION OF SUBJECTS ACCORDING TO TYPE OF EMPLOYMENT

SR NO	TYPE OF EMPLOYMENT	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Full time	46	24	22	15.33
2	Part time	154	71	83	51.33
3	Casual	100	55	45	03.33

FIGURE 13

DISTRIBUTION OF SUBJECTS ACCORDING TO TYPE OF EMPLOYMENT



4.1.10 WORK EXPERIENCE

The selected subjects were engaged in this profession since long. The data revealed that majority of them were with this work since last 10 to 19 years followed by below five years and 5 to 9 years respectively.

TABLE 22

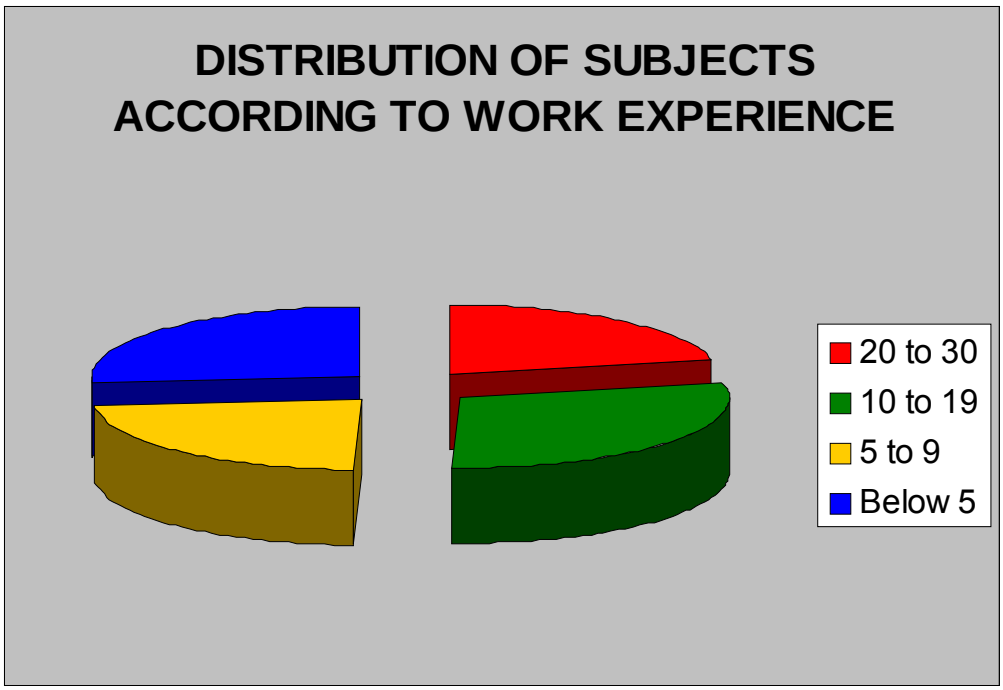
DISTRIBUTION OF SUBJECTS ACCORDING TO WORK EXPERIENCE

SR NO	EXPERIENCE IN YEARS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	

1	20 to 30	65	35	30	21.66
2	10 to 19	84	46	38	29.79
3	5 to 9	71	30	41	23.66
4	Below 5	80	39	41	26.66

FIGURE 14

DISTRIBUTION OF SUBJECTS ACCORDING TO WORK EXPERIENCE



4.1.11 REASONS FOR ENTERING SALT PRODUCTION

The sample under study may have entered the salt productions with different reasons. It was found that majority of them started salt production due to poverty followed by the reason of their parent's wish. A very few of them had joined the work of salt production due to death or disability of parents.

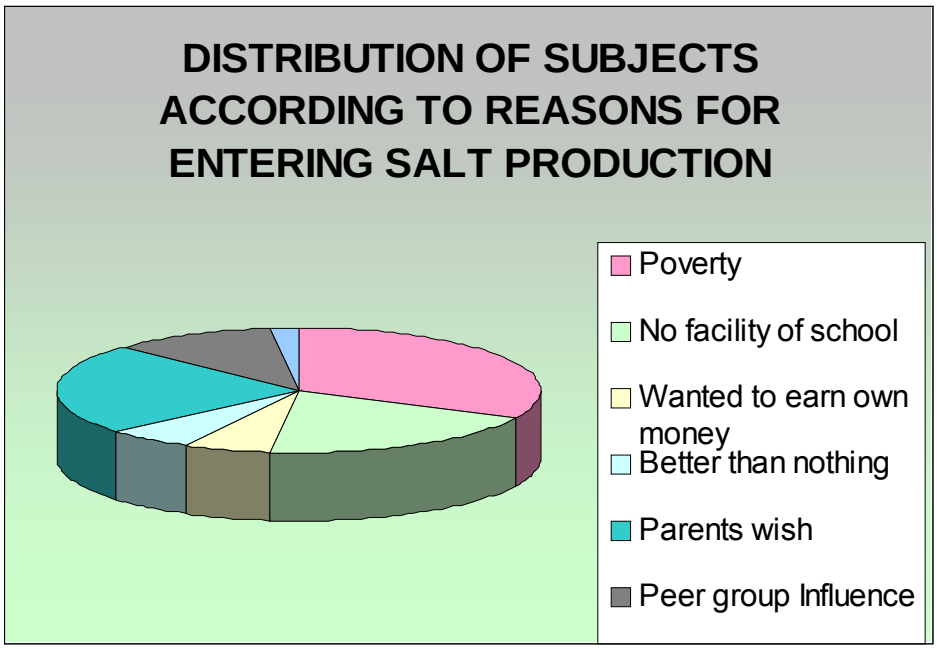
TABLE 23

DISTRIBUTION OF SUBJECTS ACCORDING TO REASONS FOR ENTERING SALT PRODUCTION

SR NO	REASONS FOR ENTERING SALT PRODUCTION	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Poverty	96	39	57	32.00
2	No facility of school	59	43	16	19.66
3	Wanted to earn own money	18	05	13	05.99
4	Better than nothing	17	06	11	05.66
5	Parents wish	71	32	39	23.66
6	Peer group Influence	32	24	08	10.66
7	Death or disability of parents	06	01	05	01.99

FIGURE 15

DISTRIBUTION OF SUBJECTS ACCORDING TO REASONS FOR ENTERING SALT PRODUCTION



4.1.12 AGE OF ENTERING INTO WORK

The sample under study may have entered the salt productions with different reasons. It was found that majority of them started salt production due to poverty followed by the reason of their parent's wish. A very few of them had joined the work of salt production due to death or disability of parents.

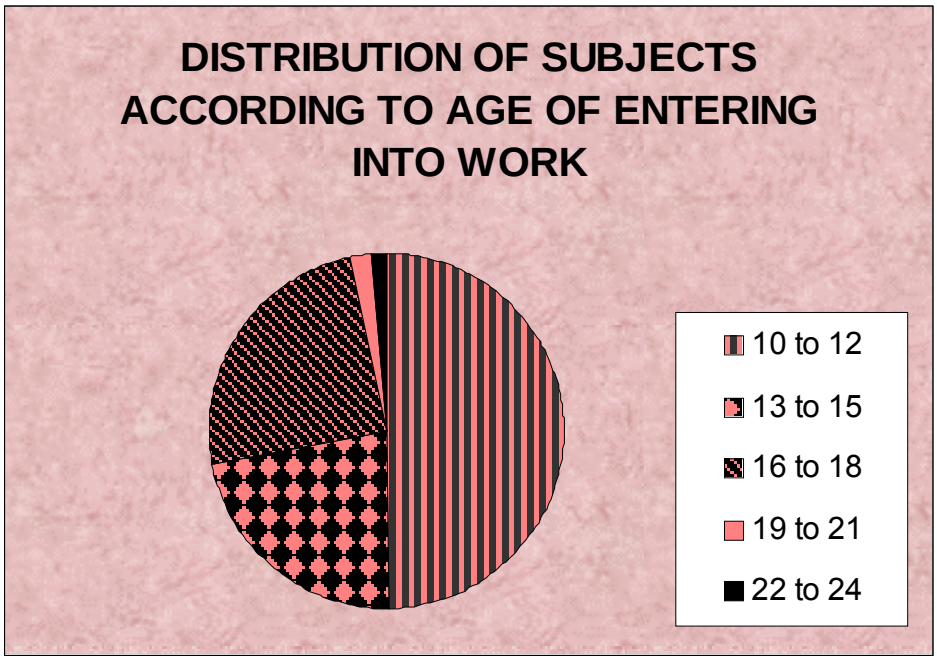
TABLE 24

DISTRIBUTION OF SUBJECTS ACCORDING TO AGE OF ENTERING INTO WORK

SR NO	AGE	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	10 to 12	149	77	72	49.66
2	13 to 15	67	39	28	22.33
3	16 to 18	74	31	43	24.66
4	19 to 21	06	02	04	02.00
5	22 to 24	04	01	03	01.33

FIGURE 16

DISTRIBUTION OF SUBJECTS ACCORDING TO AGE OF ENTERING INTO WORK



4.1.13 DISTANCE OF WORK PLACE FROM HOME

The selected salt workers lived at different places and thus the distance of work place from their home also varied. The data shows that a high majority of selected subjects had to walk more than two kilometers from their home to reach their work place.

TABLE 25

DISTRIBUTION OF SUBJECTS ACCORDING TO DISTANCE OF WORK PLACE FROM HOME

SR NO	DISTANCE	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Within 2 km	076	039	037	25.33
2	More than 2 km	224	111	113	74.66

FIGURE 17

DISTRIBUTION OF SUBJECTS ACCORDING TO DISTANCE OF WORK PLACE FROM HOME

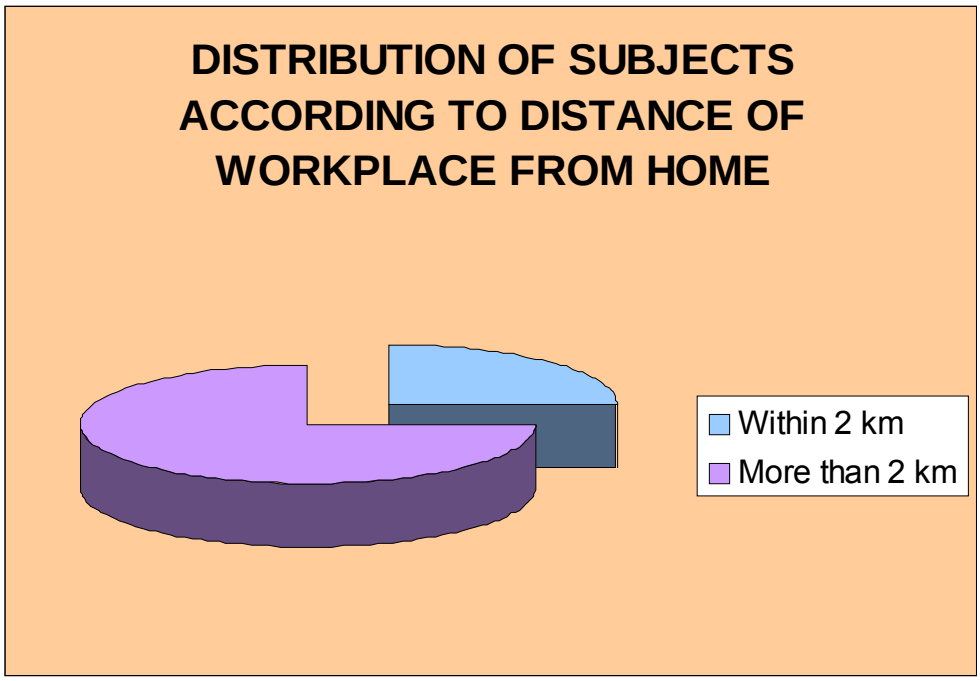


TABLE 26

DISTANCE OF WORK PLACE FROM HOME OF CONTROL GROUP SUBJECTS

No.	Distance (in km)	Total		Male		Female	
		N	%	N	%	N	%
1.	Within 2	90	30	06	02	84	28
2.	More than 2	210	70	144	48	66	22

The data of control group clearly points out that most of the subjects of the control group had their workplace at a distance of more than two kilometers.

4.1.14 REASONS FOR SCHOOL DROPOUT

The preliminary survey had revealed that a high majority of the selected subjects were illiterate or semi literate and had left schooling in between. Thus

the researcher got interested to find out the reasons for school dropout among them.

The data of experimental group reveals that highest number of subjects left schooling because of pressure to do household work followed by the reasons lack of interest and distance of school from home. Lowest number of subjects left schooling because of non facility of school and due to economical problems

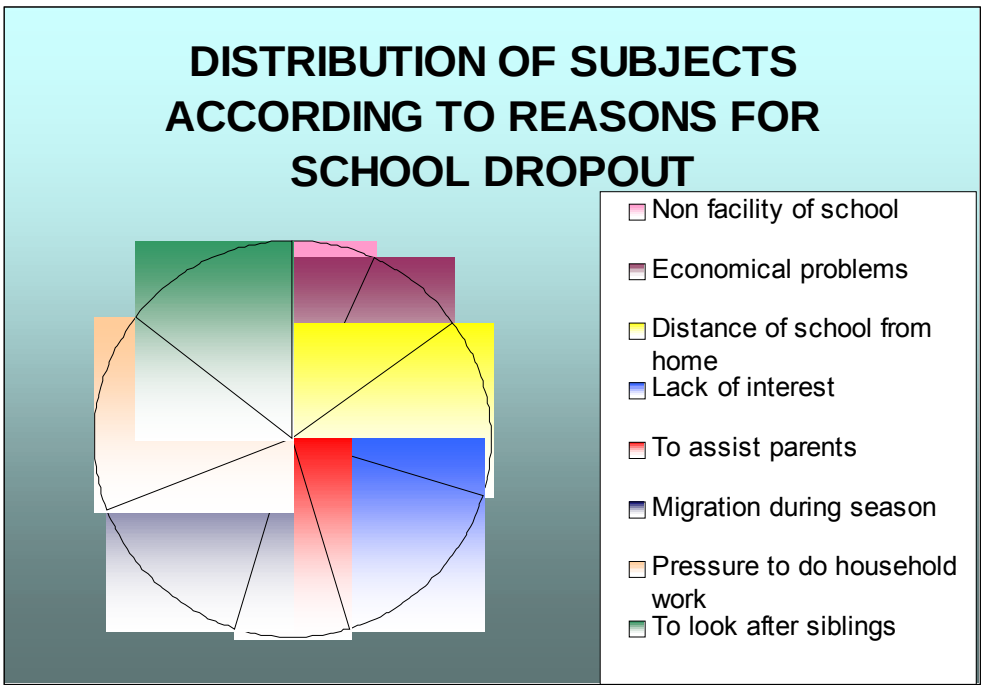
TABLE 27

DISTRIBUTION OF SUBJECTS ACCORDING TO REASONS FOR SCHOOL DROPOUT

SR NO	REASONS FOR DROPOUT	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Non facility of school	20	10	10	06.66
2	Economical problems	25	17	08	08.32
3	Distance of school from home	44	35	9	14.66
4	Lack of interest	46	34	12	15.33
5	To assist parents	28	18	10	09.66
6	Migration during season	43	32	11	14.32
7	Pressure to do household work	49	00	49	16.33
8	To look after siblings	37	0	37	14.33

FIGURE 18

DISTRIBUTION OF SUBJECTS ACCORDING TO REASONS FOR SCHOOL DROPOUT



4.1.15 RESIDENCE STATUS

The researcher that at time of preliminary survey that all salt workers was not Kutch natives observed it. Many of them had come for work from elsewhere and many were living there on temporary basis. The distribution can be seen as under:

TABLE 28

DISTRIBUTION OF SUBJECTS ACCORDING TO RESIDENCE STATUS

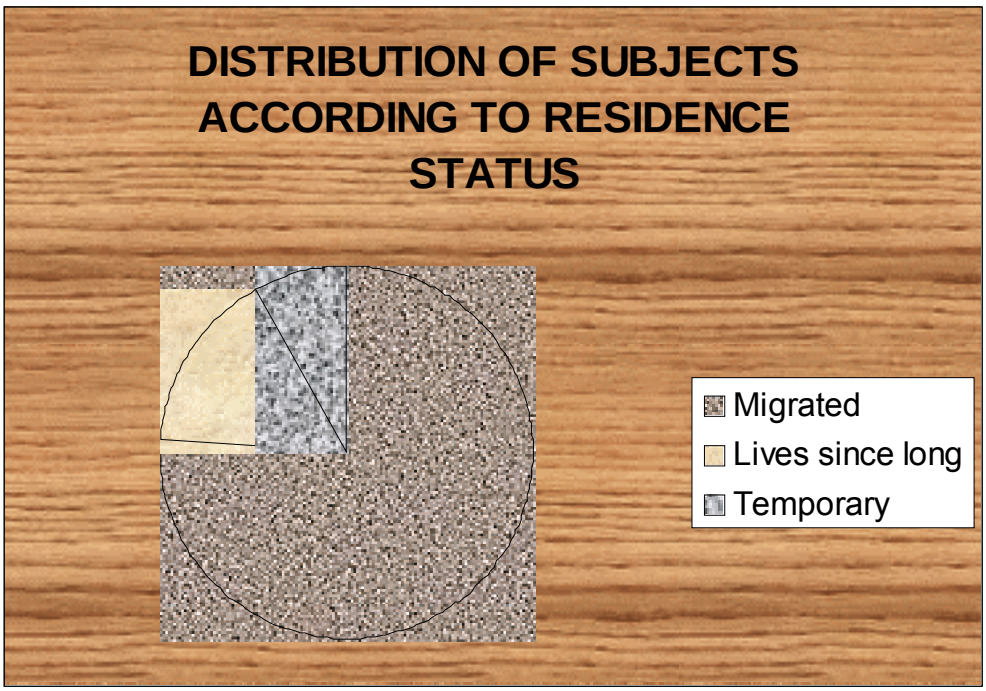
SR NO	RESIDENCE STATUS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Migrated	190	90	100	63.33
2	Lives since long	80	40	40	13.33
3	Temporary	30	20	10	06.66

The above data shows that majority of salt workers had migrated from elsewhere. It was found that this occupation seemed to be lucrative to many individuals and could engage themselves in the same without any skills or education. Thus families from near by areas migrated to Kutch in search of work .It could also be seen that number of people living in Kutch since long was half

than the migrated population and the people living on temporary basis were least in number.

FIGURE 19

DISTRIBUTION OF SUBJECTS ACCORDING TO RESIDENCE STATUS



It can be seen in most of the subjects of control group that highest number of subjects were migrated whereas those living since long and on temporary basis were equal in number.

TABLE 29

RESIDENCE STATUS OF SUBJECTS OF CONTROLGROUP

No.	Housing	Number		N	Percentage	
		M	F		M	F
1.	Migrated	90	80	170	30	26.66

2.	Lives since long	30	40	70	10	13.33
3.	Temporary	30	30	60	10	10

4.1.16 HOUSING CONDITION

The housing condition of the selected salt workers was evaluated on the basis of various criteria like type of house, ventilation, cleanliness, presence of shed, etc. On the basis of these aspects the housing condition was considered to be good, fair and poor. The distribution of subjects on the basis of their housing conditions could be seen as under. The data clearly reflects that none of the selected subjects had good housing conditions. Very few had a fair one whereas majority of selected subjects had poor housing conditions .It was also observed that number of males and females with poor housing conditions were almost equal. This suggests that there was no clear division of labor in the salt worker community and the housing remained poor in spite of presence of females.

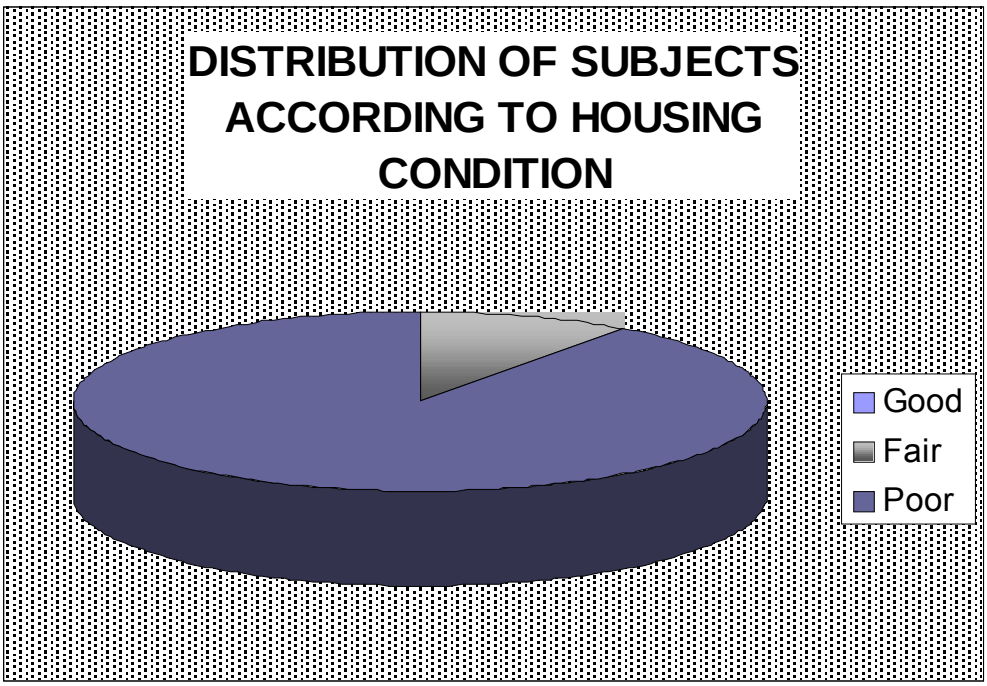
TABLE 30

DISTRIBUTION OF SUBJECTS ACCORDING TO HOUSING CONDITION

SR NO	HOUSING CONDITION	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Good	00	-	-	-
2	Fair	35	20	15	11.66
3	Poor	265	15	135	88.33

FIGURE 20

DISTRIBUTION OF SUBJECTS ACCORDING TO HOUSING CONDITION



The distribution of salt workers with respect to selected aspects for evaluating housing condition is as follows. It should be noted here that the total sample of 300 salt workers were selected from 70 households and thus housing conditions of 70 houses were studied.

Further the data reveals that:

- Type of house- A little more than half of the selected salt workers lived in kuchha houses. The number of subjects living in huts was more than those living in pucca houses and mixed houses .Pucca and mixed houses were owned to a lesser extent by the selected salt workers.
- Ventilation-Ventilation in houses of salt workers were fair for most of the selected salt workers. They were fair most of the times followed by good and poor ventilation.
- Cleanliness-Equal number of fair and dirty households with respect to cleanliness was found. Very less houses were found to be clean.
- Shed-High majority of salt workers did not have shed. The ratio was more than three times the households which had shed.
- Source of water-Most of them depended on tanker water and none of the households had water connections at home.

The data in the above table shows that the ventilation was good in most of the houses of the control group subjects.

TABLE 31

HOUSING CONDITION OF CONTROL GROUP SUBJECTS

No.	Housing condition	Number		N	Percentage	
		M	F		M	F
1.	Good	18	12	30	6	4
2.	Fair	87	93	180	29	31
3.	Poor	45	45	90	15	30

The above data shows that highest number of subjects of control group had fair housing condition followed by poor and good conditions. The aspect wise details are as under:

TABLE 32

DISTRIBUTION OF SUBJECTS ACCORDING TO VARIOUS ASPECTS OF HOUSING CONDITION

SR NO	ASPECTS		NO.	%
1	Type of house	Kuchha	40	57.14
		Pucca	05	14.28

		Mixed	05	14.28
		Hut	20	28.56
2	Ventilation	Good	10	14025
		Fair	40	57.14
		Poor	20	28.56
3	Cleanliness	Clean	10	14.26
		Fair	30	42.87
		Dirty	30	42.87
4	Shed	Present	20	28.56
		Absent	50	71.44
5	Source of drinking water	Well	03	01.00
		Hand pump	07	02.33
		Tanker	290	96.66

TABLE 33

CLEANLINESS AMONG SUBJECTS OF CONTROL GROUP

No.	Cleanliness	Number (n)	Percentage
1.	Clean	135	45.00
2.	Fair	120	40.00
3.	Dirty	45	15.00

The data shows that a higher number of subjects of control group were clean followed by fair and dirty in relation to their cleanliness.

TABLE 34

PRESENCE OF SHED AMONG SUBJECTS OF CONTROL GROUP

No.	Shed	Number (n)	Percentage
1.	Present	30	10.00
2.	Absent	270	90.00

A high majority of subjects of the control did not have shed for their cattle as revealed from the data in the table.

TABLE 35

VENTILATION IN HOUSES OF SUBJECTS OF CONTROL GROUP

No.	Ventilation	Number (n)	Percentage
1.	Good	150	50.00
2.	Fair	60	20.00
3.	Poor	90	30.00

The data of control group shows that ventilation in their houses were good in most of the cases.

TABLE 36

TYPE OF HOUSE OF SUBJECTS OF CONTROL GROUP

No.	Type of house	Number (n)	Percentage
1.	Kachcha	150	50.00
2.	Pacca	45	15.00
3.	Mixed	60	20.00
4.	Hut	45	15.00

The data of control group on type of house points out that a majority of subjects of control group lived in kachcha houses.

The data of control group on source of drinking water shows that most of the subjects were dependent on pipe water supply.

TABLE 37

SOURCE OF DRINKING WATER AMONG SUBJECTS OF CONTROL GROUP

No.	Source	Number		N
		M	F	
1.	Well	-	-	-
2.	Hand pump	15	03	18

3.	Pond	-	-	-
4.	River	-	-	-
5.	Pipe water supply	129	117	246
6.	Tankers	06	30	36

4.1.17 USE OF COMMON DRUGS AT HOME

The data on use of drugs revealed that a high majority did not use any drug at home as most of them were either unaware or they did not have money to spend on drugs.

TABLE 38

DISTRIBUTION OF SUBJECTS ACCORDING TO USE OF COMMON DRUGS AT HOME

SR NO	USE OF DRUGS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Always	138	78	60	46.00
2	Rarely	162	72	90	54.00

FIGURE 21

DISTRIBUTION OF SUBJECTS ACCORDING TO USE OF COMMON DRUGS AT HOME

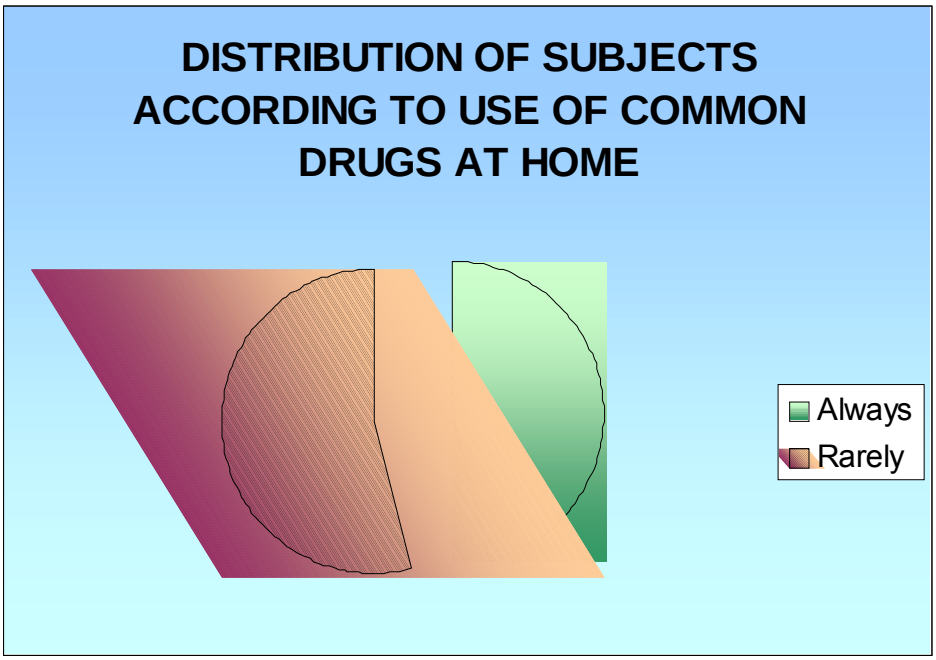


TABLE 39

USE OF COMMON DRUGS AT HOME AMONG SUBJECTS OF CONTROL GROUP

No.	Use of common drugs	Number		N	Percentage	
		M	F		M	F
1.	Always	75	33	108	25	11
2.	Rarely	75	117	192	25	39

The data of control group shows that higher number of subjects used common drugs at home to a rare extent.

4.1.18 OWNING OF MILCHING ANIMAL

The data shows a minority of selected salt workers owned a milching animal. Most of them who possessed one had goat.

