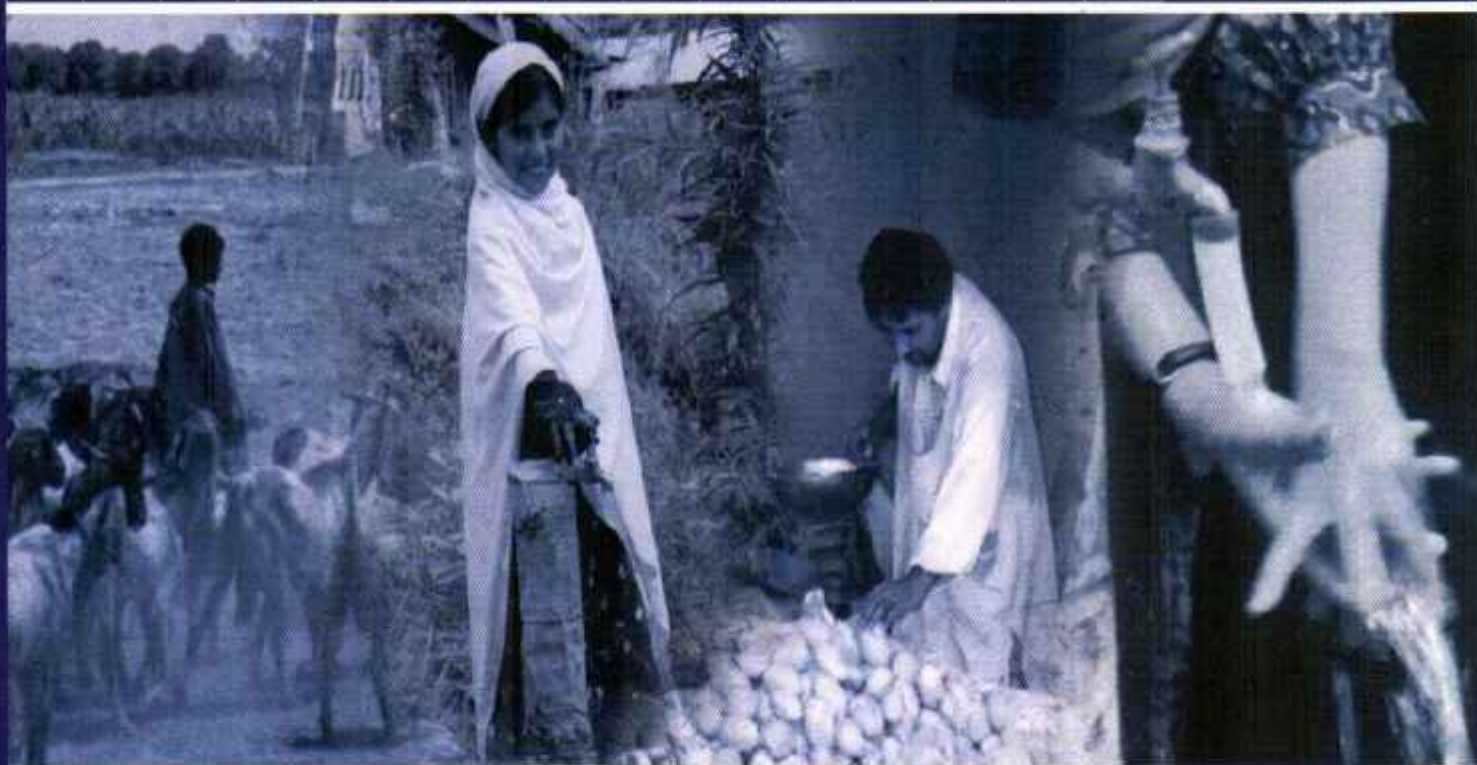




Trust for
Voluntary
Organizations

F I R S T
HANDBOOK
ON HEALTHCARE



HYGIENE & NUTRITION

Trust for Voluntary Organizations (TVO)

The Trust for Voluntary Organizations was established in 1990 in pursuance of an agreement between the governments of the US and Pakistan. The purpose was to create an independent indigenous grant-making agency for the assistance and support of NGOs engaged in participatory development. The Trust also provides assistance for the capacity building of NGOs and has, recently, undertaken dissemination of information as part of capacity building programme for its partner NGOs and the communities that they serve.

So far the Trust has disbursed about Rs. 500 million out of its own funds and the funding provided by the European Commission under a five-year agreement that would conclude in 2003. The grants have been provided in the field of Primary Education, Primary Health (including reproductive health), Poverty Alleviation and Rehabilitation of the Disabled. There are about 200 ongoing projects in these fields at present, that is, during the year 2001.

The Trust operates through its 20 regional offices and a network of CBOs (more than 300) that extends to each sub-district (*tehsil*) of Pakistan. However, NGOs/CBOs that are not part of this network are also eligible for support by the Trust.

This handbook and the other three companion volumes on healthcare are part of the TVO's programme of dissemination of information.

First Handbook on Healthcare (Hygiene & Nutrition)

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The annexes, an important part of this Handbook, were prepared by the following members of the TVO staff:

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Introduction to the series

"Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

(Preamble of the charter of the World Health Organization)

Ever since the International Conference on Primary Health Care, held in Alma-Ata in 1978, and the declaration of Alma-Ata, formulated by the World Health Organization, there has been growing recognition of the fact that health should be treated as a 'fundamental right' of all citizens, and that 'the promotion and protection of the health of the people is essential to sustained economic and social development.'

Although the dream of 'health for all by the year 2000' remains largely unfulfilled, governments all over the world do feel compelled to 'formulate national policies, strategies and plans of action to launch and sustain primary health care', and to cooperate to ensure better health for all by 'fuller and better use of the world resources'. However