TABLE 40

DISTRIBUTION OF SUBJECTS ACCORDING TO OWNING OF MILCHING ANIMAL

SR	OWNING OF	NO.OF SUBJECTS	% OF

NO	MILCHING ANIMAL	N	M	F	SUBJECTS
1	Cattle	-	-	-	-
2	Cow	2	1	1	0.66
3	Buffalo	-	-	-	-
4	Goat	5	3	2	1.66

TABLE 41

OWNING OF MILCHING ANIMAL BY SUBJECTS OF CONTROL GROUP

No.	Owing of milching animal	Number		N	Percentage	
		M	F		M	F
1.	Owns milching animal	18	12	30	6	4
2.	Cow	03	09	12	01	03
3.	Buffalo	03	09	12	01	03
4.	Goat	06	06	12	02	02

The data points out that only a few subjects of control group possessed milching animal among which were cow, buffalo and goat.

4.2 RESULTS OF PRILIMINARY SURVEY

- ***Cultural Influence:***

Malnutrition is not always due to shortage of foods people choose poor diets when good ones are available because of cultural influences which vary widely from region to region.

(a) Traditional Customs and Habits:

The traditional ideas, customs and beliefs are based on false idea. The Agaria salt worker only eat Bajra, Maize and Wheat cereals as staple food, at

night and also during Lunch. They eat Lasun, Onion and Gud, instead of Pluses, Dals etc.

(b) Religion:

Religion has a powerful influence on the food habits of Agarias. Intake of Fish, Egg, Meat is prohibited in this community. Fasting is prescribed on certain days for wealth and health, prolonged fasts weaken the personal resistance. They have trust on Meldi Mata.

(c) Food Fads:

They are only knows about direct food, they never go for processed or preserved food, as they are preserved by organisms and one called state food.

(d) Cooking Practice :

Preparing away the rice or Khichadi water at end of the cooking in open vessels prolonged boiling in open pans. Peeling of potato, no formentaten, germination or fortification adopted, foods stored in open Tapela may be infected by rodent or other insects also.

(e) Taboo / Cults or disease linked foods:

They considered Jaggery, Til (Gingally) seed and Tea as hot foods. Papaya avoid during pregnancy because it is believed to cause abortion. Butter milk is believed to cause oedema in pregnant women, Potato and Pumkin are believed to cause flatus. Rice is prohibited for lactating mother as it reduces the milk output.

(f) Child rearing Practice:

There were number of pregnancies, miscarriage, abortion and still birth, there was no special delivery place or specialized trained midwife for that, they breast fed child up to 3 to 4 years. There was no supplementary or weaning foods. No, immunization of under staining of parasites diseases.

(g) Miscellaneous :

In some Agarias men eat firs and women eat last and poorly prolonged period lead to serious malnutrition in women.

- ***Socio Economic Factors:***

(a) Poverty:

Food is purchasable commodities it can be had only for a price protection foods such as milk, fruits, baby foods relatively costly and therefore do not find a peace in the diets of poor Agaria (salt worker).

(b) Ignorance:

Ignorance is at the root of most health problems. It prevents the house wife from making better use of existing limited resources to feed her family and it is main cause of faulty habits.

(c) Family Size:

There is 7 to 8 members in one family live together in one room or hut. Which also cause polluted air, 02 Oxygen circulation leads headache, fatigue and anorexia, lack of appetite. In limited budget, such a wide family can't eat protective foods but only for fullness of stomach.

- ***Conditioning Factors:***

(a) Soil:

Owing to the retention of water in this soil, they are salty cold and damp and there for require adequate drainage. Such soil responsible for spread of infections diseases like fever, cold, cough, skin allergies, dysten is in Agaria.

(b) Housing and Building:

Healthy site must be for better health, Agarias hut is in humid, waitness, cold place. There is no open on the east and south to allow free passage of light and air and should be exposed to sun.

Agaria's house should not constructed on proper sanitary lines, house are made of clay and gunny bag as shed, there is no chimney in the house, only are room for 8 to 10 members. So, breathing produce carbondioxide and suffocation, which leads to headache fatigue and loss of appetite and some of inhalation spread infection disease like cold, cough and bronchitis.

A house should not dry or properly lighted or ventilated. There is moisture oozing out form the roof. It is fully damp course which also spread snizzing cough, cold, fever, Asthama in such poor community.

There should be no proper arrangement of water supply or disposal of dry refuse waste water or excreta again they are cause of parasites diseases like dystenly, diarrhoea fever which diminish the health status and malnourishment.

Disease of house with poor facilities observed one irritation of mucus membranes of ENT, and lungs owing to smoke nuisance and disease transmitted by rodents, insects and arthropods owing to abundance of rodents, insects and arthropods in house with poor sanitary facilities.

- ***Effect of climate on health of the salt worker:***

Climate condition have an important effect on health as is evidenced by he geographical distribution and seasonal prevalence of the disease. It also effects in the variation of pigmentation of he skin.

In summer due to hot climate nerve are enervated, the skin becomes active and excretes profuse selection continued residence leads a languor both mental and physical premature sanility and lowing in the expectation of life.

Near coastal are, there is warm moist air. It is worse, evaporation cannot take place easily so perspiration is no dried. It lowers the health and working efficiency to great extent and renders are susceptible to sun stroke. There is a loss of appetite and disclamation to mental and physical work found in Agaria.

- ***Hygiene and Sanitation:***

Community and personal hygiene and sanitation, which are essentials for preservation and improvement of health. Where Agaria (salt worker) found to be away form such practices. There was no daily both practice changing of clothes, no practice of wearing foot wear or brushing tooth daily. There was no any personal or communities latrine for band evaluation which are again produce, skin diseases, dermatitis and rough skin, child of Agaira found to be dystenry and diarrhoea periodically. There were many infections skin diseases seen in salt workers. It may be due salt allergies and infection again, there is no hygiene of drinking of storage of water supply, food supply. There were poor hygiene of housing and disposal of human wastes. The chief source of water is tanker water supply by owner of salt factories ones a week or twice. In such miserable condition reduce the health and life expansion of poor Agarias.

4.3 HEALTH PRACTICES

The health practices of selected salt workers were studied with respect to their habits like brushing teeth, taking bath, etc. They were considered to be good, fair and poor on an average. The distribution of salt workers in relation to their health practices can be seen as under:

TABLE 42

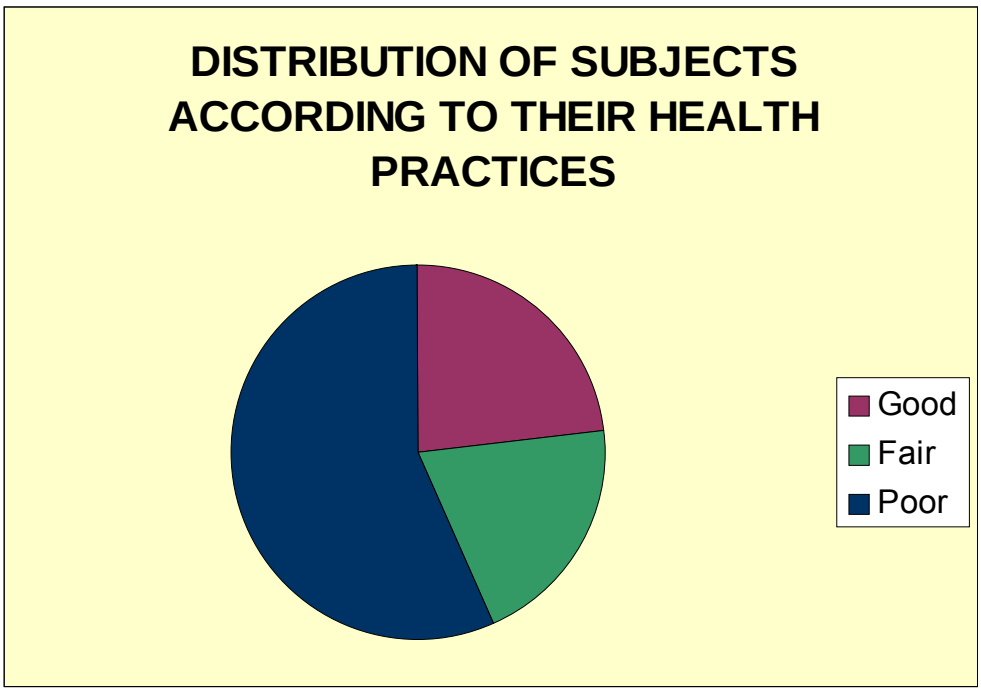
DISTRIBUTION OF SUBJECTS ACCORDING TO THEIR HEALTH PRACTICES

SR NO	HEALTH PRACTICES	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Good	70	40	30	23.33
2	Fair	60	40	20	20.00
3	Poor	170	70	100	56.66

The data reveals that majority of selected salt workers followed poor health practices. The number of salt workers following good health practices was more than those following fair health practices. The aspect wise distribution can be seen as under.

FIGURE 22

DISTRIBUTION OF SUBJECTS ACCORDING TO THEIR HEALTH PRACTICES



The data of control group reveals that a high majority of salt workers did not brush their teeth daily .It could be seen that the percentage of salt workers brushing their teeth daily was almost three times less than the others. The data clearly points out that a high majority of selected subjects had their bath only sometimes and very less percentage had their bath daily. The researcher also observed that a high majority of selected salt workers did not use footwear on regular basis.

TABLE 43

DISTRIBUTION OF SUBJECTS ACCORDING TO VARIOUS ASPECTS OF HEALTH PRACTICES

SR NO	ASPECTS		NO.	%
1	Brushing teeth	Daily	80	26.67
		Sometimes	220	73.33
2	Taking bath	Daily	80	26.67

		Sometimes	220	73.33
3	Use of footwear	Always	30	10.00
		Sometimes	270	90.00

TABLE 44

HEALTH PRACTICES OF SUBJECTS OF CONTROL GROUP

No.	Health practices	Number		N	Percentage	
		M	F		M	F
1.	Good	36	24	60	12	8
2.	Fair	54	45	99	18	15
3.	Poor	60	51	141	30	17

The data on health practices of subjects' shows that high majority of subjects from control group followed poor health practices followed by fair and good health practices respectively. The aspect wise data is as follows:

TABLE 45

HABIT OF BRUSHING TEETH AMONG SUBJECTS OF CONTROL GROUP

No.	Brushing teeth	Number		N	Percentage	
		M	F		M	F
1.	Daily	60	30	30	30	30
2.	Sometimes	40	20	20	20	20

The data points out that most of the subjects in control group brushed their teeth daily.

TABLE 46

HABIT OF TAKING BATH AMONG SUBJECTS OF CONTROL GROUP

No.	Taking bath	Number		N	Percentage	
		M	F		M	F
1.	Daily	115	135	240	35	45
2.	Sometimes	45	15	60	15	05

The data in table shows that most of the subjects of the control grouped had their bath daily.

TABLE 47

HABIT OF USING FOOTWEAR AMONG SUBJECTS OF CONTROL GROUP

No.	Using footwear	Number		N	Percentage	
		M	F		M	F
1.	Always	141	129	270	47	43
2.	Sometimes	09	21	30	03	07

The data on subjects of control group points out that most of the subjects always used footwear.

4.4 DIET PRACTICES

4.4.1 USE OF MILK PRODUCTS

It was found that only a few of the selected subjects consumed milk products. Majority of times it was in form of butter milk only.

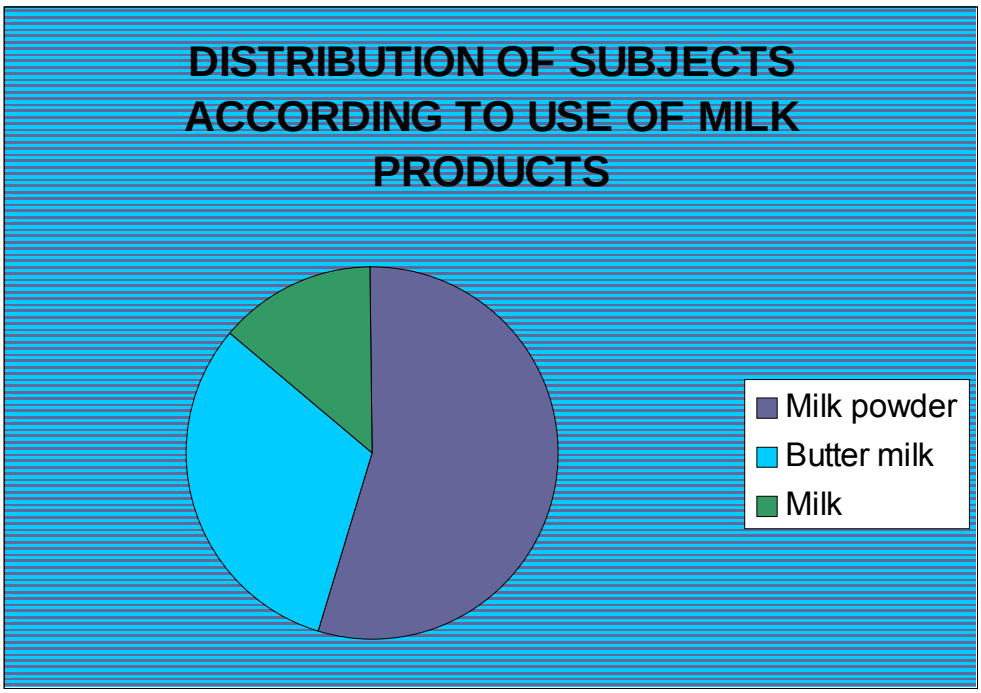
TABLE 48

DISTRIBUTION OF SUBJECTS ACCORDING TO USE OF MILK PRODUCTS

SR NO	USE OF MILK PRODUCTS	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Milk powder	04	02	02	10.33
2	Butter milk	18	02	10	06.00
3	Milk	08	10	04	02.66
4	Total	30	16	14	10.00

FIGURE 23

DISTRIBUTION OF SUBJECTS ACCORDING TO USE OF MILK PRODUCTS



4.4.2 FOOD FORBIDDEN FOR PREGNANT WOMEN

The data revealed that the selected salt workers forbidden certain food at time of pregnancy without knowing the scientific reason for the same. Butter milk, citrus and salty food were some of them.

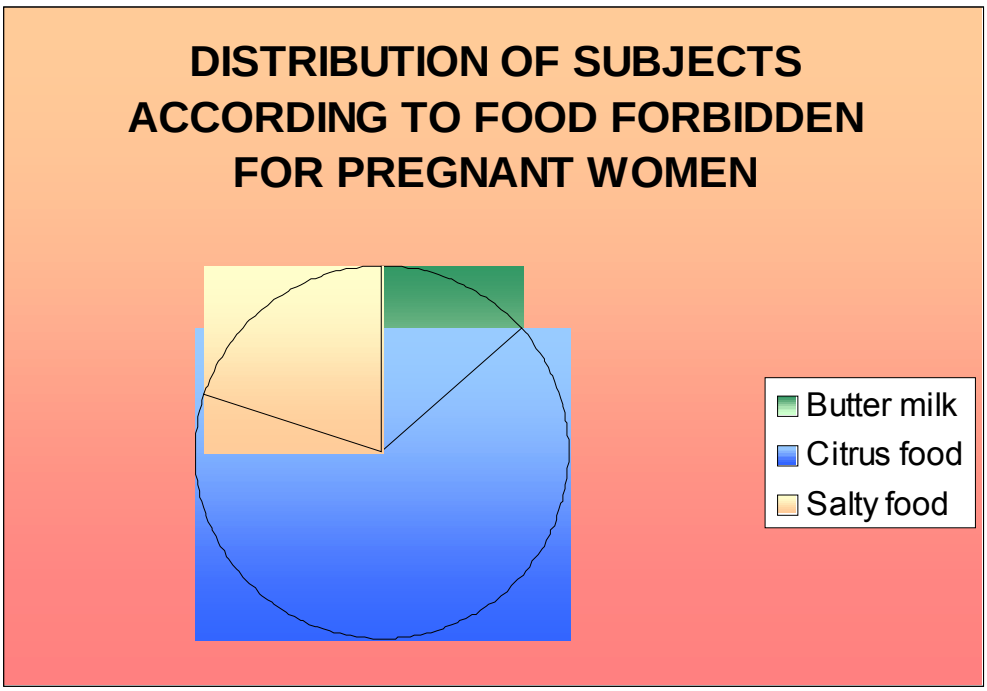
TABLE 49

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD FORBIDDEN FOR PREGNANT WOMEN

SR NO	FOOD FORBIDDEN	NO.OF SUBJECTS(F)	% OF SUBJECTS (F)
1	Butter milk	020	13.33
2	Citrus food	100	66.66
3	Salty food	030	20.00

FIGURE 24

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD FORBIDDEN FOR PREGNANT WOMEN



The data in below table clearly points out that only a few of the subjects of the control group used milk products out of which buttermilk was the principal one.

TABLE 50

USE OF MILK PRODUCTS BY SUBJECTS OF CONTROL GROUP

No.	Mild products	Number		N	Percentage	
		M	F		M	F
1.	Milk powder	-	-	-	-	-
2.	Butter milk	30	20	50	10	6.66
3.	Milk	20	15	35	6.66	05

4.4.3 FOOD FORBIDDEN FOR LACTATING WOMEN

In a similar manner certain food were also prohibited for lactating mothers. Rice, butter milk and sour food were some of them

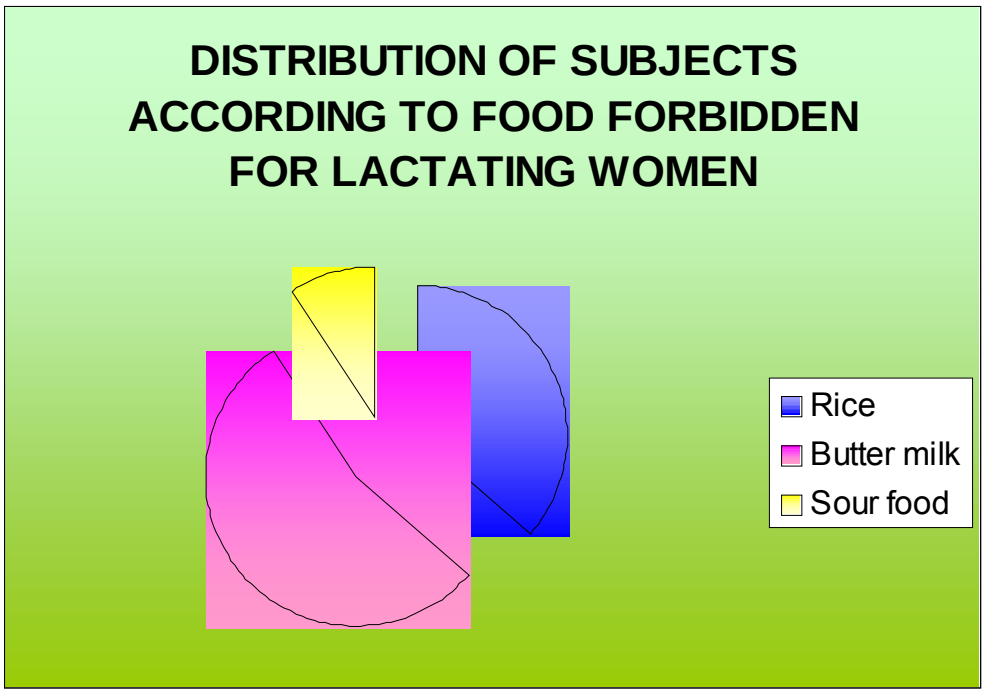
TABLE 51

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD FORBIDDEN FOR LACTATING WOMEN

SR NO	FOOD FORBIDDEN	NO.OF SUBJECTS (F)
1	Rice	080
2	Butter milk	120
3	Sour food	020

FIGURE 25

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD FORBIDDEN FOR LACTATING WOMEN



4.4.4 DURATION OF LACTATION

The researcher found out that there was a variation in the period for lactation. Equal number of the females continued lactation for 1 to 2 years and more than 3 years. Least number of females lactated their children less than one year.

TABLE 52

DISTRIBUTION OF SUBJECTS ACCORDING TO DURATION OF LACTATION

SR NO	DURATION	NO.OF SUBJECTS(F)
1	Less than 1 year	10
2	1 year to 2 years	40
3	2 years to 3 years	30
4	More than 3 years	40

4.4.5 FOOD FORBIDDEN FOR PRESCHOOL CHILDREN

The selected salt worker community forbade certain food for preschool children. Here again they are unaware of the reason for doing so but do it since many years. Garlic, papaya and chilly were some of them.

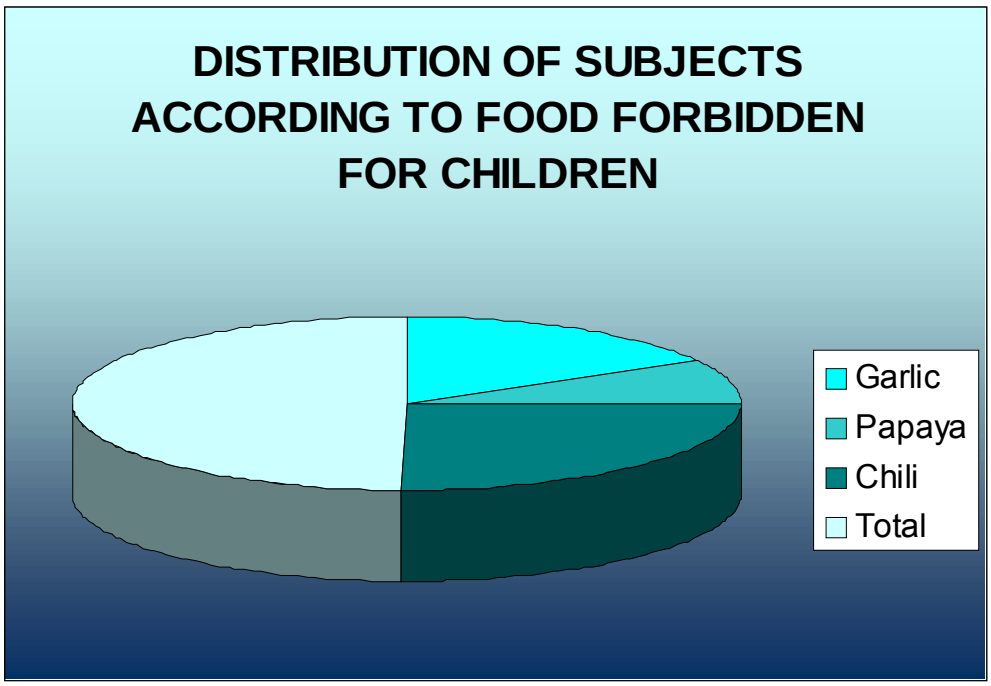
TABLE 53

DISTRIBUTION OF SUBJECTS ACCORDING FOOD FORBIDDEN FOR PRESCHOOL CHILDREN

SR NO	FOOD FORBIDDEN	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Garlic	20	08	12	33.33
2	Papaya	10	06	05	17.67
3	Chili	30	14	16	50.00
4	Total	60	27	33	100.00

FIGURE 26

DISTRIBUTION OF SUBJECTS ACCORDING FOOD FORBIDDEN FOR PRESCHOOL CHILDREN



On other hand they preferred to give certain food to small children whenever possible. They were rab and khichhadi.

TABLE 54

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD PREFERENCE FOR INFANTS

SR NO	FOOD PREFERED	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Rab	10	07	03	25.00
2	Khicchadi	30	19	11	75.00
3	Total	40	26	14	100.00

4.4.7 FOOD PREFERENCE FOR SICK PERSONS

No separate food and drug preparations were done for sick persons at home but majority of times they preferred to give them khicchadi kadhi and rab as their food.

TABLE 55

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD PREFERENCE FOR SICK PERSONS

SR NO	FOOD PREFERED	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Rab	20	05	15	16.68
2	Khicchadi	70	60	10	58.33
3	Kadhi	30	05	25	25.00
4	Total	120	70	50	100.00

Many of the subjects of the control group did not have specific preferences for sick persons. However khichadi was mostly given to sick persons.

TABLE 56

FOOD PREFERRED FOR SICK PERSONS AMONG SUBJECTS OF CONTROL GROUP

No.	Food preferred	Number		N	Percentage	
		M	F		M	F
1.	KhIchadi	60	75	135	20	24.99
2.	Khakhara	30	30	60	10	10.00
3.	Fruit	30	10	40	10	3.33
4.	Not decided	30	35	65	10	14.99

4.4.8 FOOD AVOIDED IN SUMMER

The selected salt workers avoided to eat garlic, papaya and black tea in summer as they believed them to cause harm.

TABLE 57

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD AVOIDED IN SUMMER

SR NO	FOOD AVOIDED	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Garlic	20	03	17	22.22
2	Black tea	50	30	20	55.55
3	Papaya	20	18	02	22.22
4	Total	90	51	39	100.00

FIGURE 27

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD AVOIDED IN SUMMER

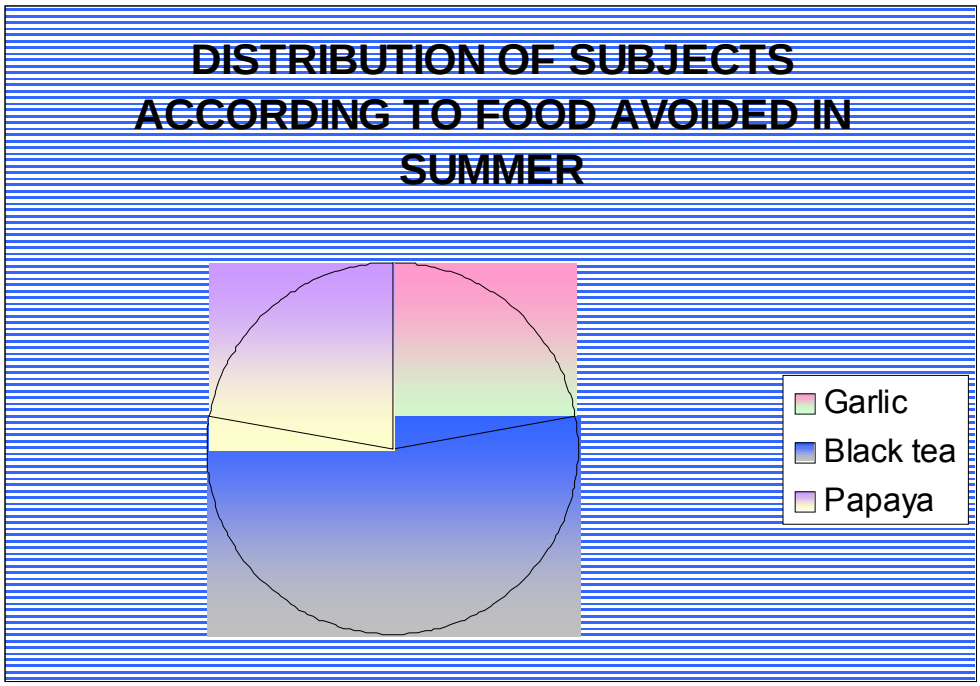


TABLE 58

FOOD AVOIDED IN SUMMER BY SUBJECTS OF CONTROL GROUP

No.	Food avoided	Number		N	Percentage	
		M	F		M	F
1.	Onion	-	-	-	-	-
2.	Black tea	60	40	100	20	13.33
3.	Not anything	90	110	200	30	36.66
	Total	150	150	300	50	50

Most of the subjects in the control group did not avoid anything in summer whereas among those who avoided, black tea was principal.

4.4.9 FOOD AVOIDED IN WINTER

The salt worker community in a similar manner avoided to consume butter milk and banana in the winter season as according to them eating them would lead to cough and cold.

TABLE 59

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD AVOIDED IN WINTER

SR NO	FOOD AVOIDED	NO.OF SUBJECTS			% OF SUBJECTS
		N	M	F	
1	Butter milk	10	05	05	45.46
2	Banana	12	07	05	54.54
3	Total	22	12	10	100.00

FIGURE 28

DISTRIBUTION OF SUBJECTS ACCORDING TO FOOD AVOIDED IN WINTER

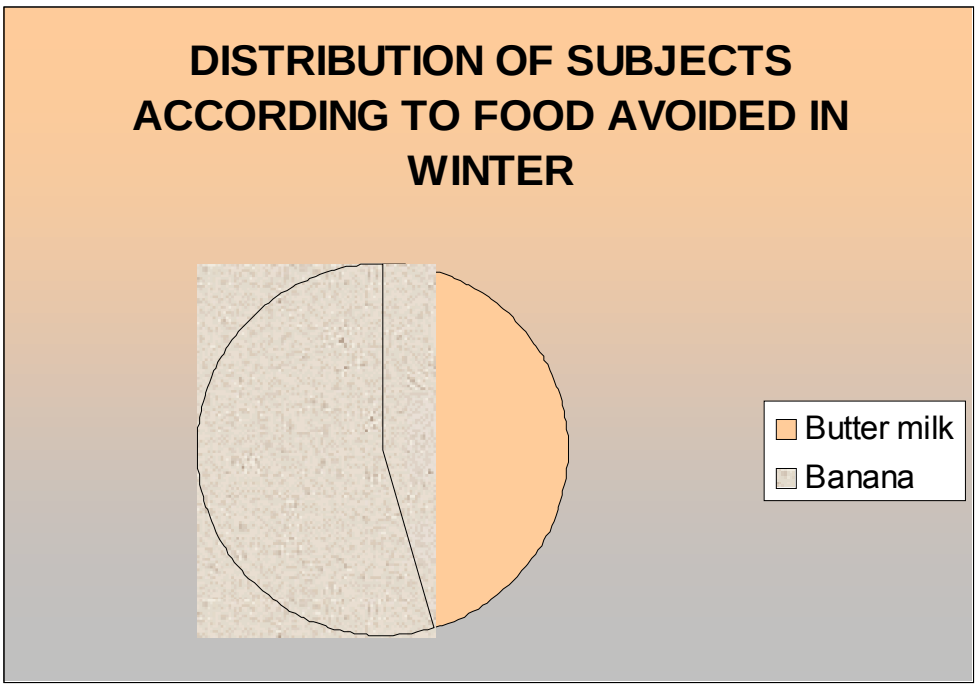


TABLE 60

FOOD AVOIDED IN WINTER BY SUBJECTS OF CONTROL GROUP

No.	Food avoided	Number		N	Percentage	
		M	F		M	F
1.	Buttermilk	30	18	48	10	6
2.	Not anything	120	132	252	40	44

Most of the subjects in the control group did not avoid anything in winter, whereas among those who avoided, butter milk was principal.

In addition to these data, the data on physical characteristics shows that the variations in height and weight of individuals were in accordance to their age. Obvious differences were observed in between age group and sex group. On comparison with the standard values given by ICMR, it was found that all values were within the given range. On other hand a very slight variation could be observed between similar experimental and control groups.

TABLE 61

PHYSICAL CHARACTERISTICS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Mean Age (yrs)	Mean Height (m)	Mean Weight (kg)	Mean BMI (kg/m^2)
1.	CM>44	55.60 ± 0.40	1.59 ± 0.01	55.90 ± 1.71	22.03 ± 0.65
2.	CM 35-44	43.50 ± 0.76	1.63 ± 0.01	51.50 ± 1.63	19.42 ± 0.56
3.	CM 25-34	30.80 ± 0.90	1.64 ± 0.02	50.70 ± 2.09	18.94 ± 0.90
4.	CM 15-24	18.40 ± 0.56	1.61 ± 0.02	52.00 ± 1.91	19.92 ± 0.49
5.	CM <15	13.30 ± 0.37	1.52 ± 0.04	38.50 ± 2.18	18.94 ± 0.90
6.	CF >45	48.70 ± 0.37	1.50 ± 0.02	43.80 ± 0.84	16.77 ± 0.56
7.	CF 35-44	40.30 ± 0.97	1.61 ± 0.02	48.10 ± 1.46	18.67 ± 0.52
8.	CF 25-34	30.00 ± 0.95	1.58 ± 0.02	41.40 ± 1.15	20.75 ± 0.70
9.	CF 15-25	17.70 ± 0.56	1.56 ± 0.01	40.00 ± 2.77	17.56 ± 1.10
10.	CF <15	13.60 ± 0.16	1.43 ± 0.03	33.40 ± 1.22	16.16 ± 0.38
11.	EM >44	50.97 ± 0.74	1.61 ± 0.01	51.68 ± 1.02	19.94 ± 0.42
12.	EM 35-44	42.23 ± 0.53	1.63 ± 0.01	51.42 ± 1.39	19.30 ± 0.53
13.	CM 25-34	30.53 ± 0.46	1.65 ± 0.01	50.47 ± 0.91	18.52 ± 0.39
14.	EM 15-24	18.67 ± 0.52	1.62 ± 0.01	49.10 ± 1.28	19.60 ± 0.65
15.	EM <15	13.17 ± 0.19	1.48 ± 0.02	35.70 ± 1.11	18.52 ± 0.39
16.	EF >45	49.03 ± 0.40	1.52 ± 0.01	46.50 ± 0.56	16.25 ± 0.36
17.	EF 35-44	39.33 ± 0.52	1.58 ± 0.01	45.70 ± 0.85	18.50 ± 0.36
18.	EF 25-34	28.83 ± 0.55	1.56 ± 0.01	41.63 ± 0.92	22.01 ± 4.67
19.	EF 15-24	18.27 ± 0.44	1.56 ± 0.00	41.70 ± 1.22	17.72 ± 0.49

20.	EF <15	13.23 ± 0.15	1.41 ± 0.02	31.60 ± 0.86	16.17 ± 0.43
	'F' Value		25.50*	28.48*	1.05

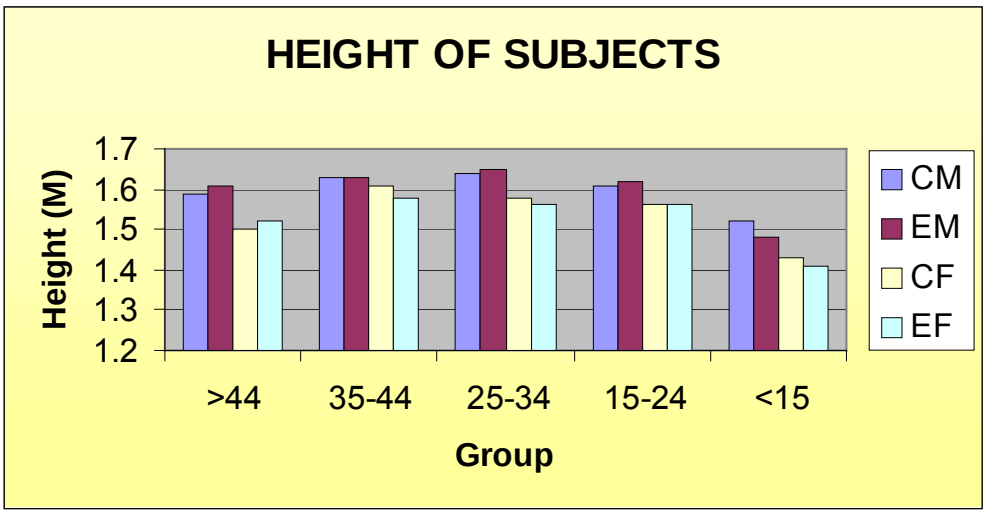
CM = Control Male, CF = Control Female, EM = Experimental Male,

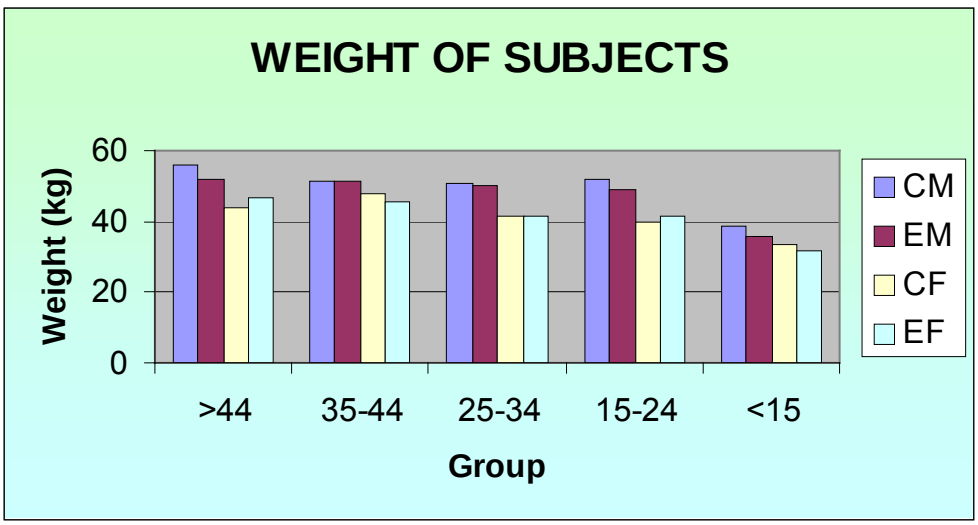
EF = Experimental Female, BMI = Body Mass Index

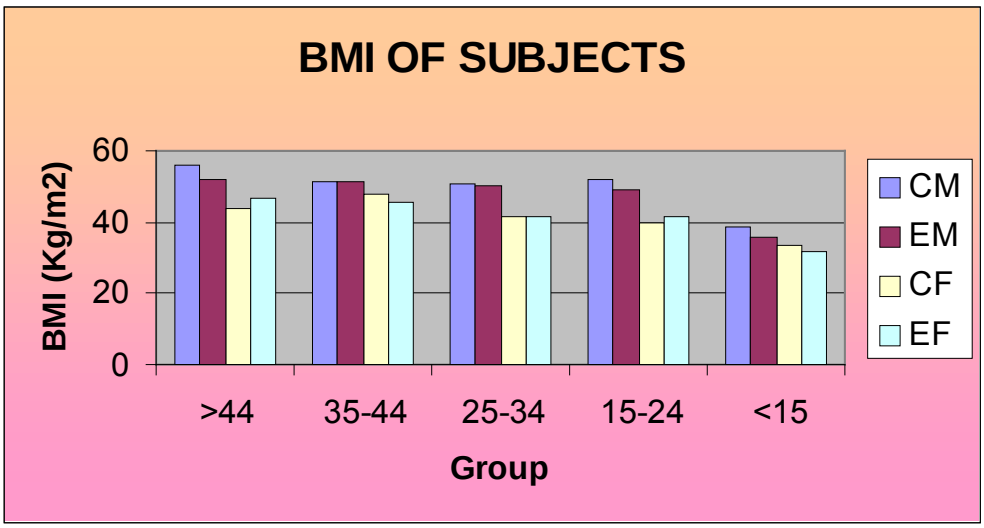
Values are Mean ± SEM of 10 and 30 subjects in control and experimental group respectively.

*Differ significantly ($P \leq 0.05$)

FIGURE 29 PHYSICAL CHARACTERISTICS OF SUBJECTS







4.6 NUTRIENT INTAKE

TABLE 62

DAILY INTAKE OF PRINCIPAL NUTRIENTS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Caloric	CHO	FAT	Protein
1.	CM>44	1563.00 ± 24.69	285.20 ± 6.20	26.20 ± 0.39	6.60 ± 0.72
2.	CM 35-44	2108.90 ± 51.70	394.50 ± 3.83	28.90 ± 0.66	52.90 ± 0.80
3.	CM 25-34	2206.10 ± 39.94	11.00 ± 5.62	31.96 ± 0.64	53.20 ± 0.76
4.	CM 15-24	1884.80 ± 36.08	358.20 ± 11.44	34.00 ± 0.71	54.00 ± 0.71
5.	CM <15	1855.00 ± 34.30	343.00 ± 10.01	31.60 ± 1.09	52.90 ± 0.60
6.	CF >45	1434.40 ± 9.22	262.3 ± 2.56	24.00 ± 0.26	2.30 ± 0.65
7.	CF 35-44	1585.65 ± 20.20	288.30 ± 6.59	26.15 ± 0.49	6.70 ± 0.87
8.	CF 25-34	1655.00 ± 27.28	300.70 ± 4.37	27.90 ± 1.03	6.70 ± 1.48
9.	CF 15-25	1577.50 ± 16.38	303.70 ± 5.02	28.70 ± 0.99	5.90 ± 2.21
10.	CF <15	1501.10 ± 16.42	269.20 ± 4.53	26.30 ± 0.33	6.90 ± 0.55
11.	EM >44	1533.03 ± 20.76	278.70 ± 5.32	25.97 ± 0.22	6.13 ± 0.39
12.	EM 35-44	2027.30 ± 14.03	390.67 ± 2.36	28.37 ± 0.37	52.33 ± 0.48
13.	CM 25-34	2110.03 ± 13.76	7.00 ± 2.72	30.70 ± 0.27	51.43 ± 0.22
14.	EM 15-24	1861.07 ± 17.51	354.20 ± 6.22	33.60 ± 0.34	53.60 ± 0.34
15.	EM <15	1841.83 ± 22.83	338.83 ± 5.45 ,	31.03 ± 0.45 .	51.80 ± 0.82
16.	EF >45	1424.02 ± 6.24	260.53 ± 1.46	23.88 ± 0.14	1.73 ± 0.31
17.	EF 35-44	1560.62 ± 20.82	287.33 ± 4.97	25.55 ± 0.34	5.33 ± 0.59
18.	EF 25-34	1634.33 ± 26.42	296.27 ± 1.72	29.67 ± 2.48	5.57 ± 0.90
19.	EF 15-24	1591.23 ± 11.04	295.67 ± 2.75	27.23 ± 0.35	0.87 ± 1.60
20.	EF <15	1476.07 ± 12.78	264.53 ± 3.07	25.93 ± 0.21	6.13 ± 0.37

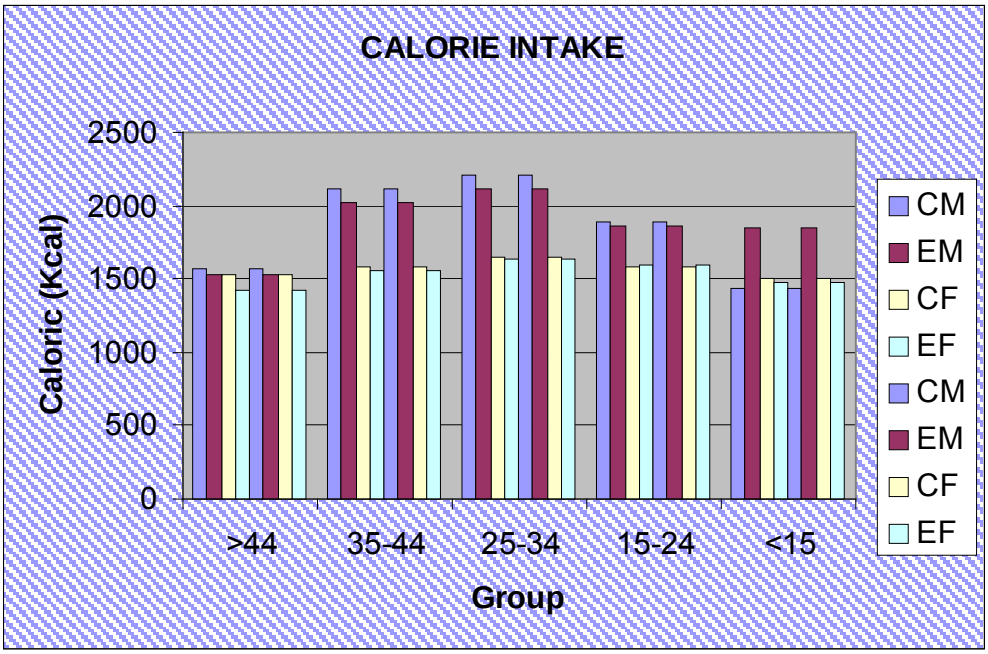
	'F' Value	123.094	112.567	10.201	25.828

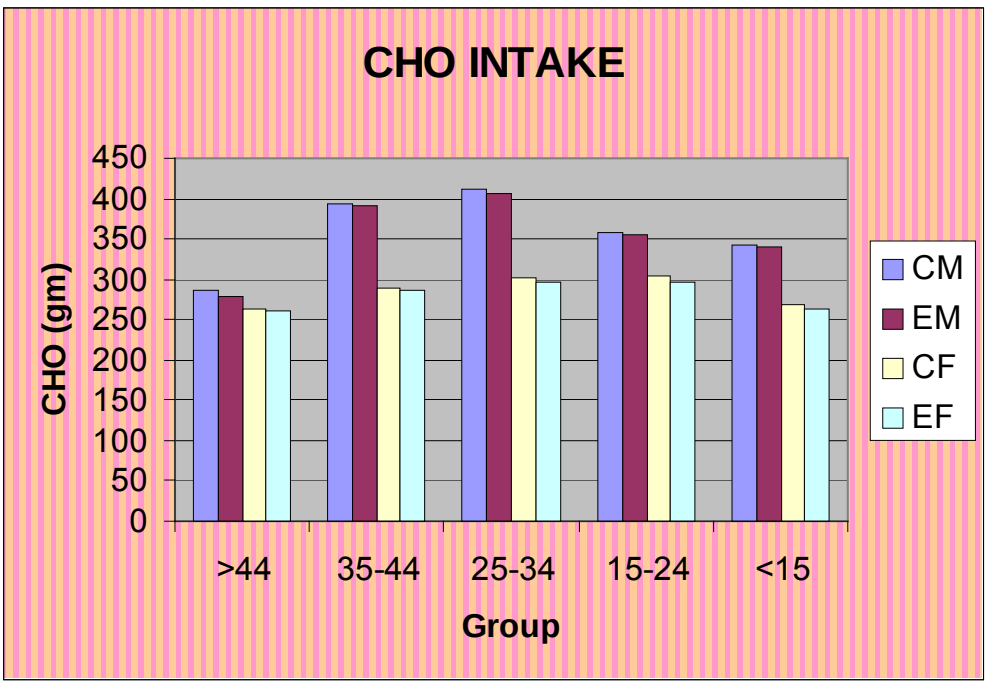
The data in table 62 reveals average intake of principal nutrients. It points out that –

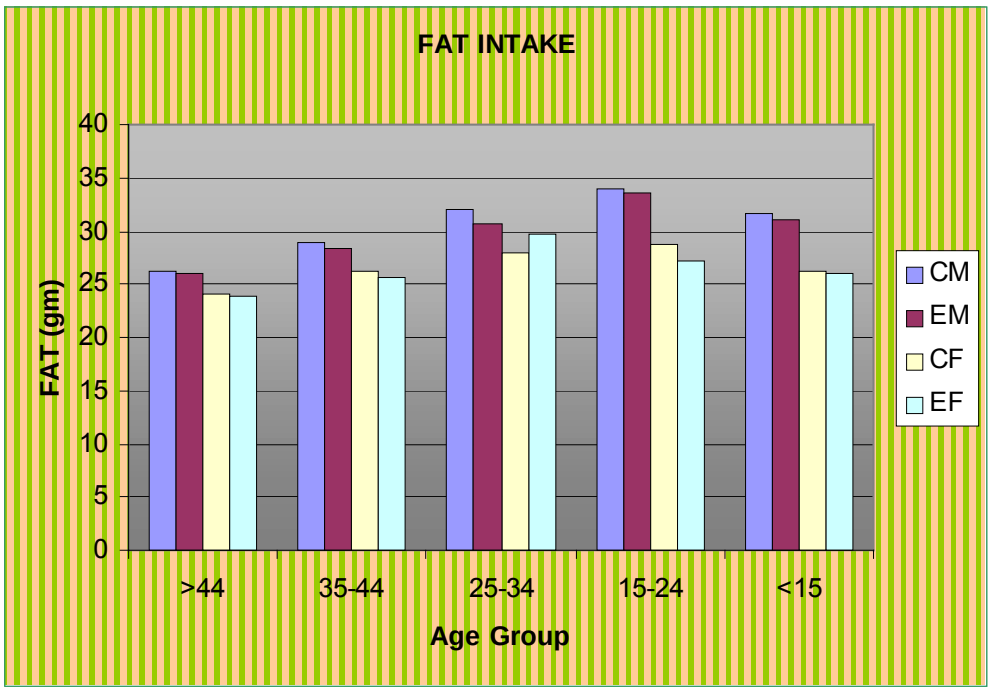
- The highest calorie intake was in the male age group between 25 to 34 years and the lowest intake was in the female age group above 45 years.
- In experimental group the highest calorie intake was in the male age group between 25 to 34 years and lowest intake was in female age group above 45 years.
- The differences of calorie intake in experimental and control group were maximum in male age group of 25 to 34 years and minimum in female age group above 45 years. Overall the difference in between groups was non-significant.
- In control group the highest cabohydrate intake was in the male age group between 35 to 44 years and lowest intake was in female age group between 15 to 25 years.
- The differences of carbohydrate intake in experimental and control group were maximum in female age group between 15 to 24 years and minimum in female age group between 35 to 44 years. Overall the difference between groups and significant at 5% level.
- In control group the highest fat intake was in male age group between 15 to 24 years and lowest was in female age group above 45 years.
- In experimental group the highest fat intake was in male age group between 15 to 24 years and lowest intake was in female above 45 years of age.
- The differences of fat intake in experimental and control group were maximum in female age group of 15 to 24 years and minimum in female of 35 to 44 years. Overall the difference between groups were significant at 5% level.

- In control group the highest protein intake was in male age group between 15 to 24 years and lowest was in female age group above 45 years.
- In experiment group the highest protein intake was in male age group between 15 to 24 years and lowest in female between 15 to 24 years.
- The differences of protein intake in experimental and control group were maximum in male between 25 to 34 years and minimum in female between 25 to 34 years. Overall the difference between groups were significant at 5% level.

FIGURE 30
DAILY INTAKE OF PRINCIPAL NUTRIENTS


CALORIE INTAKE
Caloric (Kcal)
2500
2000
1500
1000
500
0
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF
CM
EM
CF
EF


CHO INTAKE
CHO (gm)
450
400
350
300
250
200
150
100
50
0
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF


FAT INTAKE
40
35
30
25
20
15
10
5
0
FAT (gm)
>44
35-44
25-34
15-24
<15
Age Group
CM
EM
CF
EF

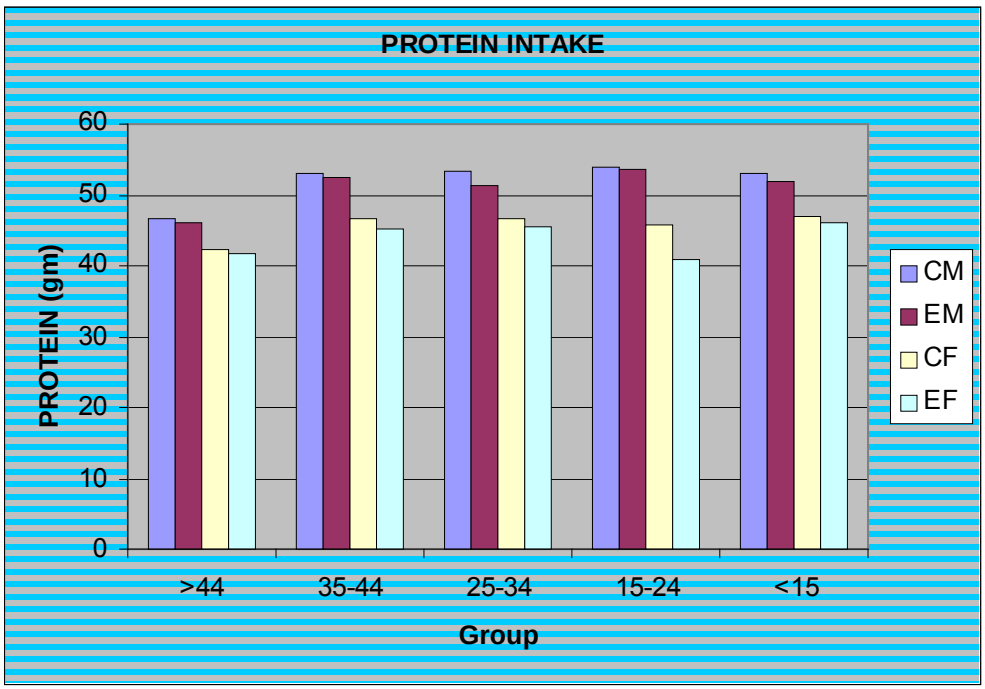

PROTEIN INTAKE
60
50
40
30
20
10
0
PROTEIN (gm)
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF

TABLE63

DAILY INTAKE OF PRINCIPAL MINERALS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Iron	Calcium	Phosphorus
1.	CM>44	30.70 ± 0.80	187.00 ± 3.88	1243.60 ± 18.36
2.	CM 35-44	35.80 ± 0.20	227.10 ± 4.73	1560.10 ± 25.93
3.	CM 25-34	37.09 ± 0.45	260.00 ± 3.31	1785.80 ± 23.98
4.	CM 15-24	41.10 ± 1.42	278.50 ± 4.28	1847.00 ± 24.66
5.	CM <15	43.80 ± 1.56	291.20 ± 5.55	1905.50 ± 21.21
6.	CF >45	26.20 ± 0.84	166.90 ± 1.95	1102.60 ± 14.23
7.	CF 35-44	29.90 ± 0.60	183.80 ± 2.49	1231.00 ± 33.55
8.	CF 25-34	31.50 ± 1.83	192.50 ± 8.23	1308.60 ± 38.92
9.	CF 15-25	32.10 ± 0.86	194.90 ± 6.40	1355.00 ± 55.86
10.	CF <15	31.20 ± 0.51	188.90 ± 4.67	1360.00 ± 51.66
11.	EM >44	30.20 ± 0.44	187.13 ± 2.03	1248.20 ± 11.37
12.	EM 35-44	35.70 ± 0.26	222.90 ± 2.79	1533.67 ± 20.90
13.	CM 25-34	36.53 ± 0.22	259.07 ± 1.99	1735.10 ± 15.54
14.	EM 15-24	39.93 ± 0.63	275.43 ± 2.38	1832.63 ± 15.07
15.	EM <15	42.97 ± 0.82	289.07 ± 2.78	1895.90 ± 12.65
16.	EF >45	25.17 ± 0.44	165.50 ± 0.97	1092.97 ± 07.21
17.	EF 35-44	29.77 ± 0.53	180.53 ± 2.53	1224.10 ± 21.42
18.	EF 25-34	29.80 ± 0.67	184.77 ± 4.23	1270.47 ± 37.72
19.	EF 15-24	31.77 ± 0.62	194.00 ± 4.32	1347.00 ± 36.15
20.	EF <15	30.30 ± 0.40	182.10 ± 3.37	1298.67 ± 35.69
	'F' Value	61.684*	151.062*	96.834*

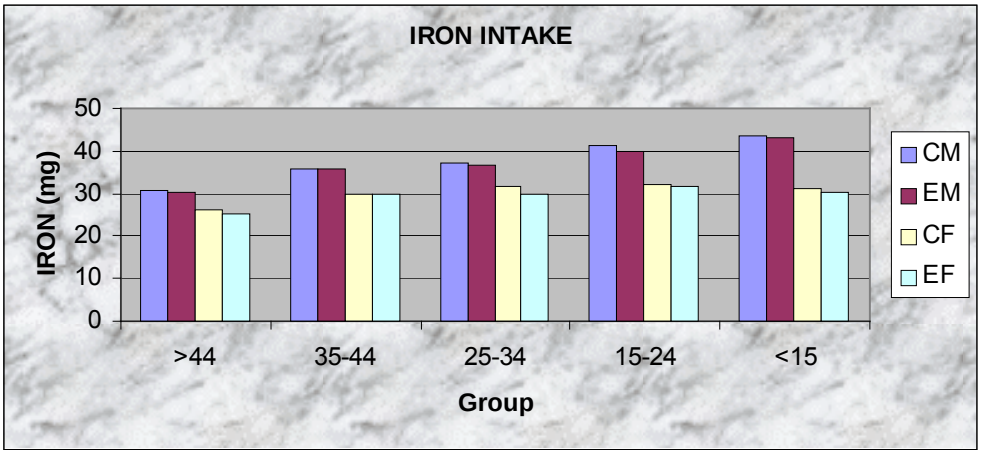
The data in table 63 shows average intake of principal minerals. It highlights the following :

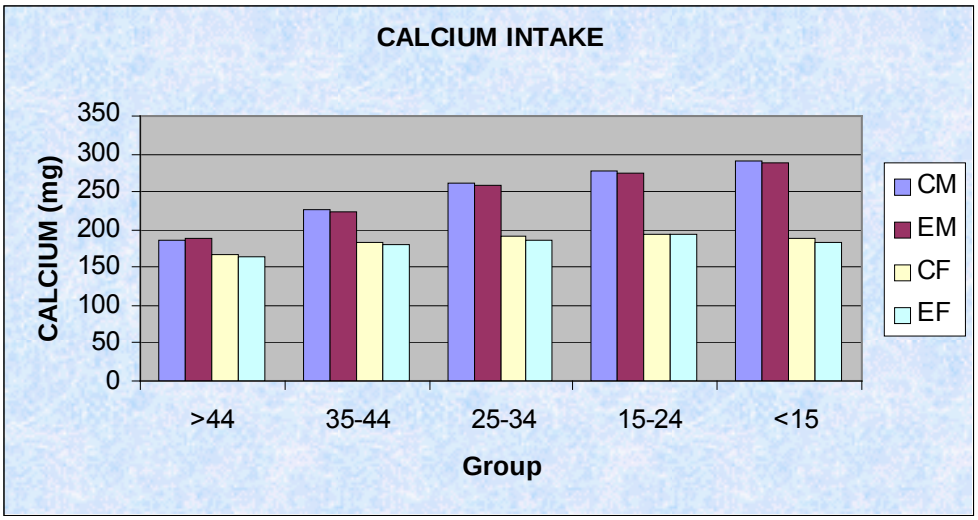
- In control group the highest iron intake was male age group below 15 years and lowest in male above 44 years.
- In experimental group the highest iron intake was found in male below 15 years of age and lowest in female above 44 years.

- The differences of iron intake between experimental and control group were maximum in male below 15 years and minimum in female age group between 25 to 34 years. Overall the difference was significant at 5% level.
- In control group the highest calcium intake was in male below 15 years and lowest intake was in female group above 44 years.
- In experimental group the highest calcium intake was in male group below 15 years and lowest was in female below 15 years of age.
- The differences of calcium intake between experimental and control group were maximum in female age group between 35 to 44 years and minimum in female age group between 15 to 24 years. Overall the difference was significant at 5% level.
- In control group the highest phosphorus intake was in male below 15 years and lowest in female between 35 to 44 years.
- In experimental group the highest phosphorus intake was in male between 15 to 24 years and lowest in male between 15 to 24 years of age.
- The differences of phosphorus intake between experimental and control group were maximum in female below 15 years and minimum in male above 44 years of age. Overall the difference was significant at 5% level.

FIGURE 31

DAILY INTAKE OF PRINCIPAL MINERALS





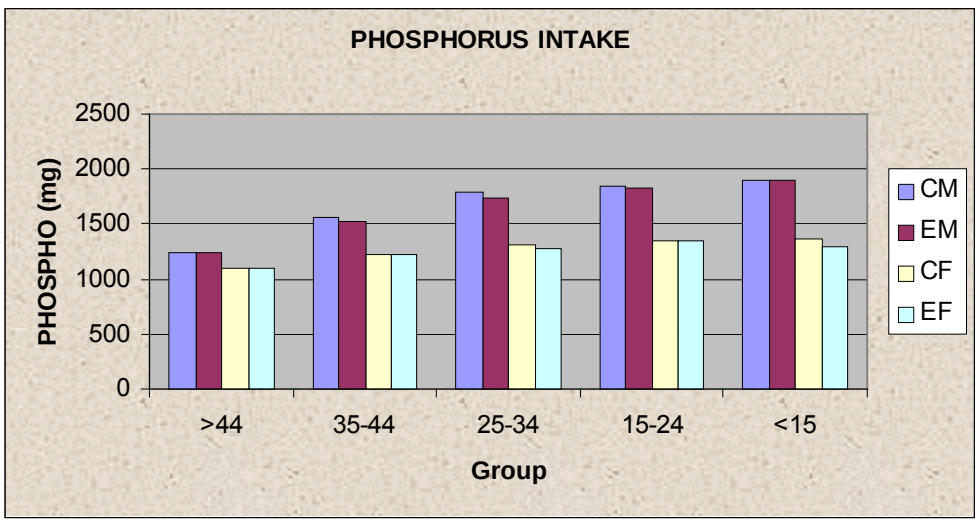


TABLE 64

DAILY INTAKE OF VITAMIN OF CONTROL AND EXPERIMENTAL GROUP

No	Group	Vit A(mg)	Vit B_1(mg)	Vit B_2(mg)	Vit B_3(mg)	Vit C(mg)
1	CM>44	190.00±4.9	1.441±0.033	1.057±0.042	10.971±0.31	16.30±2.03
2	CM 35-44	215.30±4.2	1.642±0.031	1.225±0.017	14.09±0.30	21.50±0.78
3	CM 25-34	257.10±7.0	1.760±0.046	1.548±0.061	15.76±0.52	29.00±1.26
4	CM 15-24	276.30±6.7	1.984±0.062	1.714±0.058	17.14±0.058	31.20±0.33
5	CM <15	292.10±3.7	2.117±0.053	1.881±0.048	18.92±0.44	33.20±1.38
6	CF >45	161.80±3.3	1.065±0.032	0.908±0.010	9.12±0.16	14.50±1.24
7	CF 35-44	189.30±1.4	1.446±0.084	1.135±0.089	11.34±0.35	21.10±1.20
8	CF 25-34	187.60±8.7	1.510±0.080	1.222±0.080	12.10±0.72	21.50±2.01
9	CF 15-25	193.80±5.4	1.564±0.088	1.148±0.038	11.50±0.35	23.50±1.00
10	CF <15	150.11±24.	1.531±0.085	1.102±0.042	11.17±0.33	18.60±0.50
11	EM >44	188.30±2.7	1.472±0.031	1.057±0.021	10.99±0.18	15.53±1.27
12	EM 35-44	212.20±1.7	1.622±0.013	1.204±0.015	13.14±0.15	20.27±1.01
13	CM 25-34	250.07±4.0	1.744±0.025	1.482±0.031	15.38±0.23	28.80±0.63
14	EM 15-24	274.40±3.7	1.943±0.032	1.700±0.030	17.05±0.24	30.40±0.32
15	EM <15	291.77±1.7	2.099±0.027	1.870±0.023	18.49±0.19	30.40±0.15
16	EF >45	159.33±1.7	1.044±0.016	0.901±0.060	8.99±0.076	13.43±0.66
17	EF 35-44	183.03±3.3	1.365±0.045	1.012±0.020	11.02±0.25	17.40±0.44
18	EF 25-34	181.40±3.9	1.342±0.054	1.068±0.036	10.67±0.33	16.63±0.54
19	EF 15-24	191.00±3.5	1.504±0.058	1.079±0.022	11.02±0.24	19.24±0.23
20	EF <15	169.74±9.0	1.417±0.061	1.058±0.024	10.66±0.25	18.60±0.26
F		68.384*	38.007*	95.479*	123.179*	57.492*

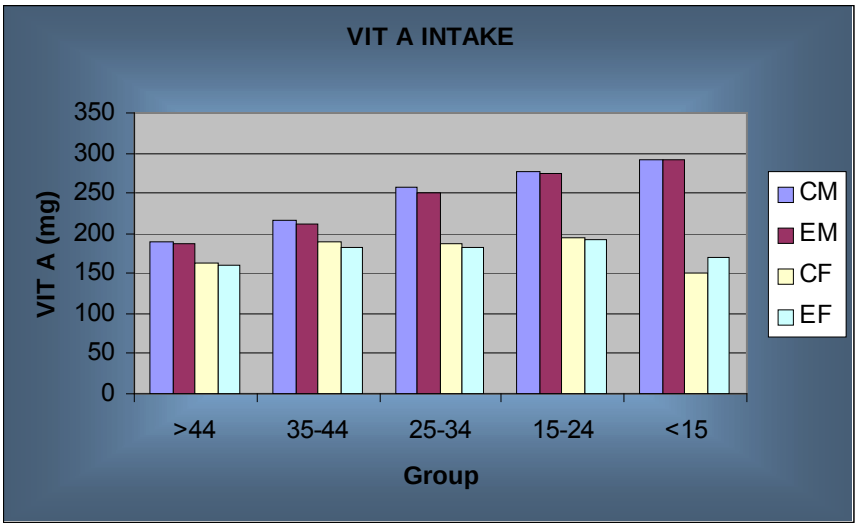
The data represented in table 64 shows average intake of major vitamins as consumed by selected salt workers. It shows that -

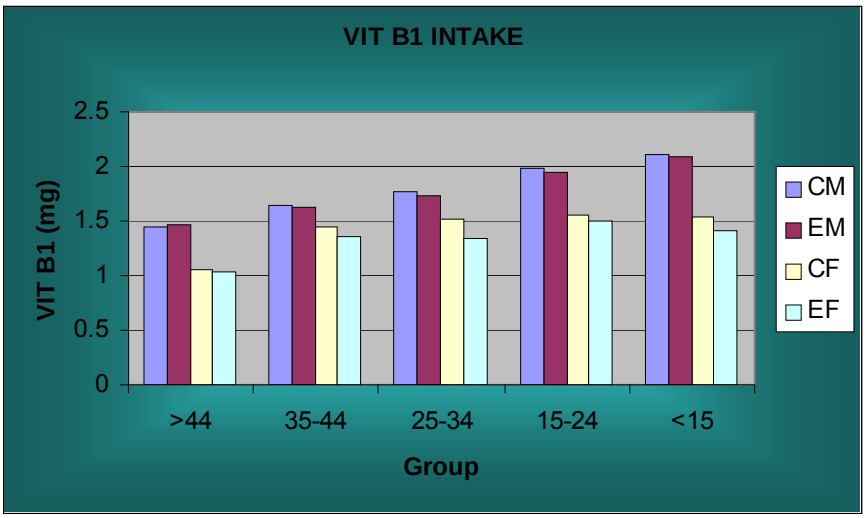
- In control group the highest vitamin A intake was in male below 15 years and lowest in female below 15 years.
- In experimental group the highest vitamin A intake was in male between 25 to 34 years and lowest in male below 15 years.
- The differences of vitamin A intake between experimental and control group was maximum in male age group of 25 to 34 years and minimum in female of below 1 years of age. Overall the difference was significant at 5% level.
- In control group the highest vitamin B_1 intake was in male below 15 years and lowest in female above 44 years.
- In experimental group the highest vitamin B_1 intake was in male below 15 years and lowest in female above 44 years.
- The differences of vitamin B_1 intake between experimental and control group was maximum in female between 15 to 34 years and minimum in male below 15 years.
- In control group the highest vitamin B_2 intake was in female above 44 years of age and lowest in male above 44 years.
- In experimental group the highest vitamin B_2 intake was in male below 15 years and lowest in female above 44 years.
- The differences of vitamin B_2 intake between experimental and control group was maximum in female between 25 to 34 years and minimum in male below 15 years. Overall the difference was significant at 5% level.
- In control group the highest vitamin B_3 intake was in male below 15 years of age and lowest in female above 44 years.
- In experimental group the highest vitamin B_4 intake was in male below 15 years and lowest in female above 44 years.
- The differences of vitamin B_3 intake between experimental and control group was maximum in male above 44 years and minimum in female between 25 to 34 years of age. Overall the difference was significant at 5% level.

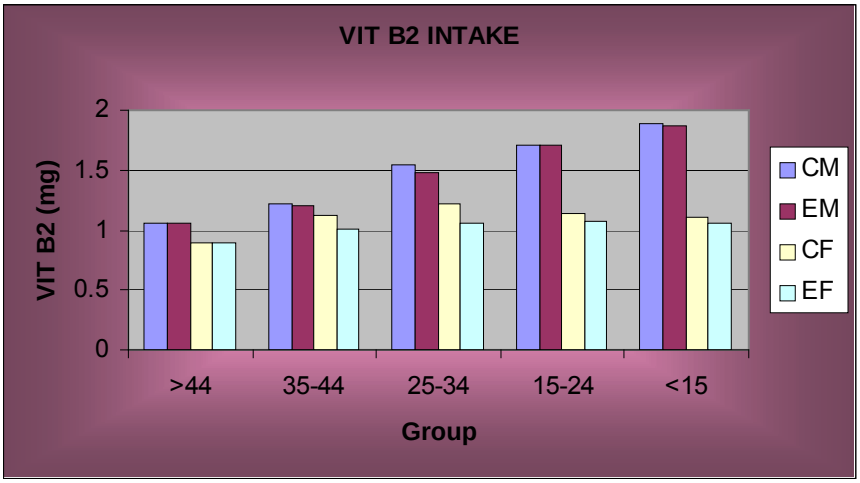
- In control group the highest vitamin C intake was in male below 15 years and lowest in female above 44 years.
- In experimental group the highest vitamin C intake was in male below 15 years and lowest in female above 44 years.
- The differences of vitamin C intake between experimental and control group was maximum in female between 15 to 24 years and minimum in male between 25 to 34 years. Overall the difference was significant at 5% level.

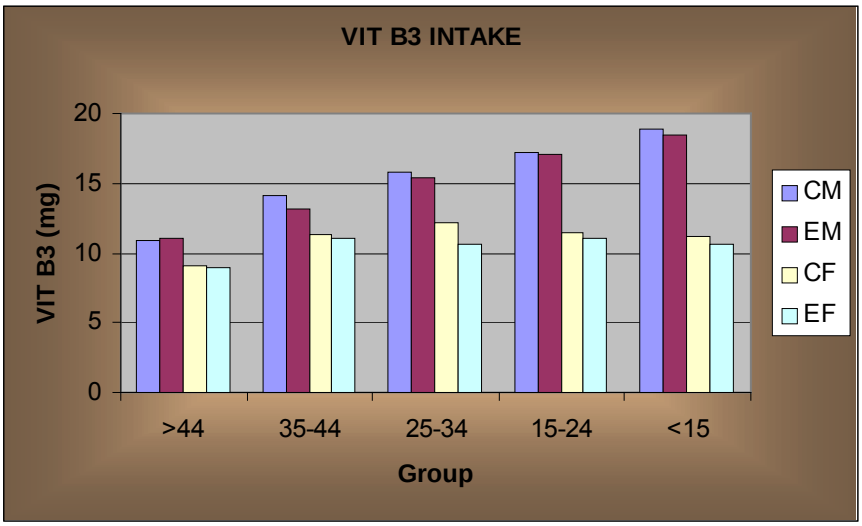
FIGURE 32

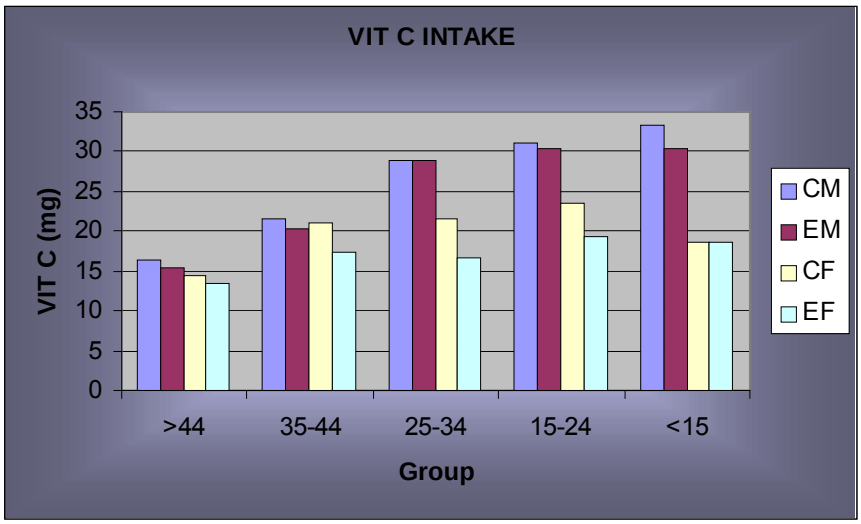
DAILY INTAKE OF VITAMIN




VIT B1 INTAKE
VIT B1 (mg)
2.5
2
1.5
1
0.5
0
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF


VIT B2 INTAKE
VIT B2 (mg)
2
1.5
1
0.5
0
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF


VIT B3 INTAKE
VIT B3 (mg)
20
15
10
5
0
>44
35-44
25-34
15-24
<15
Group
CM
EM
CF
EF



The data in table 65 points out the mean nutrient intake of selected male and female subjects. In experimental group average calorie, carbohydrate, protein, fat, iron, calcium, phosphorus. vitamin A, vitamin B, vitamin B_2, Vitamin B_3 and vitamin C intake was higher in males than females. The mean nutrient intake of selected male and female subjects, in control group average calorie, carbodydrate, protein, fat, iron, calcium vitamin A, Vitamin B_1 vitamin B_2, vitamin B_3 and vitamin C intake was higher in males than females. Phosphorus intake in females was higher than males in control group.

TABLE 65

ALL OVER SEX WISE COMPARISON WITH CONTROL GROUP

No		Sex	AV intake CG	AV intake Ex G	Diff	Diff%
1	Calories	M	1923.36	1874.40	48.80	2.545
		F	1550.00	1537.00	13.58	0.87
2	Carbo (gm)	M	343.00	338.00	0.466	0.136
		F	284.84	286.86	0.3.98	0.139
3	Protein (gm)	M	52.30	51.73	2.06	3.938
		F	45.7	43.95	01.57	1.247

4	Fat (gm)	M	30.53	29.95	00.57	1.867
		F	26.55	26.45	00.14	0.527
5	Iron (mg)	M	37.868	37.698	0.200	0.528
		F	42.18	29.362	12.82	30.393
6	Calorie (mg)	M	248.88	247.118	1.762	0.707
		F	185.40	181.40	4.00	2.157
7	Phosphorus (mg)	M	1568.26	1630.84	16.80	1.071
		F	1271.14	1242.66	24.60	1.888
8	Vit A (mg)	M	243.228	230.16	13.06	5.369
		F	176.94	176.52	00.42	0.237
9	Vit B_1 (mg)	M	1.79	1.78	0.01	0.558
		F	1.423	1.33	0.09	6.324
10	Vit B_2 (mg)	M	1.486	1.457	0.029	1.951
		F	1.103	1.029	0.074	6.708
11	Vit B_3 (mg)	M	15.379	14.958	0.421	2.37
		F	11.046	10.301	0.755	6.838
12	Vit C (mg)	M	26.24	25.078	1.16	4.420
		F	19.84	17.92	1.92	9.677

TABLE 66

COMPARISON ON AVERAGE OF DIETARY INTAKE IN RELATION TO THEIR RDA.

No.	Nutrient	AV intake	RDA*	%Difference
1	Calories	1705.7	2443.00	-26.35
2	Carbohydr	320.28	330.00	-0294
3	Protein	043.92	0.62.10	-29.27
4	Fat	025.2	0.28.0	-12.80
5	Iron	033.61	033.05	-1.69
6	Calcium	214.24	540.00	-60.32

7	Phosphorus	1436.75	920.00	+35.966
8	Vit A	210.08	600.00	-64.98
9	Vit B_1	001.56	001.26	-23.80
10	Vit B_2	001.23	01.57	-21.65
11	Vit B_3	012.62	15.30	-17.51
12	Vit C	021.49	40.0	-46.27

The above table shows that calcium deficiency was observed to a maximum extent where phosphorus intake was taken in surplus amounts.

4.6 PHYSICAL PROBLEMS

The data in table 67 shows that in control and experimental group leg pain was experienced by most number of subjects. Overall the subjects in experimental group faced more muscular / skeletal problems. In experimental group all types of pains were more among females than males. This could be because of their poor nutritional problems and more susceptibility towards occupational problems.

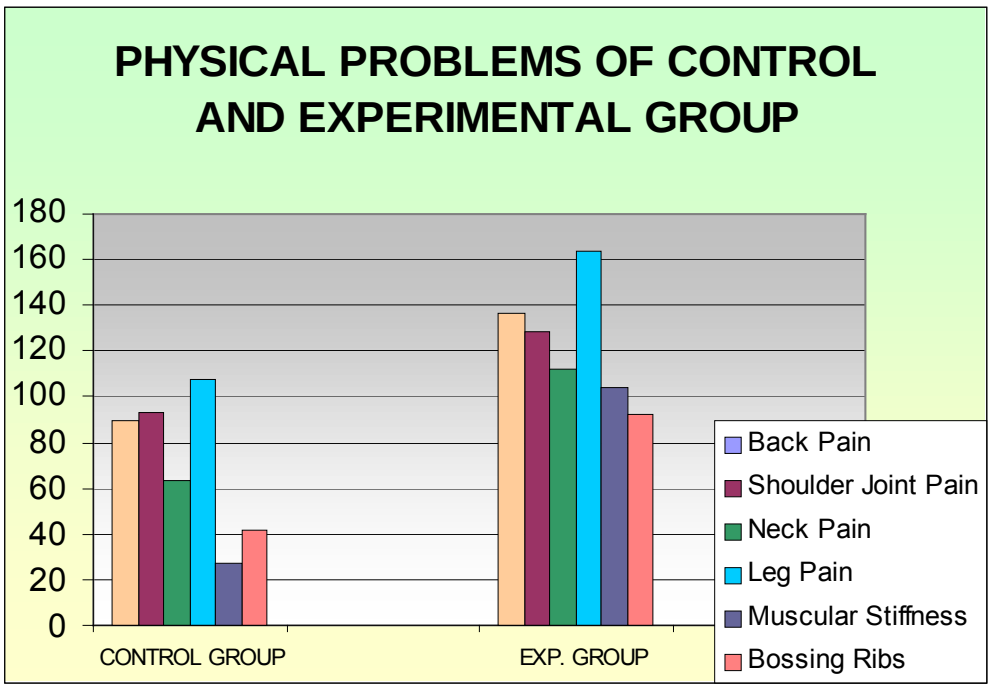
TABLE 67
PHYSICAL PROBLEMS OF CONTROL AND EXPERIMENTAL GROUP

No	Problem	Sex	Control Group		Experimental Group	
			No	%	No	%
1	Back Pain	M	33	22.0	50	33.33
		F	57	38	87	58
		Total	90	30.00	137	45.66
2	Shoulder Joint Pain	M	48	32.00	47	31.33
		F	45	30.00	81	54
		Total	93	31.00	128	42.165
3	Neck Pain	M	33	22.00	35	23.33
		F	30	20.00	7	51.33
		Total	63	21.00	112	37.33

4	Leg Pain	M	51	34.00	64	42.66
		F	57	38.00	100	66.66
		Total	108	26.00	164	54.66
5	Abdominal Pain	M	09	6.00	09	6.00
		F	42	28.00	62	41.33
		Total	51	17.00	71	23.66
6	Muscular Stiffness	M	03	2.00	56	37.33
		F	24	16.00	58	38.66
		Total	27	9.00	104	37.995
7	Bossing Ribs	M	21	14.00	40	26.66
		F	21	14.00	52	34.66
		Total	42	14.00	92	30.66
Total	All over Problems	M	198	18.85	293	27.90
		F	270	25.71	517	49.24
		Total	468	22.29	810	38.57

FIGURE 33

PHYSICAL PROBLEMS OF CONTROL AND EXPERIMENTAL GROUP



The data on respiratory problems as shown in table 68 shows that in control group problem of sneezing was maximum whereas in

experimental group most number of subjects faced problem of cough. In experimental group all problems other than TB and bronchitis were more among females than females. TB was more among males because of their alcohol consumption.

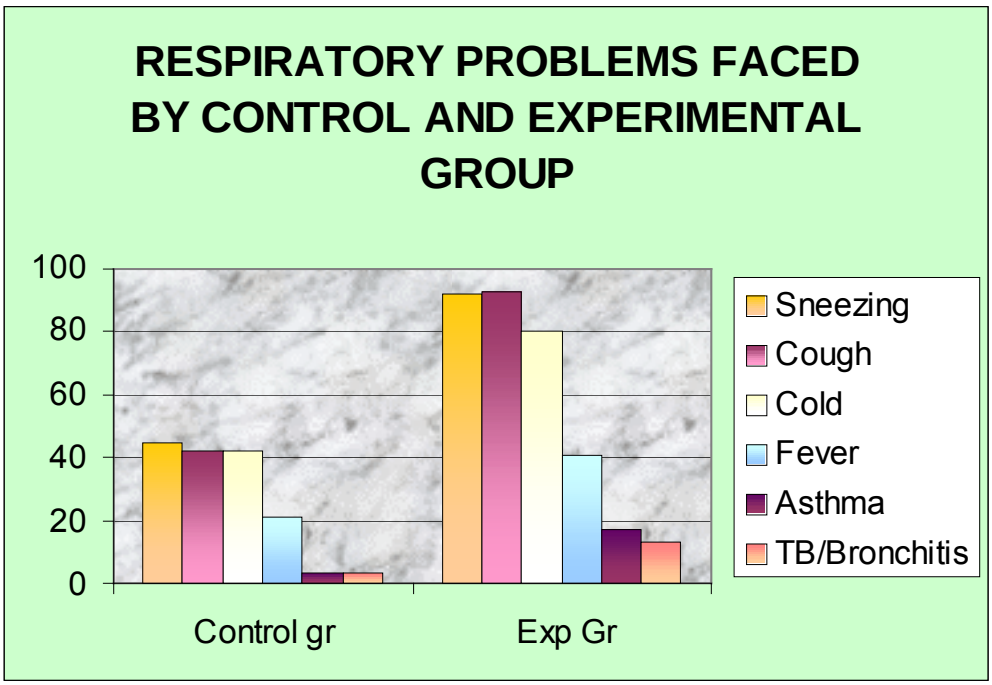
TABLE 68

RESPIRATORY PROBLEMS FACED BY SUBJECTS OF CONTROL AND EXPERIMENTAL GROUP

No.	Problems	Sex	Control Group		Experimental Group	
			No.	%	No.	%
1	Sneezing	M	15	10.00	29	19.33
		F	30	20.00	63	42.00
		Total	45	15.00	92	30.6
2	Cough	M	12	8.00	30	20.00
		F	30	20.00	63	42.00
		Total	42	14.00	93	31.00
3	Cold	M	18	12.00	33	22.00
		F	24	16.00	47	31.33
		Total	42	14.00	80	26.66
4	Fever	M	09	6.00	16	10.66
		F	12	8.00	25	16.66

		Total	21	7.00	41	27.33
5	Asthma	M	0	0.00	6	4.00
		F	3	10.00	11	7.33
		Total	3	2.00	17	5.66
6	TB/Bronchitis	M	0	0.00	8	5.33
		F	3	10.00	5	3.33
		Total	3	1.00	13	4.33
	All over	M	54	6.00	132	14.66
		F	102	11.33	224	24.88
		Total	156	17.33	356	19.77

FIGURE 34 RESPIRATORY PROBLEMS FACED BY SUBJECTS OF CONTROL AND EXPERIMENTAL GROUP



The data on skin diseases shows that they were experienced only by subjects of experimental group. Among these problems maximum problem was on red skin patches. These problems are because of salty and humid environment. Thus this could be recognized as one of the occupational hazard.

TABLE 69

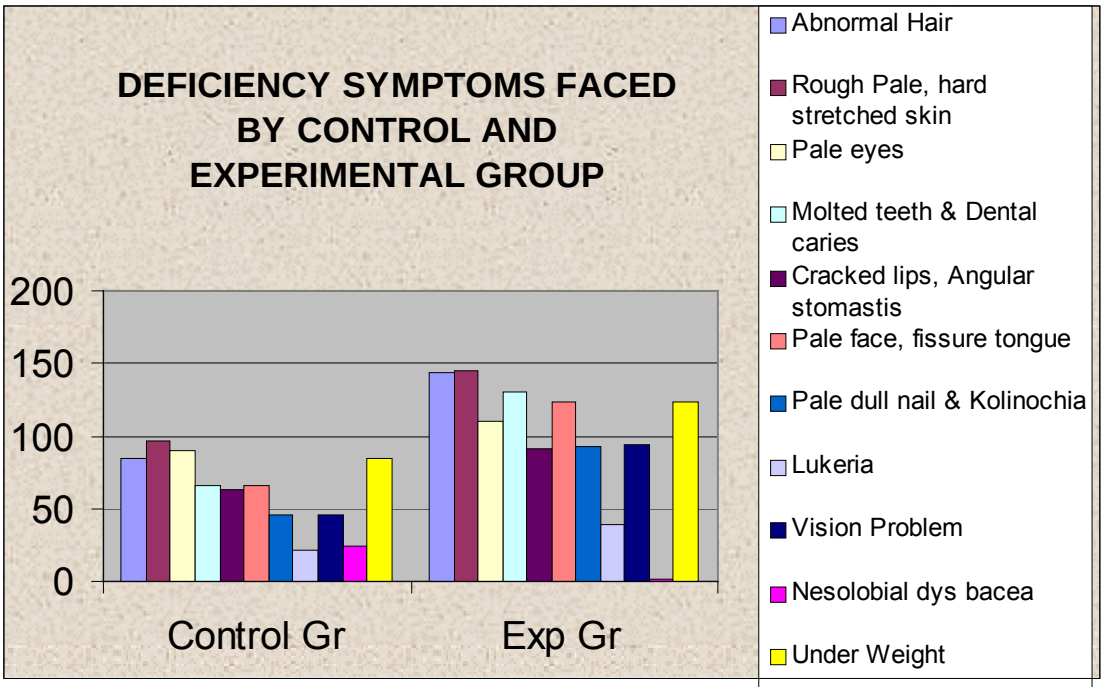
SKIN DISEASES FACED BY SUBJECTS OF CONTROL AND EXPERIMENTAL GROUP

No.	Problems	Sex	Control Group		Experimental Group	
			No	%	No	%
1	Red skin & patches	M	0	0.0	70	46.66
		F	0	0.0	89	59.33
		Total	0	0.0	159	53.00
2	Burning skin & foot	M	0	0.0	71	47.33
		F	0	0.0	78	52.00
		Total	0	0.0	149	49.66
3	All over	M	0	0.0	141	47.00
		F	0	0.0	167	55.66
		Total	0	0.0	308	51.33

TABLE 70 DEFICIENCY SYMPTOMS FACED BY SUBJECTS OF CONTROL AND EXPERIMENTAL GROUP

No.	Problems	Sex	Control Group		Experimental Group	
			No	%	No	%
1	Abnormal Hair	M	33	22.00	45	30.00
		F	51	34.00	99	66.00
		Total	84	28.00	144	48.00
2	Rough Pale, hard stretched skin	M	39	26.00	58	38.66
		F	57	38.00	87	58.00
		Total	96	32.00	145	48.33
3	Pale eyes	M	36	24.00	40	26.66
		F	54	36.00	70	46.66
		Total	90	30.99	110	36.66
4	Molted teeth & Dental caries	M	30	20.00	44	29.33
		F	36	24.00	86	57.33
		Total	66	22.00	130	43.33
5	Cracked lips,	M	27	18.00	24	16.00
	Angular stomastis and scar	F	36	24.00	67	44.66
		Total	63	21.00	91	30.33
6	Pale face, fissure tongue , chelosis	M	27	18.00	50	33.33
		F	39	26.00	73	46.66
		Total	66	22.00	123	39.83
7	Pale dull nail & Kolinochia	M	18	12.00	29	19.33
		F	27	18.00	64	42.66
		Total	45	15.00	93	30.99
8	Lukeria	M	00	0.0	00	00
		F	21	14.00	39	26.00
		Total	21	7.00	39	26.00
9	Vision Problem (Lack of Sight)	M	24	16.00	46	30.66
		F	21	14.00	48	32.00
		Total	45	15.00	94	31.33
10	Nesolobial dys bacea	M	06	4.00	08	5.33
		F	18	12.00	14	9.33
		Total	24	8.00	2	7.33
11	Under Weight	M	36	24.00	50	33.33
		F	48	32.00	73	48.66
		Total	84	28.00	123	40.99

FIGURE 35 DEFICIENCY SYMPTOMS FACED BY SUBJECTS GROUP



In control as well as experiment group highest number of subjects faced problem of pale, hard and stretched skin. The deficiency syndromes were observed more in experimental group than control group. This reflects the poor food habits followed by the subject of experimental group.

TABLE 71PROBLEMWISE DETAILS OF SUBJECTS OF CONTROL AND EXPERIMENTAL GROUP

Problem / Group	Muscular/ Skeletal		Respiratory disease		Skin disease		Nutritional deficiency	
1	06	31.42	15	8.33	-	-	66	10.00
2	51	24.29	12	6.66	-	-	54	16.36
3	33	15.71	06	3.33	-	-	51	15.45

4	30	14.28	03	1.66	-	-	51	15.45
5	18	08.57	18	10.00	-	-	57	17.27
CM	198	18.85	57	6.00	0	0	278	16.90
6	63	30.00	18	10.00	-	-	93	28.18
7	78	37.142	18	10.00	-	-	78	23.63
8	66	31.42	27	15.00	-	-	93	28.18
9	42	20.00	09	05.00	-	-	78	23.63
10	21	10.00	30	16.66	-	-	66	20.00
CF	270	25.71	102	11.33	0	0	408	24.72
CM+CF	468	22.29	156	17.33	0	0	687	20.81
11	85	40.47	6	14.44	22	36.66	75	22.72
12	100	47.62	29	16.11	38	63.33	101	30.60
13	34	16.19	29	16.11	22	36.66	71	21.51
14	38	18.09	3	12.77	31	51.66	63	19.09
15	36	17.14	25	13.68	28	46.66	67	20.30
EM	293	27.00	132	14.66	141	47.00	287	17.39
16	117	55.71	45	25.00	34	56.66	156	47.27
17	104	19.52	42	23.33	23	28.33	147	.44.54
18	124	59.048	51	28.33	41	68.33	153	46.36
19	106	50.48	37	20.55	34	56.66	135	40.90
20	66	31.42	49	27.22	35	58.33	125	37.87
EF	517	49.27	224	24.88	167	55.66	716	43.39
EM+EF	810	38.57	356	19.77	308	51.33	1003	30.39

Musclo skeletal, respiratory, skin disease and deficiency symptoms in case of control and experimental group was experienced more by females than males.

The data in below table shows that nutritional deficiency symptoms were optimally experienced by selected subjects followed by musclo-skeletal, infection and skin diseases and respiratory problems respectively.

TABLE 72

PHYSIOLOGICAL PROBLEMS OF CONTROL AND EXPERIMENTAL GROUP

No.	Categories of problem	Sex	Control Group	Exp. Group
1	Muscular & skeletal problems	M	198	293
		%	18.85	27.90
		F	270	517
		%	25.71	49.24
2	Respiratory problems	M	54	132
		%	6	14.66
		F	102	224
		%	11.33	24.88
3	Infection & Skin diseases	M	0.00	141
		%	0	47.00
		F	0.00	167
		%	0	51.33
4	Nutritional deficiency	M	279	287
		%	16.90	17.39
		F	48	716
		%	24.72	43.39

4.7 BIO CHEMICAL ASSESSMENT

TABLE 73

SERUM MINERAL CONTENT OF CONTROL AND EXPERIMENTAL GROUP

No.	ALP	Calcium	Phosphorus	Sodium	Potassium
1	205.80±6.79	8.32±0.07	5.40±0.14	135±1.61	4.00±09
2	167.70±8.17	9.07±0.17	5.19±0.23	132.80±0.80	4.06±0.12
3	191.70±9.06	9.05±0.13	5.62±0.16	141.20±1.00	5.11±0.12
4	259.10±15.24	9.52±0.08	6.09±0.23	143.20±0.68	5.16±0.06

5	186.10±9.44	9.38±0.08	6.23±0.13	141.00±1.13	5.15±0.10
6	167.20±2.41	8.32±0.06	4.76±0.11	131.90±1.48	3.95±0.12
7	223.70±14.91	8.67±0.07	4.54±0.15	143.20±1.13	4.95±0.16
8	180.70±2.47	8.79±0.07	4.15±013	133.00±0.80	4.68±0.19
9	193.33±2.63	8.78±0.11	4.20±0.06	142.80±0.85	5.20±0.09
10	220.30±21.78	8.66±0.10	4.76±0.11	141.90±1.30	5.42±0.05
11	210.30±7.95	8.23±0.07	5.28±0.17	133.90±2.03	3.84±0.13
12	162.60±10.38	8.95±0.18	5.09±0.26	131.70±1.27	3.33±0.13
13	187.40±11.16	8.97±0.16	5.40±0.24	139.50±1.50	5.01±0.10
14	245.60±19.41	9.40±0.09	5.91±0.32	141.60±1.02	5.06±0.16
15	179.70±11.38	9.26±0.11	6.01±0.16	139.60±1.48	4.97±0.11
16	158.30±8.17	8.17±0.08	4.71±0.12	130.10±1.68	3.88±0.16
17	214.80±16.20	8.53±0.10	4.34±0.22	141.40±1.24	4.68±0.24
18	177.00±3.57	8.61±0.11	3.94±0.23	130.90±1.22	3.88±0.11
19	190.73±3.22	8.60±0.14	4.94±0.07	141.60±1.15	5.01±0.15
20	218.30±22.05	8.50±0.12	4.56±0.11	140.50±1.73	5.31±0.05
F	5.14*	13.17*	16.00*	13.16*	19.79*

Table 73 shows that :

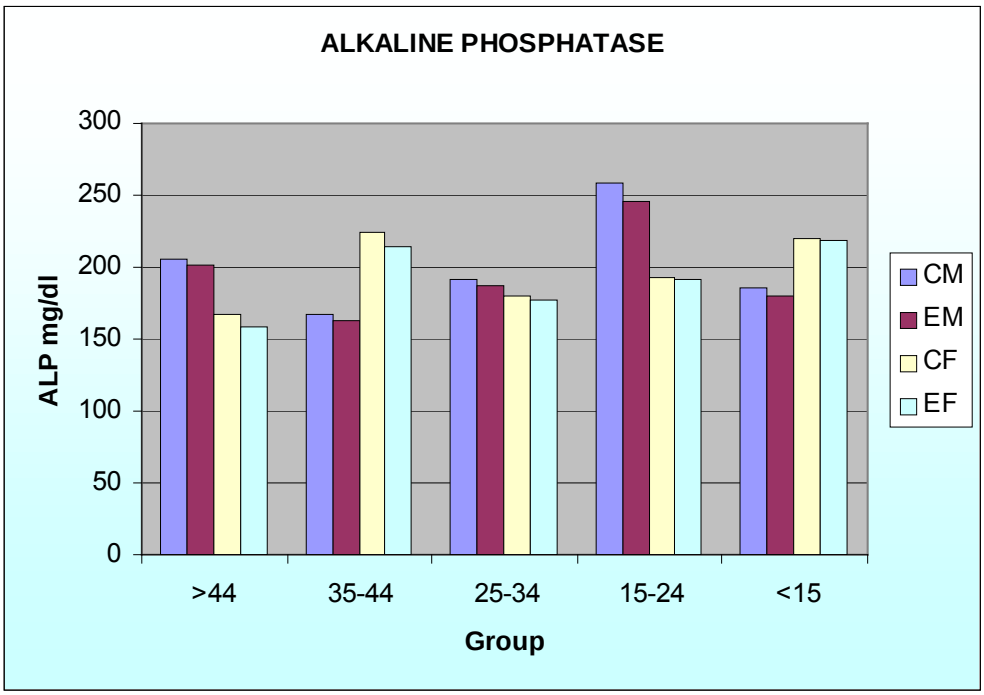
In case of serum alkaline phosphatase –

- Male between 15 to 24 years had maximum value in control group.
- Female above 44 years had minimum value in control group.
- Male between 15 to 25 years had maximum value in experimental group.
- Female above 44 years had minimum value in experimental group.
- The overall difference was found significant at 5% level.

- The standard range falls between 200 to 465 mg/dl. All values experimental and control group falls in this range.

FIGURE 36

SERUM ALKALINE PHOSPHATASE CONTENT OF CONTROL AND EXPERIMENTAL GROUP

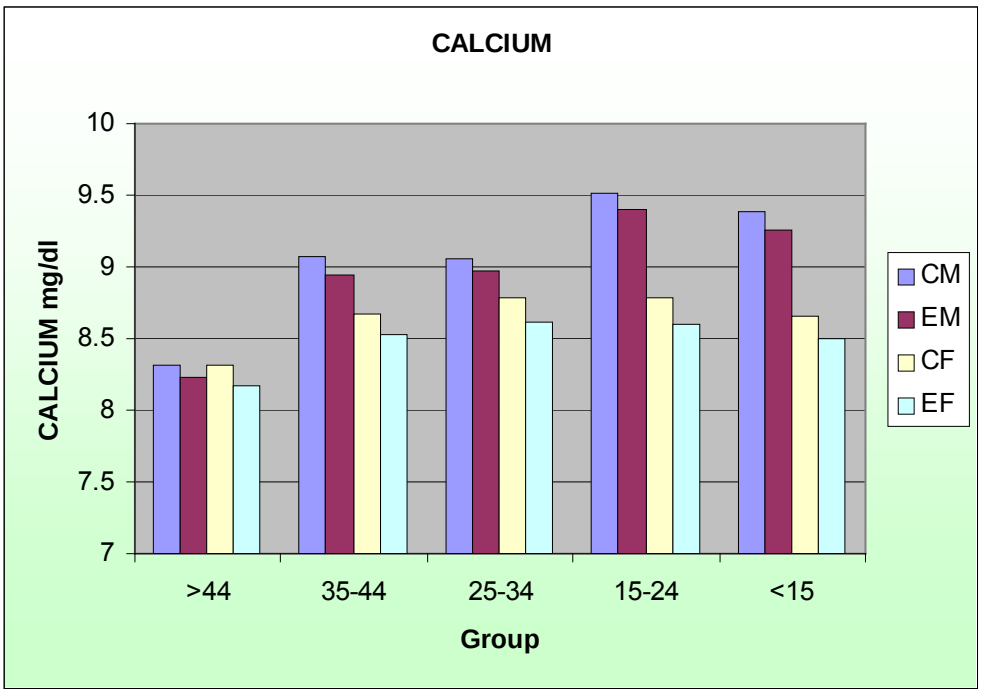


In case of serum calcium –

- Male between 15 to 24 years had maximum value in control group.
- Male above 44 years had minimum value in control group.
- Male between 25 to 34 years had maximum value in experimental group.
- Female above 44 years had minimum value in experimental group.
- The overall difference was found significant at 5% level.
- The standard range falls between 9 to 11 mg/dl. All values experimental and control group falls in this range.

FIGURE 37

SERUM CALCIUM CONTENT OF CONTROL AND EXPERIMENTAL GROUP

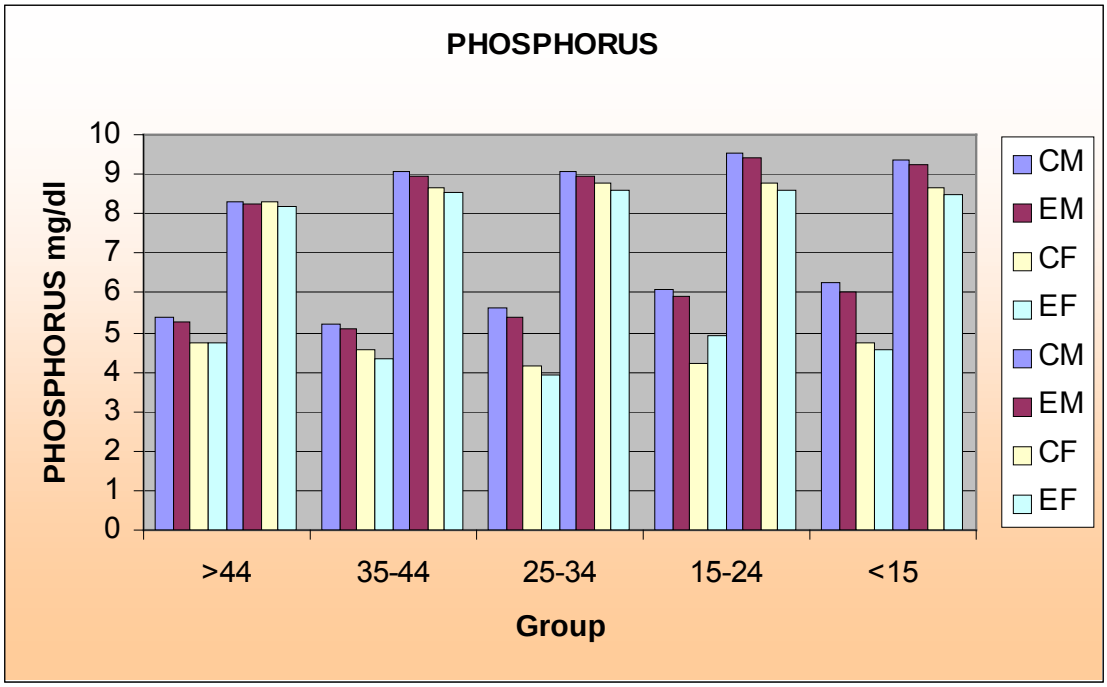


In case of serum phosphorus –

- Male between 15 to 24 years had maximum value in control group.
- Female between 25 to 34 years had minimum value in control group.
- Male between 35 to 44 years had maximum value in experimental group.
- Female between 25 to 34 years had minimum value in experimental group.
- The overall difference was found significant at 5% level.
- The standard range falls between 2.52 to 4.5 mg/dl. All values in experimental and control group falls in this range.

FIGURE 38

SERUM PHOSPHORUS CONTENT OF CONTROL AND EXPERIMENTAL GROUP

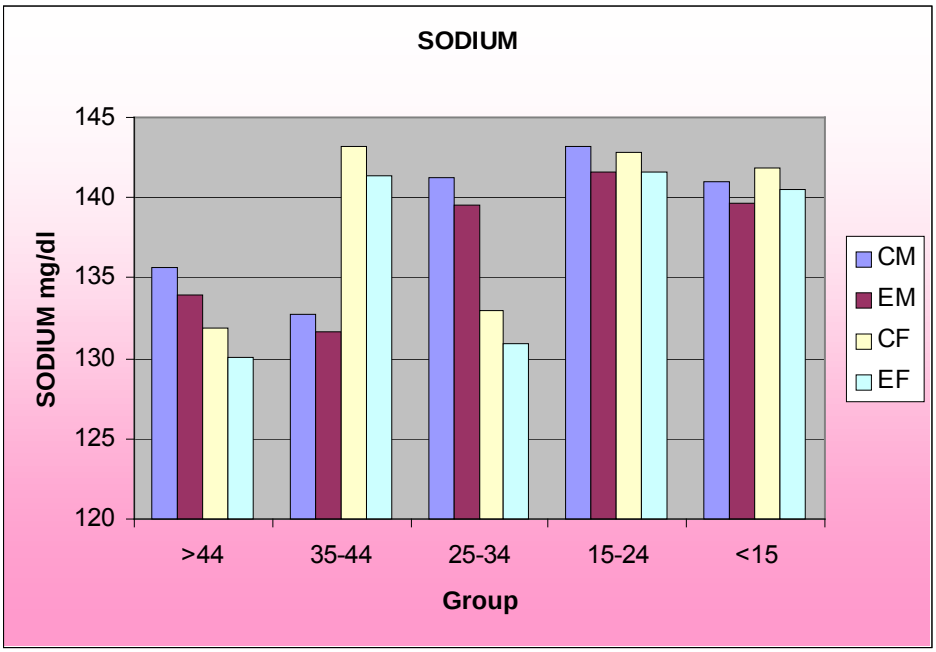


In case of serum sodium –

- Male between 15 to 24 years had maximum value in control group.
- Female above 44 years had minimum value in control group.
- Male between 15 to 25 years had maximum value in experimental group.
- Female above 44 years had minimum value in experimental group.
- The overall difference was found significant at 5% level.
- The standard range falls between 320 to 335 mg/dl. All values experimental and control group falls in this range.

FIGURE 39

SERUM SODIUM CONTENT OF CONTROL AND EXPERIMENTAL GROUP



In case of serum potassium –

- Male between 15 to 24 years had maximum value in control group.
- Female above 44 years had minimum value in control group.
- Male between 15 to 25 years had maximum value in experimental group.
- Female below 15 years had minimum value in experimental group.
- The overall difference was found significant at 5% level.
- The standard range falls between 12 to 22 mg/dl. All values in experimental and control group falls in this range.

FIGURE 40

SERUM POTASSIUM CONTENT OF CONTROL AND EXPERIMENTAL GROUP

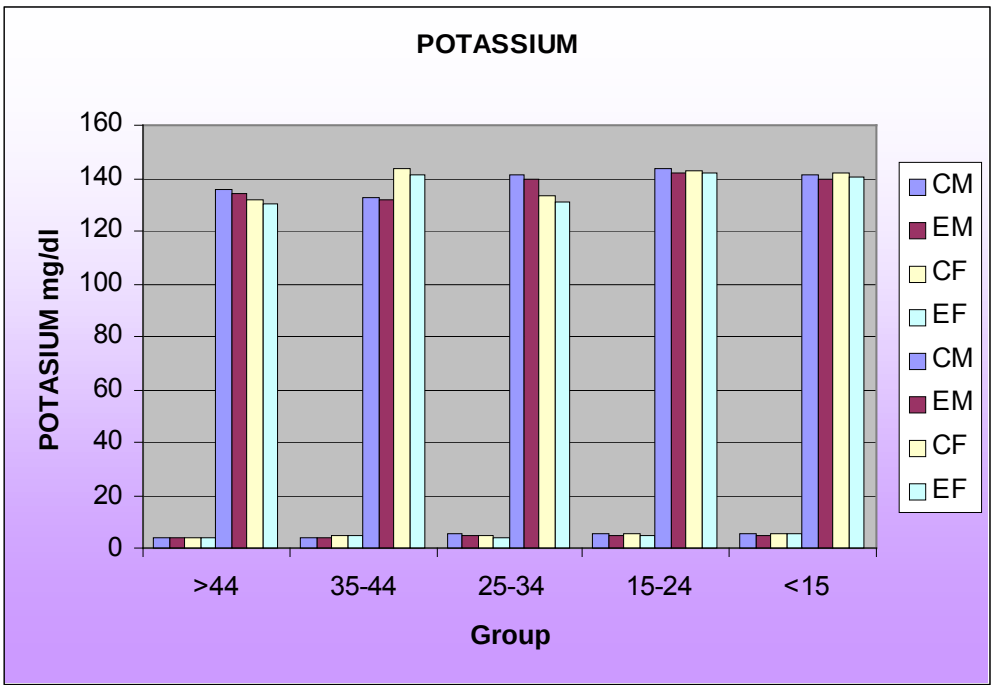


TABLE 74

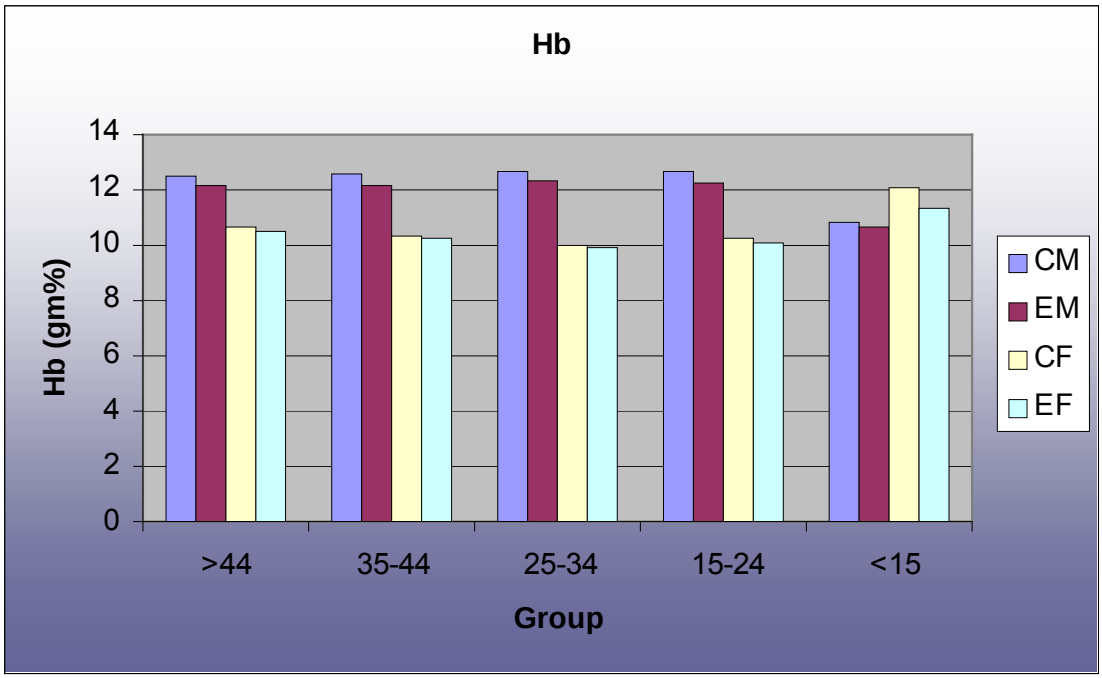
BLOOD HEMOGLOBIN SERUM PROTEIN AND CREATININE CONTENT OF CONTROL AND EXPERIMENTAL GROUP

No.	Hb (gm%)	Protein (gm%)	Creatinine (mg%)
1	12.54±0.026	6.80±0.093	0.7190±0.011
2	12.61±0.052	6.69±0.084	0.7260±0.025
3	12.66±0.230	6.76±0.094	0.6470±0.085
4	12.70±0.163	6.75±0.872	0.6670±0.015
5	10.84±0.223	6.91±0.102	0.6350±0.096
6	10.70±0.314	0.69±0.912	0.8100±0.019
7	10.37±0.172	6.70±0.110	0.7850±0.014
8	10.02±0.226	6.58±0.08	0.7980±0.015
9	10.27±0.364	6.74±0.83	0.7060±0.025
10	12.05±0.291	6.99±0.145	0.6600±0.018
11	12.18±0.096	6.68±0.113	0.7380±0.016
12	12.20±0.084	6.56±0.116	0.7590±0.030

13	12.33±0.096	6.66±0.128	0.6640±0.071
14	12.21±0.093	6.63±0.120	0.6980±0.014
15	10.65±0.155	6.77±0.100	0.6500±0.093
16	10.47±0.152	6.55±0.110	0.8550±0.020
17	10.27±0.103	6.52±0.138	0.8090±0.013
18	9.91±0.146	6.47±0.088	0.8280±0.014
19	10.07±0.149	6.55±0.104	0.6960±0.20
20	11.31±0.207	6.59±0.118	0.6980±0.18
F value	41.129*	1.474*	14.605*

FIGURE 41

BLOOD HEMOGLOBIN CONTENT



In case of blood haemoglobin –

- Male between 15 to 24 years had maximum value in control group.

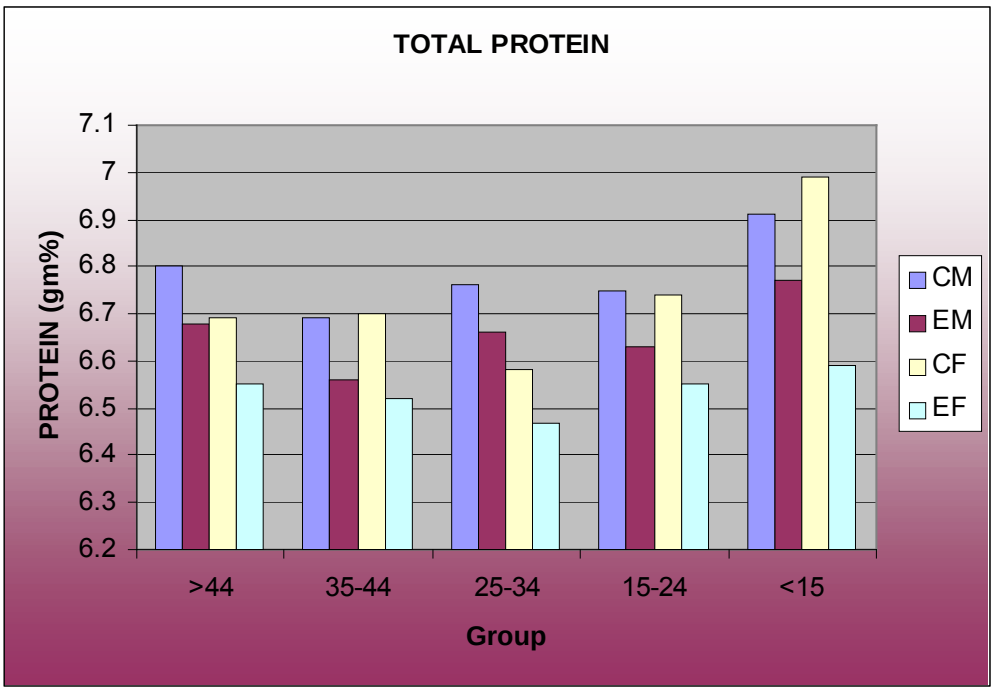
- Female between 25 to 34 years had minimum value in control group.
- Male between 25 to 34 years had maximum value in experimental group.
- Female between 25 to 34 years had minimum value in experimental group.
- The overall difference was significant at 5% level.
- The standard range falls between 12 to 14 mg% for females and 13 to 16 mg% for males. Most of the values among selected subjects were lower than standard range.

In case of total protein –

- Female below 15 years had maximum value in control group.
- Female between 25 to 34 years had minimum value in control group.
- Male below 15 years had maximum value in experimental group.
- Male between 25 to 34 years had minimum value in experimental group.
- The overall difference was significant at 5% level.
- The standard range falls between 5.5 to 6.5 g%. All values experimental and control group falls within this range.

FIGURE 42

TOTAL PROTEIN CONTENT

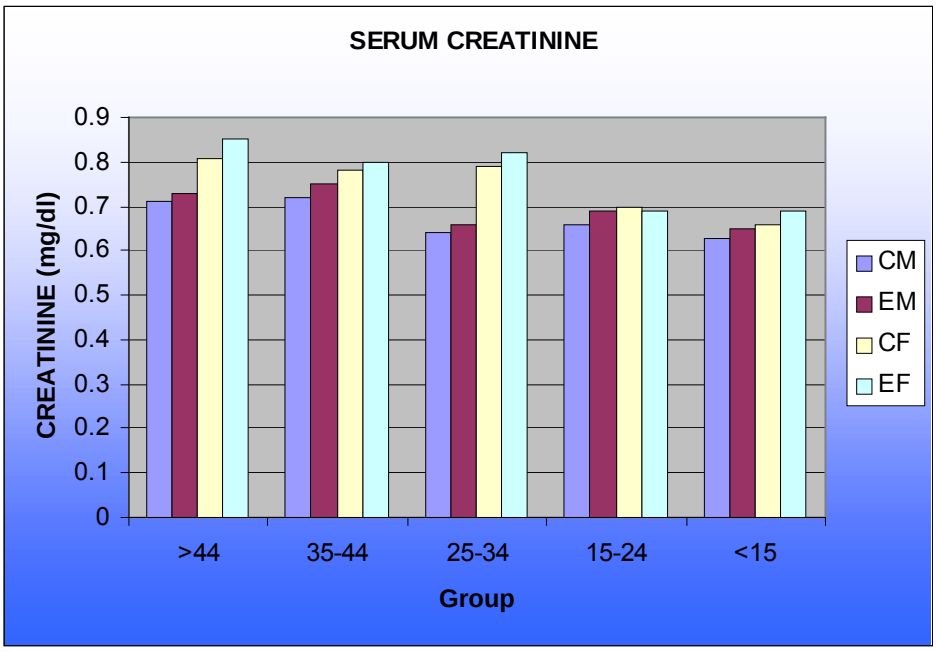


In case of serum creatinine –

- Female above 44 years had maximum value in control group.
- Male between 25 to 34 years had minimum value in control group.
- Female above 44 years had maximum value in experimental group.
- Male between 25 to 34 years had minimum value in experimental group.
- The overall difference was significant at 5% level.
- The standard range falls between 0.5 to 1.2 mg/dl. All values in experimental and control group falls within this range.

FIGURE 43

SERUM CREATININE CONTENT



4.8 CLINICAL ASSESSMENT

TABLE 75
BLOOD PRESSURE OF CONTROL AND EXPERIMENTAL GROUP

Group	Diastolic REST	Systolic REST	Diastolic WORK	Systolic WORK
1	78.80±1.40	119.00±1.00	82.60±1.58	123.80±1.21
2	72.00±1.63	121.40±1.16	77.40±1.19	126.60±1.52
3	71.20±1.12	122.20±1.05	76.00±0.94	126.40±1.26
4	71.40±1.19	118.40±0.65	76.60±0.90	123.20±0.90
5	71.00±0.80	117.40±1.30	76.40±0.88	121.40±1.12
6	72.80±1.27	110.40±2.23	77.80±1.31	117.40±2.33
7	71.20±0.61	111.20±0.80	76.00±0.79	118.20±0.63
8	70.40±1.11	113.40±1.27	73.80±1.56	120.20±1.25
9	70.80±1.08	115.40±1.84	75.00±1.31	120.80±1.96

10	69.60±0.40	112.00±1.84	74.80±0.95	118.20±1.62
11	74.60±0.93	120.00±0.96	79.20±1.24	131.00±1.20
12	72.87±0.88	121.93±0.73	80.13±0.87	133.60±1.02
13	70.60±0.62	121.67±0.56	75.60±0.70	127.60±1.07
14	71.00±0.54	118.33±0.55	78.67±0.98	127.13±1.08
15	70.67±0.40	118.13±0.66	73.13±0.61	121.20±0.86
16	71.67±0.56	111.67±1.32	74.73±0.77	125.00±1.66
17	71.67±0.61	114.00±0.82	74.20±0.83	126.73±1.17
18	70.00±0.37	112.00±0.93	73.47±1.15	120.53±1.48
19	71.13±0.56	113.53±1.12	73.67±1.05	121.47±0.95
20	70.60±0.26	112.33±0.85	74.33±0.87	120.00±0.50
'F' value	5.09*	14.38*	5.58*	12.00*

FIGURE 44

DIASTOLIC BLOOD PRESSURE AT REST

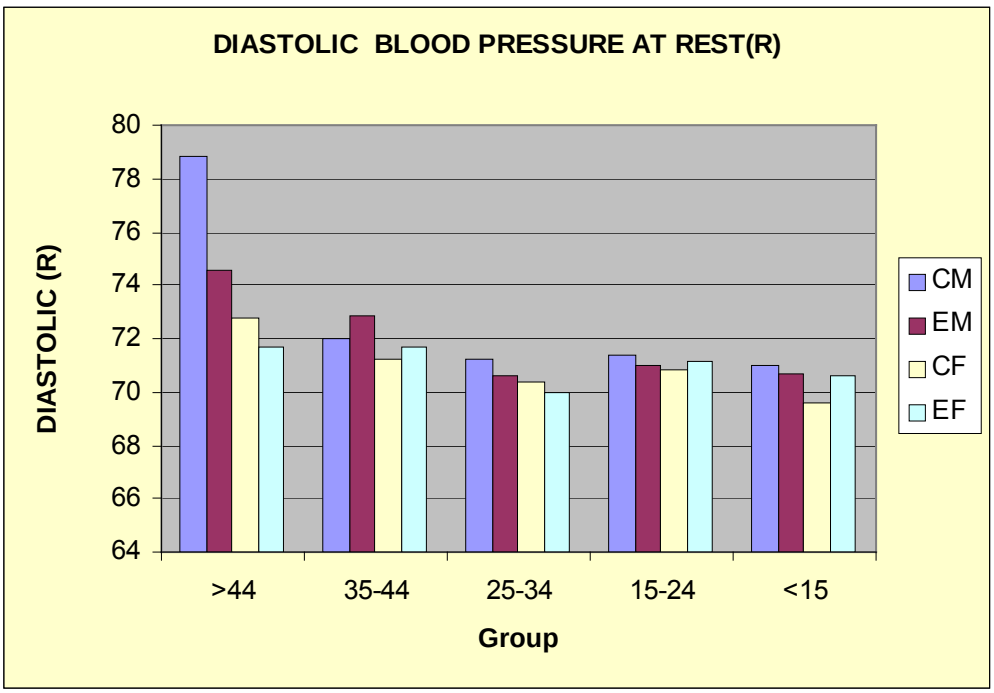


FIGURE 45

SYSTOLIC BLOOD PRESSURE AT REST

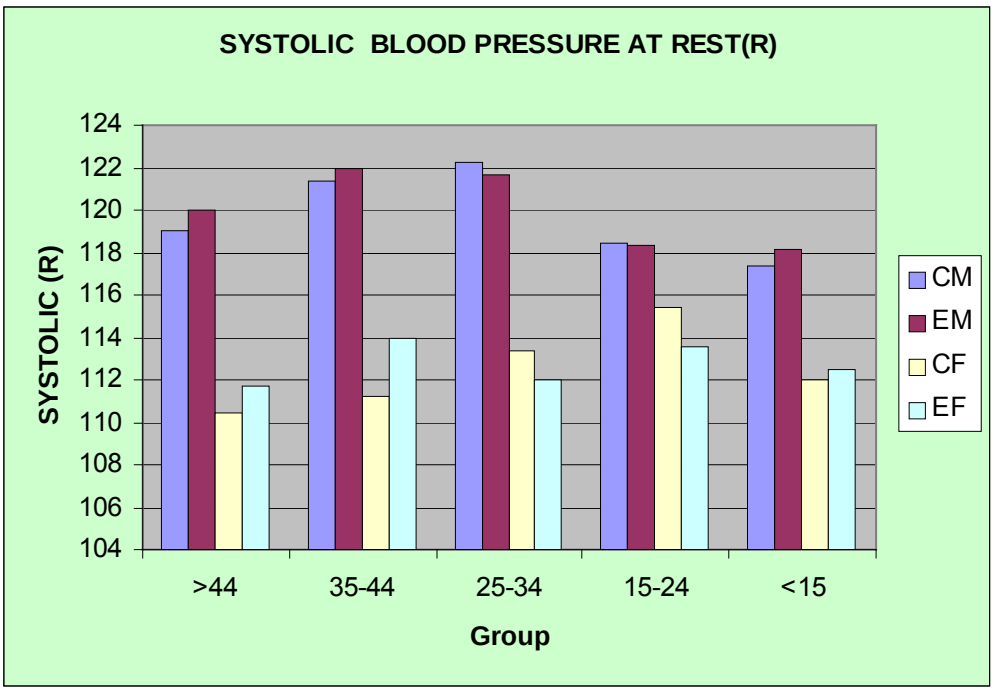


FIGURE 46

DIASTOLIC BLOOD PRESSURE AT WORK

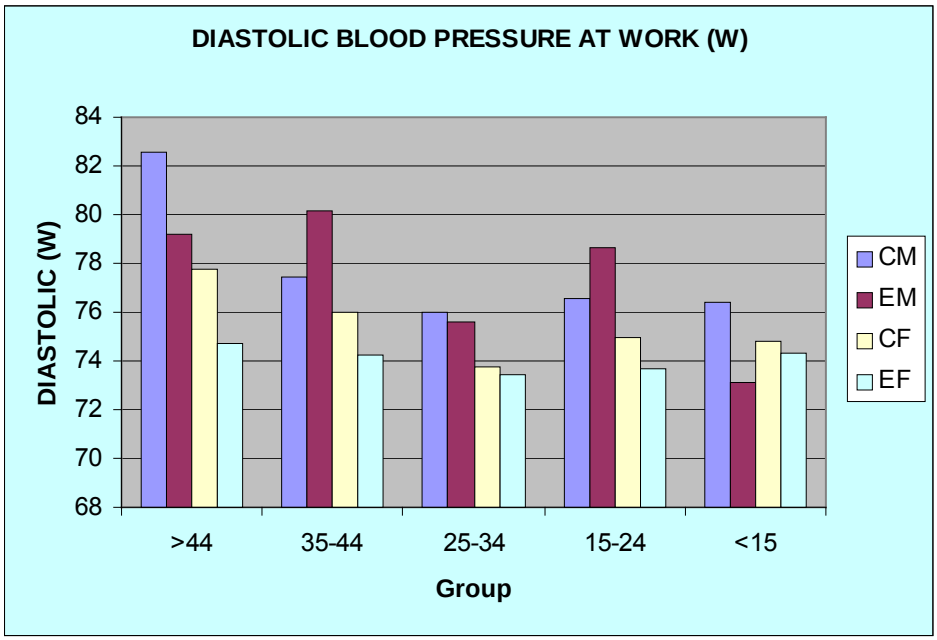
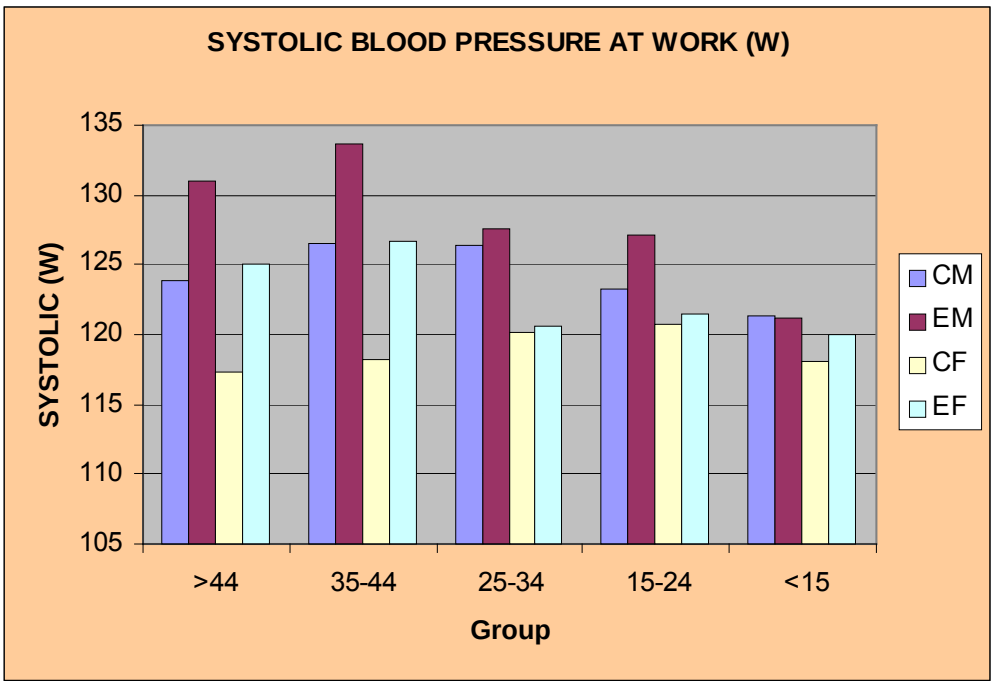


FIGURE 47

SYSTOLIC BLOOD PRESSURE AT WORK



The data in above table shows that in control group the difference between diastolic and systolic blood pressure is less whereas it is observed more in experimental group. As age increases the difference between diastolic and systolic blood pressure also increases. All the differences are found differ pressure and 110 Hg for diastolic blood pressure.

TABLE 76 HEART RATE AND BODY TEMPERATURE OF CONTROL AND EXPERIMENTAL GROUP

Group	Heart Rate Rest	Heart Rate Work	Body Temperature Rest	Body Temperature Work
1	72.60±1.46	77.00±1.34	98.00±0.00	98.52±0.04
2	72.60±0.73	76.60±0.85	98.00±0.00	98.72±0.07
3	72.80±0.53	76.80±0.68	97.80±0.20	98.10±0.37
4	71.80±0.36	77.40±0.60	98.80±0.00	98.32±0.06
5	72.60±0.60	77.20±0.53	97.60±0.27	98.22±0.04
6	73.60±1.48	77.20±1.61	97.00±0.30	98.00±0.18
7	71.40±0.31	77.80±0.63	97.90±0.10	98.39±0.07

8	70.80±0.61	76.40±0.78	97.20±0.13	98.08±0.24
9	70.20±0.47	76.20±0.76	98.00±0.00	98.50±0.05
10	73.20±0.80	77.80±0.47	97.60±0.27	98.39±0.02
11	70.53±0.66	89.60±1.89	98.20±0.07	98.97±0.09
12	71.27±0.54	88.40±1.68	98.35±0.09	99.37±0.13
13	72.00±0.46	86.80±1.48	98.37±0.12	98.89±0.17
14	71.87±0.25	80.47±0.84	98.40±0.09	98.39±0.44
15	71.73±0.36	80.20±0.55	97.93±0.11	98.66±0.12
16	72.07±0.63	96.80±1.93	97.77±0.15	98.57±0.10
17	71.80±0.38	98.13±3.05	98.20±0.09	98.97±0.11
18	71.83±0.58	99.80±1.82	98.03±0.14	98.85±0.15
19	70.60±0.26	129.60±28.72	98.17±0.07	98.80±0.05
20	72.40±0.35	84.33±1.39	97.97±0.11	98.67±0.06
'F' value	1.83*	2.07*	5.90*	2.90*

FIGURE 48

HEART RATE AT REST

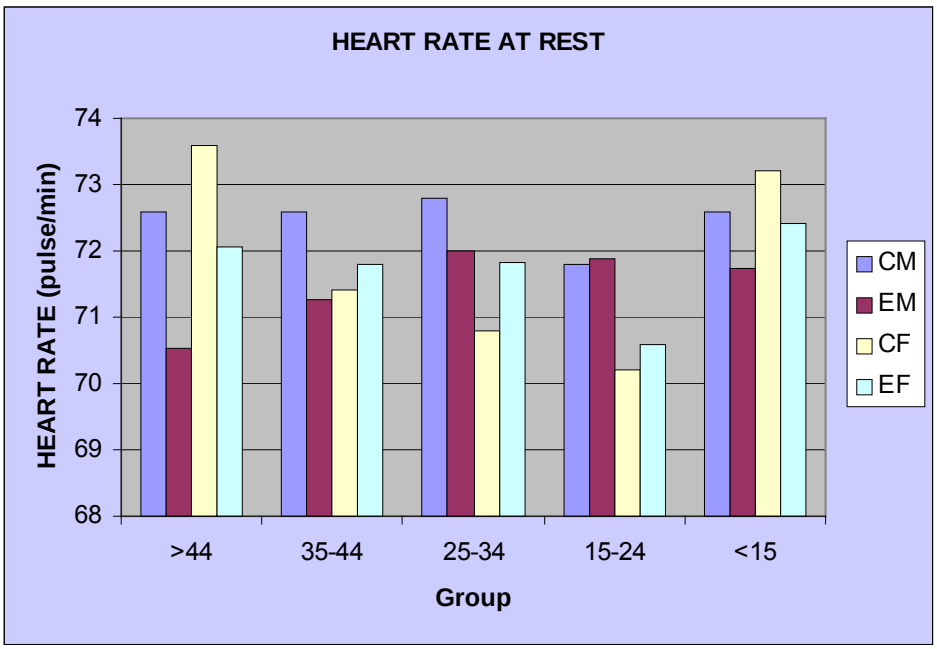


FIGURE 49

HEART RATE AT WORK

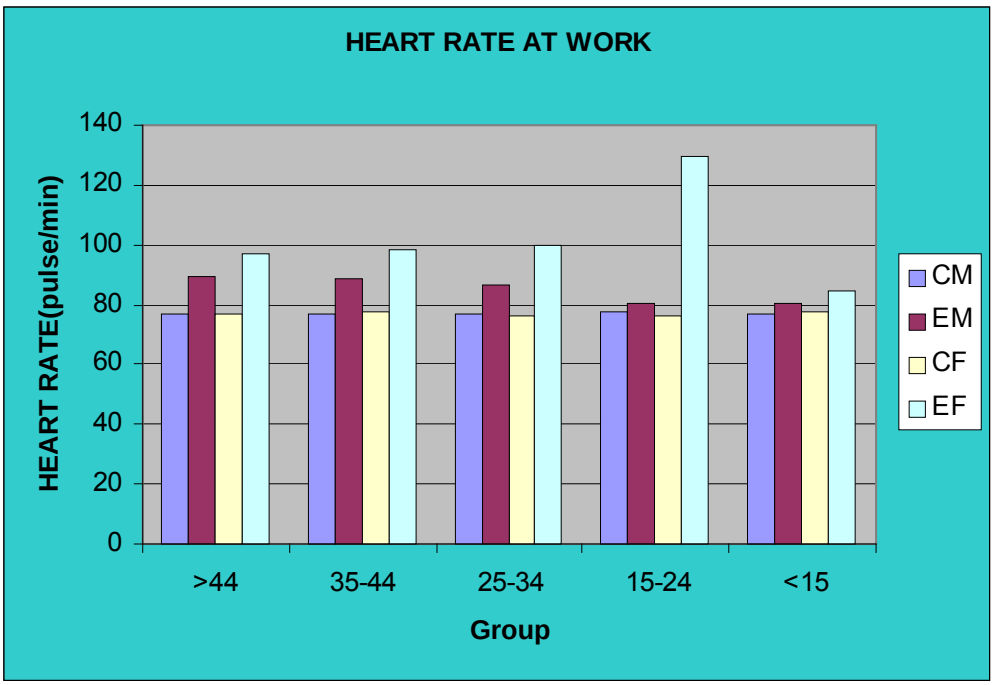


FIGURE 50

BODY TEMPERATURE AT REST

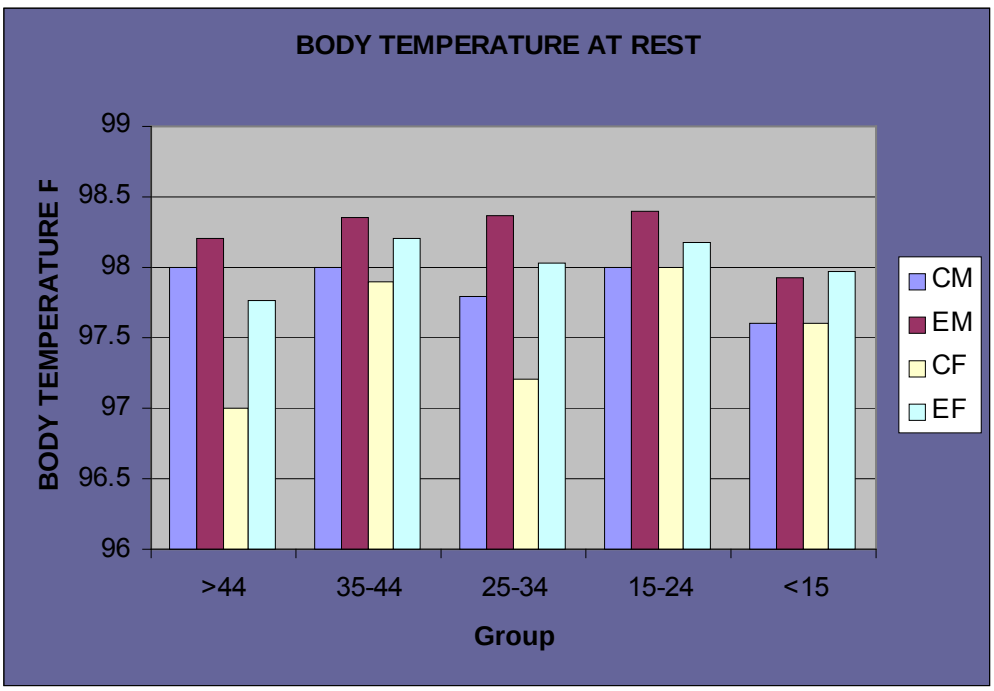
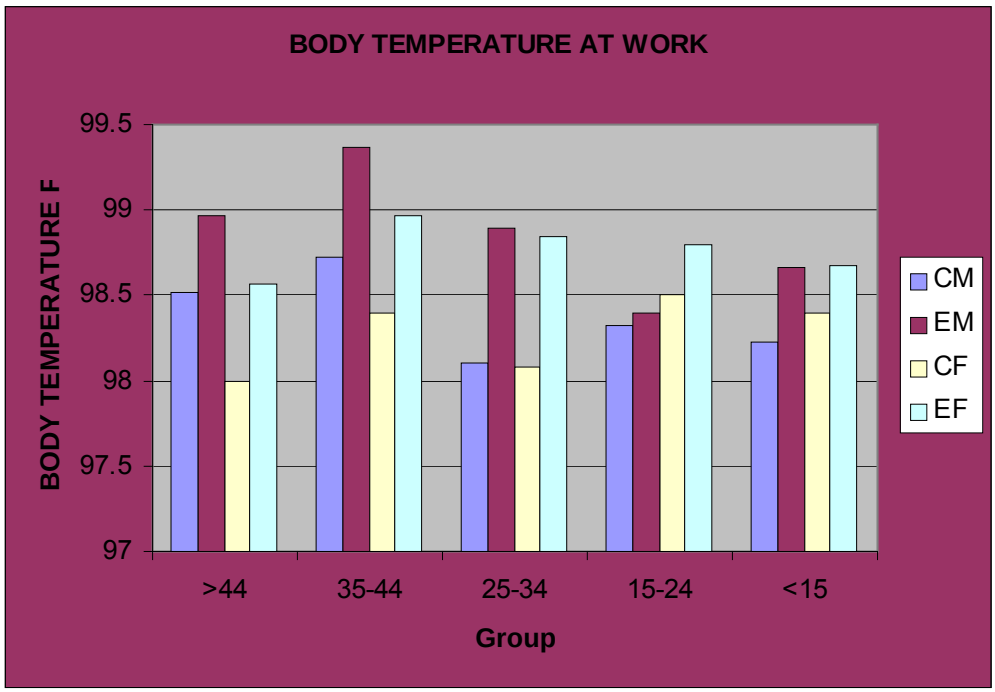


FIGURE 51

BODY TEMPERATURE AT WORK

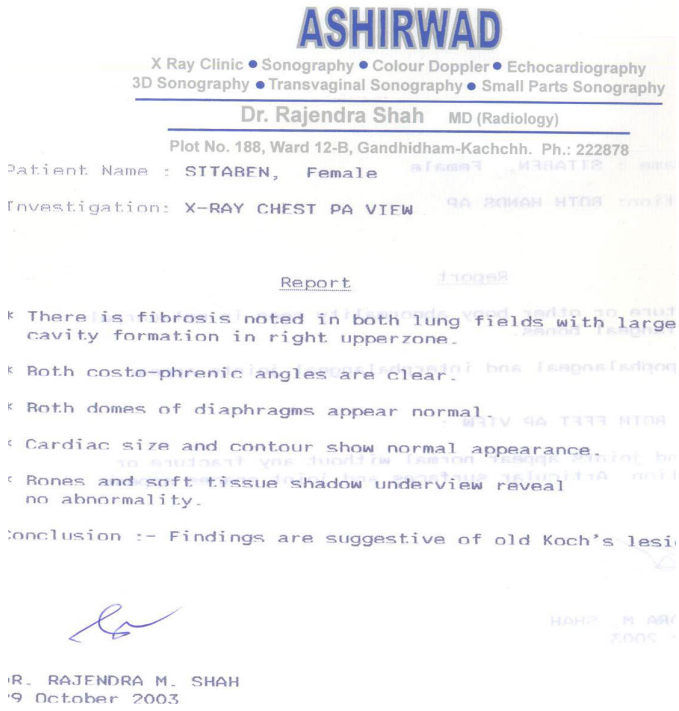


The heart rate as well as body temperature of selected salt workers was found to increase while work in comparison to values at rest in both experimental and control group. The standard range for heart rate is between 68 to 74 pulse / minute and standard range for temperature is 98.68 F°.

4.9 RADIOLOGICAL TEST

Some physical and biophysical methods complementary to clinical examination should be carried out which includes radiological tests. While routine radiographic studies of population groups are rarely possible or indeed required, it will be nevertheless, desirable to carry out radiological examinations of samples of a population if the clinical signs indicates appreciable incidence of osteomalacia, respiratory diseases, musculo skeletal problems and malnutrition. Such studies may reveal the degree of incidence of mild forms of osteomalacia, etc. Radiological examination may help to be of diagnostic value.

Among the five special cases whose radiological testing was done, the report of one of the subject is as follows. The remaining reports are in appendix.



ASHIRWAD

X Ray Clinic • Sonography • Colour Doppler • Echocardiography
3D Sonography • Transvaginal Sonography • Small Parts Sonography

Dr. Rajendra Shah MD (Radiology)

Plot No. 188, Ward 12-B, Gandhidham-Kachchh. Ph.: 222878

Patient Name : SITABEN, Female

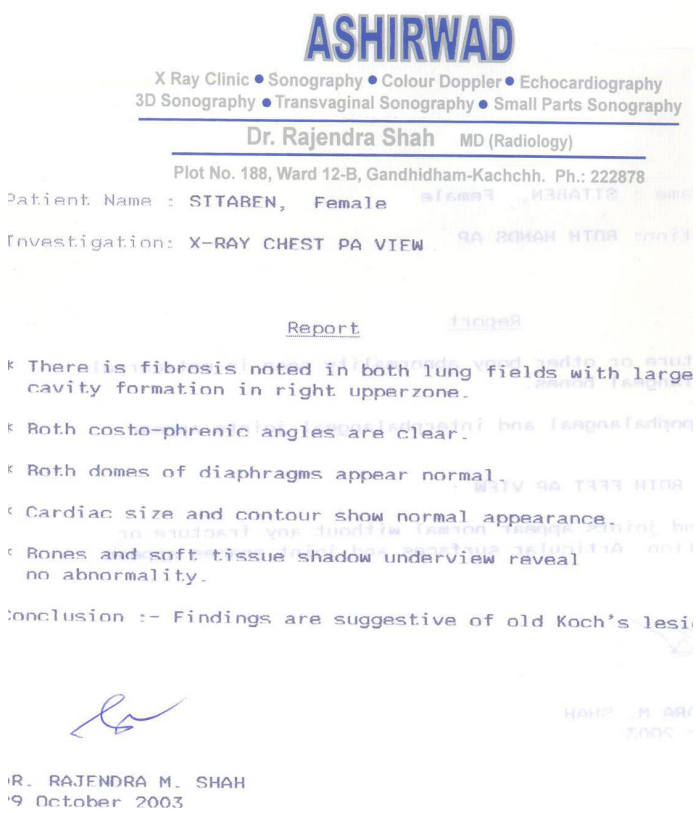
Investigation: X-RAY CHEST PA VIEW

Report

- There is fibrosis noted in both lung fields with large cavity formation in right upperzone.
- Both costo-phrenic angles are clear.
- Both domes of diaphragms appear normal.
- Cardiac size and contour show normal appearance.
- Bones and soft tissue shadow underview reveal no abnormality.

Conclusion :- Findings are suggestive of old Koch's lesi

DR. RAJENDRA M. SHAH
9 October 2003



ASHIRWAD

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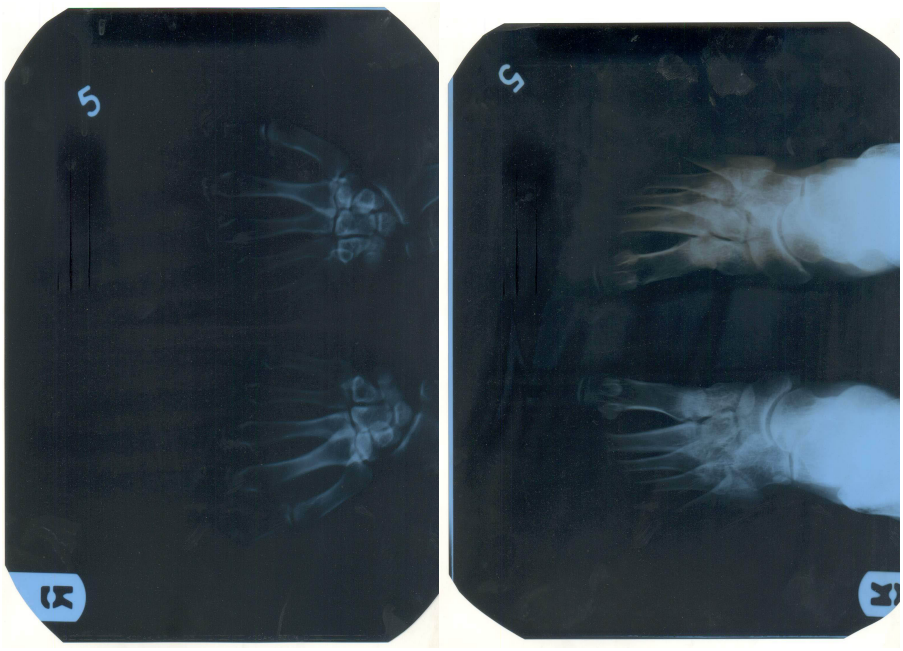
Conclusion :- Findings are suggestive of old Koch's lesi

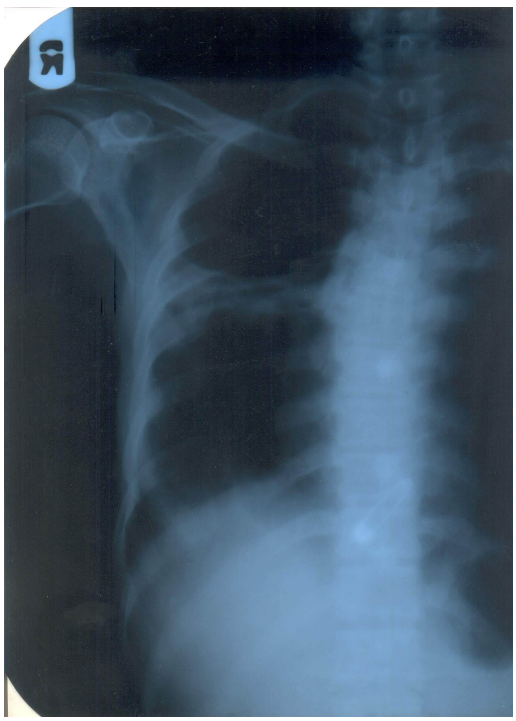
DR. RAJENDRA M. SHAH
09 October 2003

FIGURE 51

RADIOLOGICAL TEST REPORT

HANDS **LEGS**





CHEST

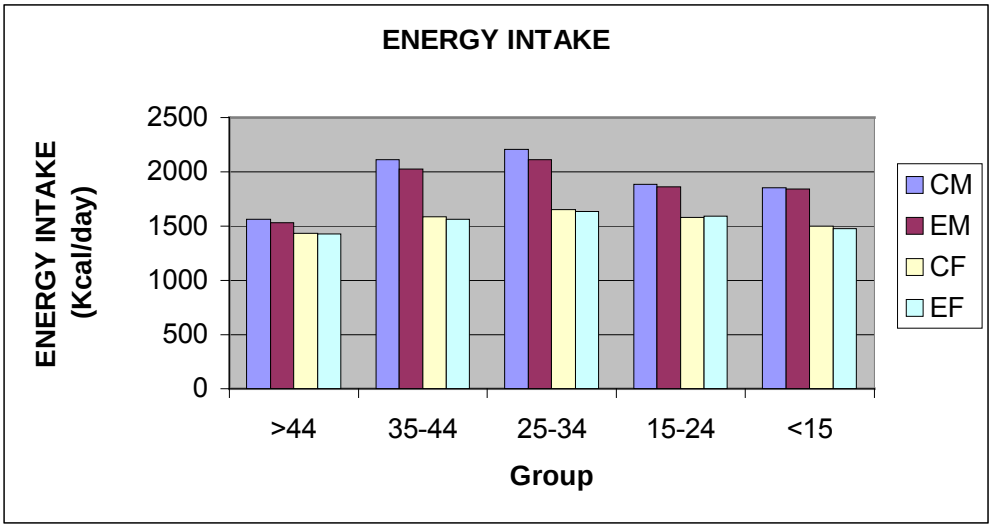
4.10 ENERGY BALANCE

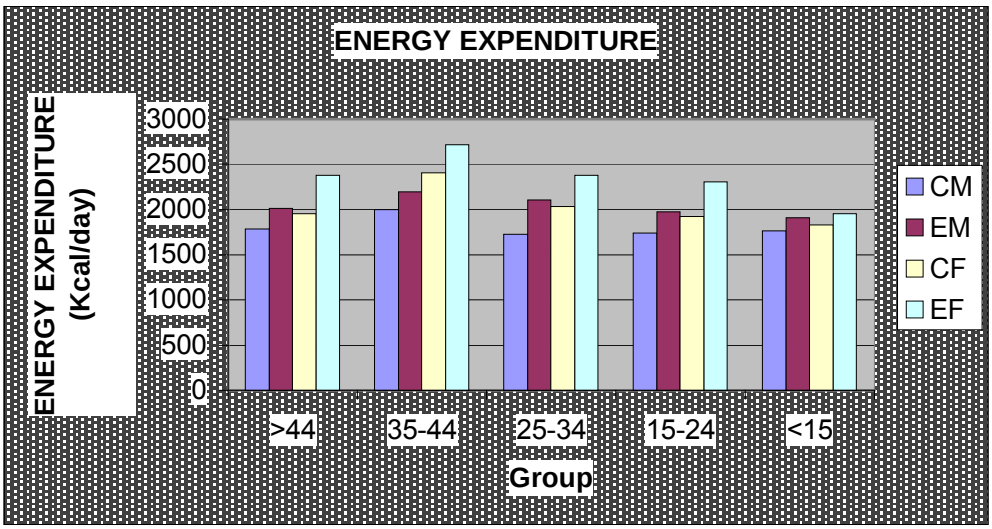
TABLE 77 ENERGY BALANCE OF CONTROL AND EXPERIMENTAL GROUP (K CAL/DAY)

Group	Energy intake by	Energy expenditure	Energy balance

	food/day	during activity/day	Kcal/day
1	1563.00±24.69	1788.80±9.22	-225.80±6.02
2	2108.90±51.70	1995.88±20.20	+113.02±4.01
3	2206.10±39.94	1727.18±27.28	+478.92±8.91
4	1884.80±36.08	1740.99±16.38	+143.81±3.02
5	1855.00±34.30	1762.71±16.42	+92.29±2.11
6	1434.40±9.22	1950.98±20.76	-516.58±16.19
7	1585.65±20.20	2404.04±14.03	-818.39±20.21
8	165.00±27.28	2033.09±13.76	-378.09±14.22
9	157750±16.38	1921.59±22.83	-344.09±13.04
10	1501.10±16.42	1829.16±17.51	-238.06±11.03
11	1533.03±20.76	2011.95±20.82	-478.92±13.07
12	2027.30±14.03	2198.56±0.624	-170.70±12.02
13	2110.03±13.76	2105.28±11.04	+004.75±5.07
14	1861.07±17.51	1974.44±12.78	-113.37±2.01
15	1841.83±22.83	911.33±26.42	-69.50±4.05
16	1424.02±6.24	2378.84±24.69	-954.82±16.38
17	1560.62±20.82	2711.86±39.94	-1151.24±6.24
18	1634.33±26.42	2377.43±34.30	-743.01±11.04
19	1591.23±11.04	2307.41±31.70	-0716.18±7.06
20	1476.07±12.78	1953.78±36.08	0477.71±5.11

FIGURE 53 ENERGY BALANCE





The above table shows that in majority of groups the energy balance was found to be negative. It was found positive only among five groups of control male between 35 to 44 years, control male between 25 to 34 years, control male between 15 to 24 years, control male below 15 years and experimental male between 25 to 34 years of age. The maximum negative energy balance in control and experimental group was between 35 to 44 years of female.

CHAPTER5
SUMMARY AND CONCLUSION

5.1 SUMMARY

Salt production is one of the hereditary occupation, which has been continued through generations and largely accepted as a traditional family occupation. A large number of work force both men and women, have been employed all over Indian Coastal line. The salt is made of salt water (sea water) and are used for many industries and as tastemaker for human beings.

The scientific study on evaluation of nutritional status, and their relationship with physical fitness, health and work load performance is very rare in our country.

It has been demonstrated from studies that the nutritional status of the individual taking part in any work activity and health plays a very significant role in this respect.

Realizing the importance of nutrition and physiological problems in improving the overall health and work efficiency, it was felt that a comprehensive study dealing with these aspects should under taken to highlight the state of the art and suggest appropriate measures for the upliftment of the standard of salt workers in the country. The present study was an attempt in this direction and was carried out with the following objectives.

Study of nutritional status of salt workers :

- Determination of body composition
- To study the socio-economic profile of community
- Survey of food consumption and dietary pattern.
- Assessment of energy balance.
- Determination of physiological problems arising out of the adopted diet and conditions.

- Evaluation of work load for salt workers and studying the physiological problems experienced or faced by them during the salt making operation and related health problems.

A total of 600 domestic and salt worker from various village on Kutch coast line near Gandhidham selected. A total subjects belonging to five different age groups (i.e. >44, 35 to 44, 25 to 34, 15 to 24and <15 year) 30 from each both male and female were selected.

The data was collected through primary as well as secondary source. Interview schedule was designed which furnished information on the demographic data and general health status. Some selected anthropometrics measurements, body weight, height, body mass index, blood pressure, body temperature, heart rate was measured and recorded. Information was collected on their dietary pattern, habit, nutrient intake, clinical survey by R.M.O. (Registered Medical Officer) for nutritional deficiency symptoms, musculoskeletal problems, respiratory and skin disease and recorded. Further time cost for different activities, occupational work, household activities, sleep and other activities were also recorded.

The sequential procedure including several operations of salt making activity were observed which consisted of channeling, plugging, cleaning, carrying, lifting, base making, heap making and finishing in sequence. The workers were engaged in the occupational work for minimum 2 hours and maximum 8 hours 24 minutes 50% of them were having 16-34 yrs of experience. Most of the workers were found to be fit. The mean height and weight was 1.68 m to 1.5 m height and 30 kg to 55 kg weight respectively. Most of the workers were of (mesotype) body type.

Anthropometrics measurement and comparison with domestic workers and standards was 10 to 20% lower in height and weight. Under weight adversely influenced work output and created health hazards 30% of workers were malnourished according to body mass index (Hecler 1990).

Most of workers belonged to joint families with maximum 8 children. 90% workers were Hindu Bhils and the rest from different communities migrated from Saurashtra, Ahmedabad and Rajasthan in search of livelihood. 90% labourers were Gujarati speaking. They were all completely illiterate people. Most of workers stayed near the work place in kuccha huts, poor ventilation without facility of water or for defecation. Only 33% of the labourers bathed daily, they walked bare footed, they did not observe any oral hygiene. They all worked together at ponds, their monthly income was not more than Rs. 200 to 600 per person. They entered work life during the age of 12 to 14 years for different reasons like poverty, parents wish etc. All the workers were dissatisfied with the physical condition at the work sites. Their leisure time activities were smoking, drinking alcohol, household chats, tobacco chewing or playing with children. There was no any side business.

Their staple food was cereals, tuber and pulse. Fruit, vegetable and milk was used once a week, all workers had only two meals daily. The food quality and quantity was lacking in nutrients. Compared to domestic works as well as standard daily regimen (by ICMR 1991), deficiency of different nutritients in their diet is reflected. Symptoms like pale face and other symptoms were found. It also decreased the immunity and caused infective diseases like cold, cough etc.

The energy expenditure and intake was estimated through record of food intake and energy expenditure was calculated. It gave negative balance among all workers compared to domestic and very less compared to RDA by ICMR/NIN

5.2 CONCLUSION

In biochemical indices, hemoglobin has a negative impact on physical fitness, it reduced immunity as well as work efficiency. It was observed that, females had a lower hemoglobin (10 to 12 g%) compared to standards in both experimental as well as in control group. Clinical symptoms such as pale

conjunctiva, skin kalinochoe, short breathing, dypsia, magenta tongue was found more in females then males. This may be due to lack of green leafy vegetable, fruits, oils seeds and infestation.

Serum protein, serum creatinine was found near to range line with standards which was shadow of nothing but malnourishment. Sodium, potassium, calcium, phosphorus, alkaline phosphates were found within normal ranges. It showed that there was no bad salt impact of salt dust inhalation, working in salt pond with bare hand / legs. Only 3 to 4 doubtful cases with lower range were further searched with radiological test. No deformity or any serious problems in obstacles of hand or legs was found. Only little infection in chest region and fibosis in lower parts of feet and hands was found due to effect of salty environment, in which they work from long time. Workers working in hot/cold climates were suffering from heat stress, heat boils, watering of eyes, cough, cold, sneezing, red lesions on skin. Only 2 to 3% workers had Asthma, T.B. due to humid air and long time living on the seacoast and humid air respired by the workers.

Malnutrition is not always due to shortage of foods but people chase poor diet when good ones are available because of cultural influences like traditional customs, habit, religion, food fads, cooking practices, lack of nutrition knowledge, child rearing practice, poverty etc. Family size also plays a great role in life of poor Agaria.

The occupational work load of salt worker evaluated from heart rate responses recorded during work, energy consumption and energy expenditure. energy consumption is 1.5 to 3.5 kcal/minute. Salt workers found to have a negative balance of about 600 to 1700 kcal/day which is very alarming.

About 27 to 30% of salt workers are suffering from leg pain, shoulder joint pain and other musculoskeletal problem was also observed.

It can be concluded from the findings summarized above that all over lower nutritional status, negative energy balance and high musculoskeletal problems with low socio-economic profile, low occupation mobility and lack of education was found among selected salt workers.

5.3 SUGGESTIONS

(1) The physical fitness and nutrition status of the workers can be improved by making them aware of proper nutrition.

(2) Commodities necessary for human life should be supplied in minimum rates by employee in proper quality and quality on time.

(3) Filtered drinking water should be supplied to reduce the infective disease spread.

(4) Good housing away from ponds could reduce respiratory disease caused by humid environment.

(5) Daily transportation for employer should be provided for going to work place.

(6) Increase of wages, should be done so that they can use more money for food and education of their children.

(7) To prevent musculoskeletal problems, the worker should be aware of the bad working postures and their ill effects on health.

(8) Awareness about equipment and tools that enforce proper posture and consume less effort should be given.

(9) Repetitive movement for long time should be avorded

(10) Extension programme for salt worker need to be promoted, as they have been totally neglected.

(11) Aquaculture can be easily taken up by women in their back yards during monsoon and post monsoons when they are relatively free for additional income.

(12) Vocational training programme, such as tailoring, embroideries, mud work packing of salt work, printing etc. can be introduced for women to improve their prospects of self employment.

(13) Salt workers should be transferred to other job during the period of monsoon.

(14) Banks should be requested to provide loan facilities to salt worker for buying equipment for side business.

(15) Mobile medical facility and check up should be provided from time to time.

5.4 RECOMMENDATIONS FOR FURTHER RESEARCH

(1) Detailed studies can be carried out on occupational mobility, covering larger area and sample.

(2) Study of the occupational health hazards of this communities with help of NGO, Govt. can be carried out.

(3) Some studies can be done to study attitudes and values of salt workers towards their traditional occupation.

(4) The physical fitness status of the workers can be evaluated from a modified Harvard step test, aerobic capacity and anaerobic threshold using standard procedures.

APPENDIX 1

INTERVIEW SCHEDULE

A. Background Information

1. Name of the Interviewer : _____
2. Name of the Village : _____
3. Name of Informant : _____
4. (a) Religion: _____
   (b) Caste : _____
5. Type of family : _____
6. Family Details :

Sr. No.	***Name of Family Members***	***Age***	***Sex***	***Relation with head of family***	***Education***	***Occupation***

*7.Family Income(*daily): _____

B. Housing Condition

* Migrated / lives long back / Temporary

1. Type of House : Kachacha / pacca / Mixed / hut
2. Ventilation : Good / Fair / Poor.
3. Cleanness : Clean / Fair / Dirty.
4. Cattle Shed : Yes / No.

C. Health Practices

(a) Brush their teeth daily : Yes / No.

(b) Have a bath daily : Yes / No.

(c) Use of footwear : Yes / No.

D. Diet Survey :

(a) Which milk product do you use :

Name 1. _____ 2. _____

(b) Do you forbid any food for pregnant women: Yes / No.

Foods : 1. _____ 2. _____

(c) Do you forbid any food for lactating mother: Yes / No.

Foods: 1. _____ 2. _____ 3. _____

(d) How long ladies breast-feed their child.

(e) Do you forbid any food for preschool children: Yes / No.

Foods : 1. _____ 2. _____

(f) Do you give any special food to children under one year : Yes / No.

Foods: 1. _____ 2. _____

(g) Do you give any special food to sick person :Yes / No.

Foods: 1. _____ 2. _____

(h) Do you avoid any food in summer. Yes / No.

If yes list it:

1.

2.

3.

(i) Do you avoid any food in winter. Yes / No.

If yes list it:

1.

2.

3.

(j) What is the source of drinking water.

- Well
- Hand-pump
- Pond

- River
- Pipe water supply.

E. Dietary Pattern

	Food Pattern							
	Age	Adult man	Adult women	Children 15 20 yr	Child 10 15 yr	Child 5 10 yr	5 2 yr	1 to 2 yr
Breakfast								
Lunch								
Snack								
Dinner								

F. General Appearance and Clinical Symptoms :

G.

Physiological Problems : Musculo Skeletal :

1. Back Pain ***Yes / No***

2. Shoulder Joint Pain ***Yes / No***

3. Neck Pain ***Yes / No***

4. Leg Pain ***Yes / No***

5. Abdominal Pain ***Yes / No***

6. Muscular stiffness ***Yes / No***

7. Bossing Ribs ***Yes / No***

Respiratory Problems :

1. Snizzing ***Yes / No***

2. Cough ***Yes / No***

3. Cold ***Yes / No***

4. Fever ***Yes / No***

5. Asthama ***Yes / No***

6. TB / Bronchitis ***Yes / No***

Skin Diseases :

1. Red patching

2. Burning skin

Clinical Nutrition Surveys :

Sr. No.	Deficiency Symptoms	Sr. No. of family members					
		1	2	3	4	5	6
1.	General appearance: (a) Pleasant (b) Dull (c) Irritable						
2.	Hair: (a) Lack of luster (b) Thinness (c) Dispigmentation (d) Easy Pluckbility						
3.	Face : (a) Moon face (b) Naso-labial pigmentation						
4.	Eyes : (a) Dull smoky (b) Luck of shining (c) Xerosis conjunctiva (d) Bitotspot (e) Watery						
5.	Lips : (a) Angular stomatitis (b) Angular scars (c) Cheilosis						
6.	Tongue : (a) Scarlet raw tongue (b) Magenta (c) Cracked						
7.	Teeth : (a) Caries teeth (b) Mottled enamel						

	(c) Enamel erosion						
8.	Gums : (a) Spongy bleeding gums (b) Recession of gums						
9.	Glands : Enlargement of thyroid						
10.	Skin : (a) Oedema (b) Folicular hyperkerotisis (c) Dermatosis						
11.	Nails : (a) Kolinychia (b) Brittle ridged nails						
12.	Skeleton : (a) Frontal and parietal bossing (b) Beading of ribs (c) Knock Knees (d) Bowlegs (e) Epiphyseal enlargement						
13.	Muscles : (a) Tender (b) Hard (c) Stretched						
14.	Lukemia						

H. Anthroprometric Survey :

Criteria	No of family members						
	1	2	3	4	5	6	7
Weight (Kg.)							
Height (Cm)							

Body length (Cm)							

H. Other Criteria:

Parameter	In working condition	In rest condition
1. Body Temperature		
2. B. P. (Blood Pressure)		
3. H. R. (Heart Rate)		

I. Biochemical Assessment :

No.	Parameter	Value
1.	Blood haemoglobin	
2.	Total protein	
3.	Serum creatinine	
4.	Alkaline phosphatase	
5.	Serum calcium	
6.	Serum phosphorus	
7.	Serum sodium	
8.	Serum potassium	

APPENDIX 2 ADDITIONAL DATA
Table - A

Food in major meals for experimental group

Food items	Break fast		Lunch		Dinner	
	M	F	M	F	M	F
Tea alone	60 (20.00%)	30 (10.00%)	-	-	-	-
Tea + Rotala	80 (26.66%)	60 (20.00%)	-	-	-	-
Rotala + Veg	-	-	40 (13.33%)	80 (26.66%)	-	-
Rotala + Veg. + Jaggary	-	-	80 (26.66%)	60 (20.00%)	-	-
Rotala + Veg + Onion + Butter milk	-	-	30 (10.00%)	10 (3.33%)	-	-
Khichadi + Rotala + Veg.	-	-	-	-	120 (40.00%)	130 (43.33%)
Khichadi + Curry + Rotala	-	-	-	-	20 (6.66%)	20 (6.66%)
Khichadi + Curry	-	-	-	-	10 (3.33%)	10 (60.00%)
Nil	10	60				
Total	150 (50%)	150 (50%)	150 (50%)	150 (50%)	150 (50%)	150 (50%)

Table - B

Food for control group

Food items	Break fast		Lunch		Dinner	
	M	F	M	F	M	F
Tea alone	80 (26.66%)	80 (26.66%)	-	-	-	-
Milk	10 (3.33%)	15 (5.00%)	-	-	-	-
Tea + Bhakhari	20 (6.66%)	15 (5.00%)	-	-	-	-
Tea + Rotala	40 (13.33%)	45 (15.00%)	-	-	-	-
Buttermilk	-	05 (1.66%)	-	-	-	-
Rotali + Veg	-	-	05 (1.66%)	10 (3.33	-	-
Rotali + Veg + Dal + Chaval (Rice)	-	-	25 (8.33%)	30 (10.00%)	-	-
Rotala + Veg + Buttermilk	-	-	120 (40.00%)	110 (36.33%)	-	-
Khichadi + Curry + Salad	-	-	-	-	70 (23.33%)	90 (30.00%)
Khichadi + Veg + Rotala	-	-	-	-	80 (26.66%)	60 (20.00%)
Nil	-	-	-	-	-	-
Total	150 (50%)	150 (50%)	150 (50%)	150 (50%)	150 (50%)	150 (50%)

TABLE - C

PROBLEMS FACED DUE TO WORK / WORK PLACE BY EXPERIMENTAL GROUP

Sr. No.	Problems	Male		Female		Total	
		No.	%	No.	%	No.	%
1.	Ill treatment by employer	15	5.00	25	8.33	40	13.33
2.	Dog, rats, sea, weeds bit	30	10.00	20	6.66	50	16.66
3.	Harassment by employer & supervisor	30	10.00	50	16.33	80	26.33
4.	Inadequate rest	20	7.67	80	23.33	100	33.33
5.	No entertainment	100	33.33	125	42.67	225	75.00
6.	No facility by health centre	150	50.00	150	50.00	300	100

TABLE - D

PROBLEMS FACED DUE TO WORK IN CONTROL GROUP

Sr. No.	Problems	Male		Female		Total	
		No.	%	No.	%	No.	%
1.	Ill treatment by employer	30	10.00	60	20.00	90	30.00
2.	Dog, rats, Bites	-	-	-	-	-	-
3.	Harassment by employer & supervisor	100	33.33	130	43.33	230	76.66
4.	Inadequate rest	40	13.33	120	40.00	160	53.33
5.	No entertainment	30	10.00	30	10.00	60	20.00
6.	No facility by health centre	-	-	-	-	-	-

TABLE - E

WILLINGNESS TO CHANGE PRESENT

Answer	Group	Male		Female		Total	
		No.	%	No.	%	No.	%
Yes	Ex	81	26.33	75	25.00	150	51.33
	Control	25		30			
No	Ex.	69	24.66	75	25.00	144	49.66
	Control						
Total	Ex.	150	50.00	150	50.00	150	50.00
	Control	150	50.00	150	50.00	150	50.00

TABLE - F

PHYSIOLOGICAL (SKIN DISEASES) PROBLEMS

Group	Red patch		Burning skin		Total (All over)	
	No.	%	No.	%	No.	%
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	6	20.00	16	53.28	22	36.66
12	22	73.26	16	53.28	38	63.33
13	11	36.76	11	36.76	22	36.66
14	16	53.28	15	40.00	31	51.66
15	15	50.00	13	43.29	28	46.66
16	18	60.00	16	53.28	34	56.66
17	11	36.63	12	40.00	23	38.33
18	24	80.00	17	56.61	41	68.33
19	19	63.27	15	50.00	34	56.66
20	17	56.61	18	60.00	35	38.33
21	89	59.33	78	52.00	167	56.66
	159	53.00	149	49.66	308	51.33

TABLE - G

REASONS FOR ENTERING THE DOMESTIC WORK

Reason	Male		Female		Total	
	No.	%	No.	%	No.	%
Poverty	45	15.00	78	26.00	123	41.00
No facility of school	00	00	00	00	00	00
Want to earn own money	24	8.00	18	6.00	42	14.00
Better than doing nothing	18	6.00	24	8.00	42	14.00
Parents wish	30	10.00	30	10.00	60	20.00
Peer group influences	24	8.00	15	5.00	39	13.00
Death or disability of parents	9.0	3.00	15	5.00	24	8.00
Totals	150		150		30	

TABLE - H

REASONS FOR LEAVING OR NOT GOING SCHOOLS

Reason	Male		Female		Total	
	No.	%	No.	%	No.	%
No facility of school	00	00	00	00	00	00
Problem of expenses	48	16.00	30	10.00	78	26.00
School is away from residence	06	2.00	06	2.00	12	04.00
Lack of interest	24	8.00	03	1.00	27	9.00
To assist the parents	60	20.00	06	2.00	66	22.00
Migration during season	00	00	00	00	00	00
Pressure to do house hold chore	06	2.00	60	20.00	66	22.00
To look after siblings	06	2.00	45	15.00	51	17.00
Total	150	50.00	150	50.00	300	100.00

TABLE - I

MONTHLY INCOME OF DOMESTIC WORKERS IN RUPEE

Income criteria in Rupee	Male		Female		Total	
	No.	%	No.	%	No.	%
1001 to 400 (%)	06	2.00	30	10.00	36	12.00
401 to 800 (%)	12	4.00	36	12.00	48	16.00
801 to 1200 (%)	09	3.00	18	6.00	27	19.00
1201 to 1600 (%)	09	3.00	24	08.00	33	11.00
1601 to 2000 (%)	66	22.00	24	8.00	105	35.00
2001 to 2400 (%)	51	17.00	18	6.00	78	26.00
Total	150	50.00	150	50.00	150	50.00

TABLE - J

EMPLOYMENT STATUS OF CONTROL GROUP

Age (year)	Full time			Part time			Casuals		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
< 14	3 (1.00%)	6 (2.00%)	9 (3.00%)	24 (8.00%)	12 (4.00%)	36 (12.00%)	9 (3.00%)	12 (4.00%)	21 (7.00%)
15 to 24	15 (5.00%)	6 (2.00%)	21 (7.00%)	12 (4.00%)	18 (6.00%)	30 (10.00%)	3 (1.00%)	6 (2.00%)	9 (3.00%)
25 to 24	08 (8.00%)	06 (2.00%)	30 (10.00%)	06 (2.00%)	18 (6.00%)	24 (8.00%)	0 (0%)	06 (2.00%)	06 (2.00%)
35 to 44	21 (7.00%)	06 (2.00%)	27 (9.00%)	09 (3.00%)	18 (6.00%)	27 (9.00%)	00 (0%)	06 (2.00%)	09 (3.00%)
> 45	06 (2.00%)	06 (2.00%)	12 (4.00%)	12 (4.00%)	12 (4.00%)	24 (8.00%)	12 (4.00%)	12 (4.00%)	24 (8.00%)
Total (%)	69 (23.00%)	24 (8.00%)	93 (31.00%)	63 (21.00%)	78 (26.00%)	141 (47.00%)	18 (6.00%)	48 (16.00%)	66 (22.00%)

TABLE – K

PHYSICAL CHARACTERISTICS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Mean Age (yrs)	Mean Height (m)	Mean Weight (kg)	Mean BMI (kg/m^2)
1.	CM>44	55.60 ± 0.40	1.59 ± 0.01	55.90 ± 1.71	22.03 ± 0.65
2.	CM 35-44	43.50 ± 0.76	1.63 ± 0.01	51.50 ± 1.63	19.42 ± 0.56
3.	CM 25-34	30.80 ± 0.90	1.64 ± 0.02	50.70 ± 2.09	18.94 ± 0.90
4.	CM 15-24	18.40 ± 0.56	1.61 ± 0.02	52.00 ± 1.91	19.92 ± 0.49
5.	CM <15	13.30 ± 0.37	1.52 ± 0.04	38.50 ± 2.18	18.94 ± 0.90
6.	CF >45	48.70 ± 0.37	1.50 ± 0.02	43.80 ± 0.84	16.77 ± 0.56
7.	CF 35-44	40.30 ± 0.97	1.61 ± 0.02	48.10 ± 1.46	18.67 ± 0.52
8.	CF 25-34	30.00 ± 0.95	1.58 ± 0.02	41.40 ± 1.15	20.75 ± 0.70
9.	CF 15-25	17.70 ± 0.56	1.56 ± 0.01	40.00 ± 2.77	17.56 ± 1.10
10.	CF <15	13.60 ± 0.16	1.43 ± 0.03	33.40 ± 1.22	16.16 ± 0.38
11.	EM >44	50.97 ± 0.74	1.61 ± 0.01	51.68 ± 1.02	19.94 ± 0.42
12.	EM 35-44	42.23 ± 0.53	1.63 ± 0.01	51.42 ± 1.39	19.30 ± 0.53
13.	CM 25-34	30.53 ± 0.46	1.65 ± 0.01	50.47 ± 0.91	18.52 ± 0.39
14.	EM 15-24	18.67 ± 0.52	1.62 ± 0.01	49.10 ± 1.28	19.60 ± 0.65
15.	EM <15	13.17 ± 0.19	1.48 ± 0.02	35.70 ± 1.11	18.52 ± 0.39
16.	EF >45	49.03 ± 0.40	1.52 ± 0.01	46.50 ± 0.56	16.25 ± 0.36
17.	EF 35-44	39.33 ± 0.52	1.58 ± 0.01	45.70 ± 0.85	18.50 ± 0.36
18.	EF 25-34	28.83 ± 0.55	1.56 ± 0.01	41.63 ± 0.92	22.01 ± 4.67
19.	EF 15-24	18.27 ± 0.44	1.56 ± 0.00	41.70 ± 1.22	17.72 ± 0.49
20.	EF <15	13.23 ± 0.15	1.41 ± 0.02	31.60 ± 0.86	16.17 ± 0.43
	'F' Value		25.50*	28.48*	1.05^{NS}

TABLE – L

DAILY INTAKE OF PRINCIPAL NUTRIENTS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Caloric	CHO	FAT	Protein
1.	CM>44	1563.00 ± 24.69	285.20 ± 6.20	26.20 ± 0.39	6.60 ± 0.72
2.	CM 35-44	2108.90 ± 51.70	394.50 ± 3.83	28.90 ± 0.66	52.90 ± 0.80
3.	CM 25-34	2206.10 ± 39.94	11.00 ± 5.62	31.96 ± 0.64	53.20 ± 0.76
4.	CM 15-24	1884.80 ± 36.08	358.20 ± 11.44	34.00 ± 0.71	54.00 ± 0.71
5.	CM <15	1855.00 ± 34.30	343.00 ± 10.01	31.60 ± 1.09	52.90 ± 0.60
6.	CF >45	1434.40 ± 9.22	262.3 ± 2.56	24.00 ± 0.26	2.30 ± 0.65
7.	CF 35-44	1585.65 ± 20.20	288.30 ± 6.59	26.15 ± 0.49	6.70 ± 0.87
8.	CF 25-34	1655.00 ± 27.28	300.70 ± 4.37	27.90 ± 1.03	6.70 ± 1.48
9.	CF 15-25	1577.50 ± 16.38	303.70 ± 5.02	28.70 ± 0.99	5.90 ± 2.21
10.	CF <15	1501.10 ± 16.42	269.20 ± 4.53	26.30 ± 0.33	6.90 ± 0.55
11.	EM >44	1533.03 ± 20.76	278.70 ± 5.32	25.97 ± 0.22	6.13 ± 0.39
12.	EM 35-44	2027.30 ± 14.03	390.67 ± 2.36	28.37 ± 0.37	52.33 ± 0.48
13.	CM 25-34	2110.03 ± 13.76	7.00 ± 2.72	30.70 ± 0.27	51.43 ± 0.22
14.	EM 15-24	1861.07 ± 17.51	354.20 ± 6.22	33.60 ± 0.34	53.60 ± 0.34
15.	EM <15	1841.83 ± 22.83	338.83 ± 5.45 ,	31.03 ± 0.45 .	51.80 ± 0.82
16.	EF >45	1424.02 ± 6.24	260.53 ± 1.46	23.88 ± 0.14	1.73 ± 0.31
17.	EF 35-44	1560.62 ± 20.82	287.33 ± 4.97	25.55 ± 0.34	5.33 ± 0.59
18.	EF 25-34	1634.33 ± 26.42	296.27 ± 1.72	29.67 ± 2.48	5.57 ± 0.90
19.	EF 15-24	1591.23 ± 11.04	295.67 ± 2.75	27.23 ± 0.35	0.87 ± 1.60
20.	EF <15	1476.07 ± 12.78	264.53 ± 3.07	25.93 ± 0.21	6.13 ± 0.37
	'F' Value	123.094	112.567	10.201	25.828

TABLE – M

DAILY INTAKE OF PRINCIPAL MINERALS OF CONTROL AND EXPERIMENTAL GROUP

No.	Group	Iron	Calcium	Phosphorus
1.	CM>44	30.70 ± 0.80	187.00 ± 3.88	1243.60 ± 18.36
2.	CM 35-44	35.80 ± 0.20	227.10 ± 4.73	1560.10 ± 25.93
3.	CM 25-34	37.09 ± 0.45	260.00 ± 3.31	1785.80 ± 23.98
4.	CM 15-24	41.10 ± 1.42	278.50 ± 4.28	1847.00 ± 24.66
5.	CM <15	43.80 ± 1.56	291.20 ± 5.55	1905.50 ± 21.21
6.	CF >45	26.20 ± 0.84	166.90 ± 1.95	1102.60 ± 14.23
7.	CF 35-44	29.90 ± 0.60	183.80 ± 2.49	1231.00 ± 33.55
8.	CF 25-34	31.50 ± 1.83	192.50 ± 8.23	1308.60 ± 38.92
9.	CF 15-25	32.10 ± 0.86	194.90 ± 6.40	1355.00 ± 55.86
10.	CF <15	31.20 ± 0.51	188.90 ± 4.67	1360.00 ± 51.66
11.	EM >44	30.20 ± 0.44	187.13 ± 2.03	1248.20 ± 11.37
12.	EM 35-44	35.70 ± 0.26	222.90 ± 2.79	1533.67 ± 20.90
13.	CM 25-34	36.53 ± 0.22	259.07 ± 1.99	1735.10 ± 15.54
14.	EM 15-24	39.93 ± 0.63	275.43 ± 2.38	1832.63 ± 15.07
15.	EM <15	42.97 ± 0.82	289.07 ± 2.78	1895.90 ± 12.65
16.	EF >45	25.17 ± 0.44	165.50 ± 0.97	1092.97 ± 07.21
17.	EF 35-44	29.77 ± 0.53	180.53 ± 2.53	1224.10 ± 21.42
18.	EF 25-34	29.80 ± 0.67	184.77 ± 4.23	1270.47 ± 37.72
19.	EF 15-24	31.77 ± 0.62	194.00 ± 4.32	1347.00 ± 36.15
20.	EF <15	30.30 ± 0.40	182.10 ± 3.37	1298.67 ± 35.69
	'F' Value	61.684*	151.062*	96.834*

TABLE - N

NUTRITIONAL DEFICIENCY PROBLEMS

Sr.	Rough pale hair		Pale eyes		Motted teeth and		Cracked lips, angular		Under weight		Pale face fissure tongue		Pale dull hair & kalinochia		Lukemia		Vision problems		Nesolacia l dysbacea	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	9	30	9	30	3	10	6	20	9	30	6	20	6	20	0	0	12	40	0	0
2	6	20	6	20	9	30	6	20	6	20	3	10	3	10	0	0	3	10	0	0
3	9	30	9	30	6	20	6	20	6	20	3	10	3	10	0	0	3	10	0	0
4	6	20	6	20	6	20	6	20	6	20	6	10	3	10	0	0	3	10	3	10
5	9	30	6	20	6	20	3	10	12	40	6	20	3	10	0	0	3	10	3	10
6	39	26	36	24	30	20	27	18	39	26	24	16	18	12	0	0	24	16	6	4
7	12	40	15	50	9	30	9	30	12	40	6	20	6	20	0	0	9	30	6	20
8	12	40	9	30	3	10	6	20	9	30	9	30	6	20	6	20	3	10	3	10
9	12	40	15	50	9	30	9	30	12	40	9	30	6	20	6	20	3	10	3	10
10	12	40	6	20	6	20	6	20	9	30	9	30	6	20	6	20	3	10	3	10
11	9	30	9	30	9	30	6	20	6	20	6	20	3	20	3	10	3	10	3	10
12	57	38	54	36	36	24	12	24	16	32	13	26	9	18	7	14	7	14	6	12
13	15	50	10	33.3	5	16.65	4	13.32	10	33.3	8	26.64	8	26.64	0	0	16	53.28	0	0
14	13	43.29	11	36.63	13	43.29	7	23.31	12	40	12	40	6	20	0	0	12	20	3	10
15	11	36.78	8	26.6	7	23.31	4	13.32	11	36.76	8	26.64	6	20	0	0	8	26.64	0	0
16	9	30	5	16.65	9	30	5	16.65	8	26.64	7	23.31	5	16.65	0	0	3	10	5	16.65
17	10	33.33	6	20	10	33.33	4	13.32	9	30	8	26.64	4	13.32	0	0	7	23.31	0	0
18	58	38.66	40	26.66	44	29.33	24	16	50	33.33	43	28.66	29	19.33	0	0	46	30.66	8	5.33
19	19	63.97	16	53.28	21	69.93	12	40	515	50	13	43.49	14	46.62	3	10	13	43.29	4	13.32
20	19	63.97	14	46.62	15	50	11	36.63	15	50	14	46.62	16	53.28	10	33.3	10	33.3	3	10
21	22	73.26	16	53.28	18	59.94	15	40	17	56.61	17	56.61	10	33.33	8	26.64	7	23.31	4	13.33
22	13	43.29	10	33.33	16	53.28	15	50	10	33.33	16	53.28	13	43.29	11	36.62	9	30	3	10
23	14	46.62	14	46.62	16	53.28	14	46.62	16	53.28	9	30	11	36.63	7	23.31	9	30	0	0
24	87	58	70	46.66	86	57.33	67	44.66	73	48.66	69	46	64	42.66	39	26	48	32	14	9.33

TABLE – O ENERGY CONDITION (KCAL / DAY)

Group No.	Domestic work / Salt production	House hold activity	Personal care & rest	Wood cutting	Sleep	Total kal/day
1	372.24	34.06	439.50	-	953.00	1788.80
2	689.00	34.88	480.00	-	792.00	1995.88
3	488.48	13.71	509.01	-	716.00	1727.18
4	423.89	36.10	537.00	-	744.00	1740.99
5	227.72	30.23	735.75	-	769.00	1762.71
Sum	2201.32	148.98	2701.25	-	3974.00	9339.53
Avg	440.27	29.79	540.25	-	794.80	1867.90
6	386.52	204.72	585.75	-	774.00	1950.98
7	1108.91	376.43	386.24	-	532.46	2404.04
8	686.93	456.09	330.07	-	560.00	2033.09
9	549.37	398.72	397.50	-	576.00	1921.59
10	258.52	199.14	607.50	-	764.00	1829.16
Sum	2990.26	1635.09	2307.06	-	3206.46	10138.89
Avg	598.05	327.02	461.41	-	641.29	2027.78
Sum (1 to 10)	5191.58	1784.07	5008.32	-	7180.48	19164.46
Avg (1 to 10)	519.15	178.40	500.83	-	718.04	1916.44
11	575.13	10.33	363.99	76.50	986.00	2011.95
12	807.55	15.51	501.75	93.74	780.00	2198.56
13	847.50	14.98	501.00	25.47	716.33	2105.28
14	705.20	6.72	561.51	27.00	674.00	1974.44
15	358.23	3.10	743.25	42.75	764.00	1911.33
Sum	3293.62	50.67	2671.50	265.46	3920.30	10201.60
Avg	585.72	10.13	534.30	53.09	784.07	2040.20
16	1016.40	325.23	275.05	31.50	730.50	2378.84
17	1358.90	423.63	261.24	135.74	532.33	2711.86
18	898.03	447.08	312.00	293.98	626.30	2577.43
19	886.45	446.88	255.00	114.75	604.33	2307.41
20	225.96	251.07	415.50	236.25	825.00	1953.78
Sum	4385.75	1893.90	1518.75	812.23	3318.50	11929.14
Avg	877.15	378.78	303.75	162.44	663.70	2385.82
Sum (11 to 20)	7679.37	1944.58	4190.26	1077.70	7238.80	20330.73
Avg (11 to 20)	767.93	194.45	419.02	107.70	723.88	2033.07

TABLE – P

PHYSIOLOGICAL (MUSCULAR SKELETAL SYSTEM) PROBLEMS OF CONTROL & EXPERIMENTAL GROUP

Sr. No.	Back pain		Shoulder joint pain		Neck Pain		Leg pain		Abdominal pain		Muscular stiffness		Bossing ribs		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
1	9	30.00	15	50.00	9	30.00	18	60.00	6	20.00	0	0.00	9	30.00	66
2	9	30.00	12	40.00	9	30.00	12	40.00	0	0.00	0	0.00	9	30.00	51
3	6	20.00	6	20.00	3	10.00	9	30.00	3	10.00	3	10.00	3	10.00	33
4	6	20.00	9	30.00	9	30.00	6	20.00	0	0.00	0	0.00	0	0.00	30
5	3	10.00	6	20.00	3	10.00	6	20.00	0	0.00	0	0.00	0	0.00	18
	33	22.00	48	32.00	33	22.00	51	34.00	9	6.00	3	2.00	21	14.00	198
6	12	40.00	12	40.00	9	30.00	9	30.00	9	30.00	6	20.00	6	20.00	21
7	15	50.00	12	40.00	9	30.00	15	50.00	12	40.00	9	30.00	6	20.00	26
8	12	40.00	12	40.00	3	10.00	15	50.00	12	40.00	6	20.00	6	20.00	22
9	9	30.00	6	20.00	3	10.00	12	40.00	6	20.00	3	10.00	3	10.00	14
10	3	10.00	3	10.00	6	20.00	6	20.00	3	10.00	0	0.00	0	0.00	7
	57	38.00	45	30.00	30	20.00	57	38.00	42	28.00	24	16.00	21	14.00	90
11	14	46.62	17	56.61	6	19.98	17	56.61	3	10.00	16	53.28	12	40.00	85
12	16	53.28	14	46.62	13	43.29	22	73.20	4	13.32	20	66.66	11	36.63	100
13	5	16.65	3	10.00	4	13.32	8	26.64	1	3.33	7	23.31	6	20.00	34
14	8	26.64	6	20.00	6	20.00	8	26.64	1	3.33	7	23.31	2	6.66	38
15	7	23.31	7	23.31	6	19.98	9	30.00	0	0.00	6	19.98	1	3.33	36
	50	33.33	47	31.33	35	23.33	64	42.66	9	6.00	56	37.33	40	26.66	293
16	23	76.59	15	50.00	16	53.28	24	80.00	10	33.33	19	63.97	10	33.33	117

17	18	60.00	17	56.61	12	40.00	14	46.62	16	53.28	13	43.29	14	46.62	104
18	19	63.27	21	70.00	18	60.00	26	86.58	15	50.00	13	43.29	12	40.00	124
19	21	70.00	1	60.00	19	63.27	21	70.00	14	46.62	7	23.31	6	20.00	106
20	6	20.00	10	33.33	12	40.00	15	50.00	7	23.31	6	20.00	10	33.33	66
	87	58.00	81	54.00	77	51.33	100	66.00	62	41.33	58	38.66	52	34.66	517

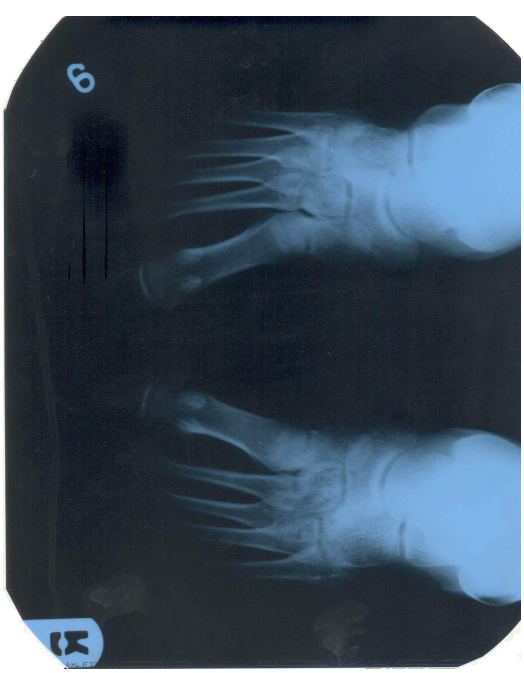
TABLE – Q

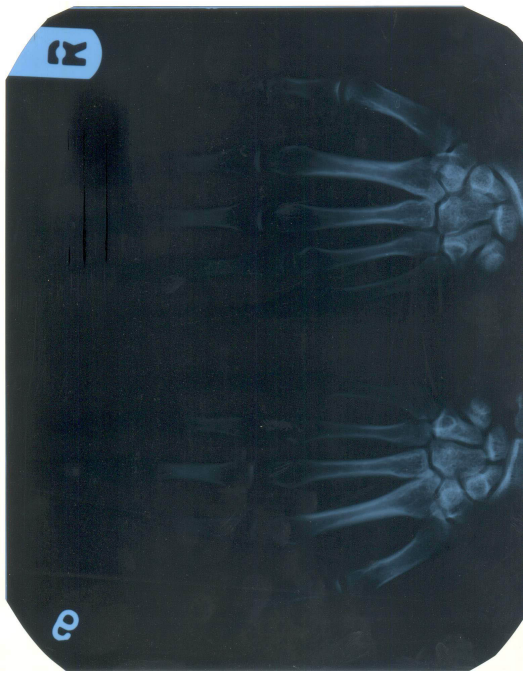
PHYSIOLOGICAL (RESPIRATORY SYSTEM) PROBLEMS OF CONTROL AND EXPERIMENTAL GROUP

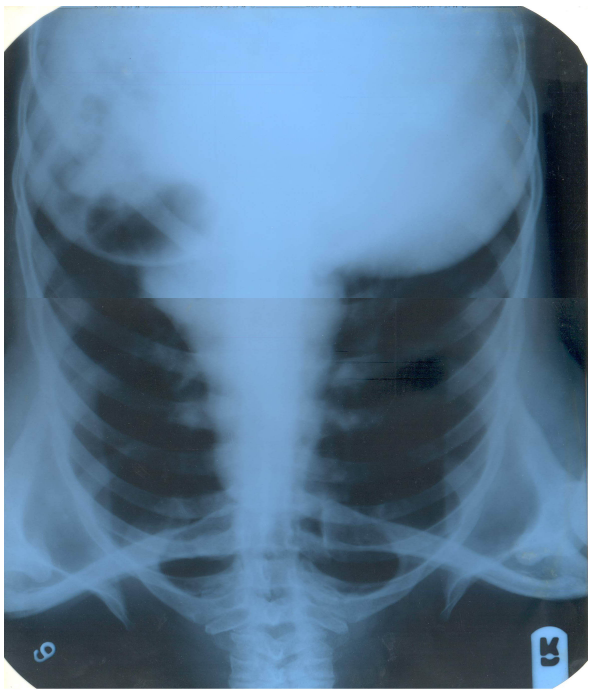
Group	Snizzing		Cough		Cold		Fever		Asthma		T.B Bronchitis		T
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
1	3	10.00	3	10.00	6	20.00	3	10.00	0	0.00	0	0.00	15
2	3	10.00	3	10.00	3	10.00	3	10.00	0	0.00	0	0.00	12
3	0	0.00	3	10.00	3	10.00	0	0.00	0	0.00	0	0.00	6
4	3	10.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3
5	6	20.00	3	10.00	6	20.00	3	10.00	0	0.00	0	0.00	18
	15	10.00	12	8.00	18	12.00	9	6.00	0	0.00	0	0.00	57
6	6	20.00	6	20.00	3	10.00	3	10.00	0	0.00	0	0.00	18
7	3	10.00	6	20.00	6	20.00	3	10.00	0	0.00	0	0.00	18
8	9	30.00	6	20.00	6	20.00	3	10.00	0	0.00	3	10.00	27
9	3	10.00	3	10.00	3	10.00	0	0.00	0	0.00	0	0.00	9
10	9	30.00	9	30.00	6	20.00	3	10.00	3	10.00	0	0.00	30
	30	20.00	30	20.00	24	16.00	12	8.00	3	2.00	3	2.00	102
11	6	20.00	5	16.65	5	16.65	6	20.00	2	6.66	2	6.66	26
12	8	26.64	8	26.64	7	23.31	3	10.00	2	6.66	1	3.33	29
13	9	30.00	8	26.64	8	26.64	2	6.66	0	0.00	2	6.66	29
14	8	26.64	5	16.65	6	20.00	2	6.66	1	3.33	1	3.33	23
15	8	26.64	4	13.32	7	23.31	3	10.00	1	3.33	2	6.66	25
	29	19.33	30	20.00	33	22.00	16	10.66	6	4.00	8	5.33	132
16	10	33.33	12	39.96	8	26.64	8	26.64	4	13.32	3	10.00	45
17	7	23.31	14	46.62	13	43.29	5	16.66	2	6.66	1	3.33	42
18	15	50.00	12	40.00	13	43.29	7	23.31	3	10.00	1	3.33	51
19	11	30.63	10	33.33	12	40.00	3	10.00	1	3.33	0	0.00	37
20	20	66.66	15	50.05	11	38.63	2	6.66	1	3.33	0	0.00	49
	63	42.00	63	42.00	47	31.33	25	16.66	11	7.33	5	3.33	224

APPENDIX – 3. RADIOLOGICAL REPORTS

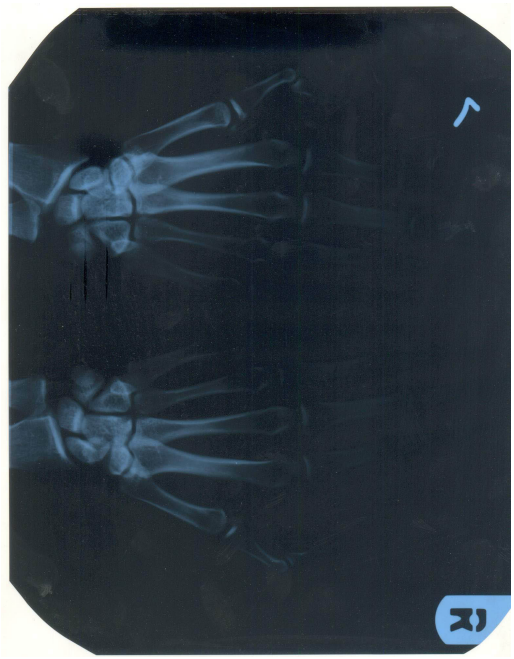
SUBJECT – 1



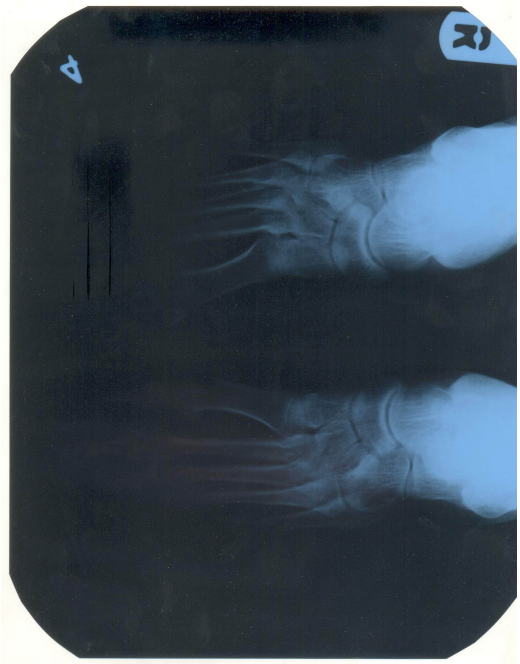


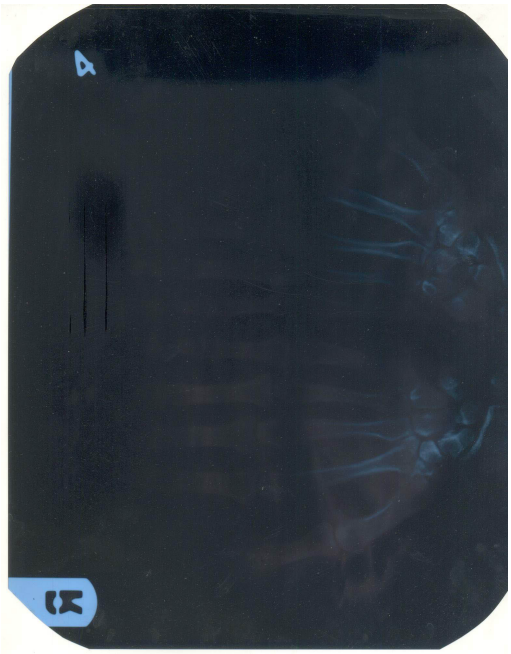


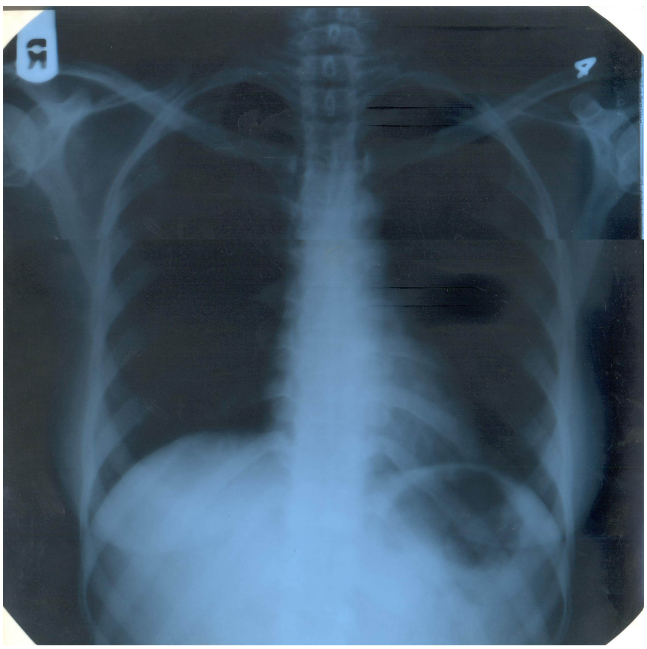
SUBJECT – 2



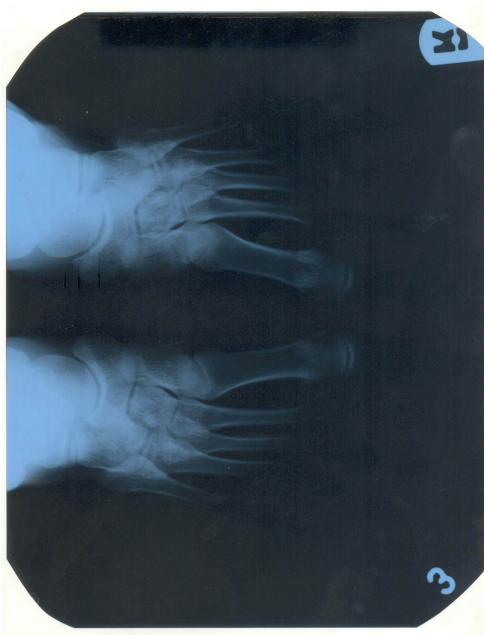
SUBJECT – 3

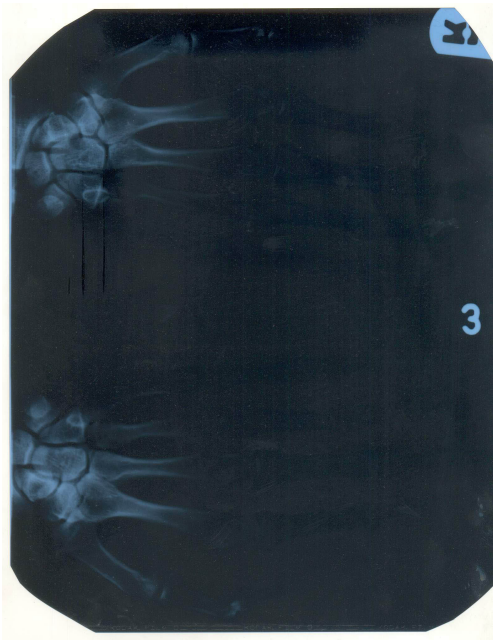


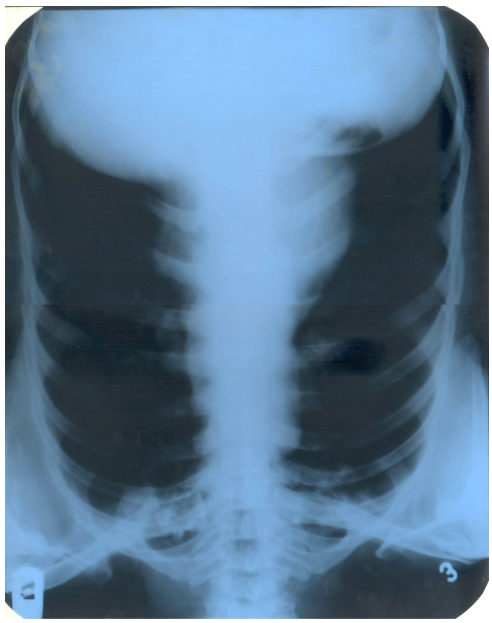




SUBJECT – 4







APPENDIX 4. PHOTOGRAPHS

MAKING HEAP OF SALT

MEASURING HEAP OF SALT

AGARIA HOUSING

SALT POND WITH SALT WORKERS

SALT WORKERS WITH RESEARCH TEAM

DATA COLLECTION

CONSTRUCTION OF KUCHHA HOUSE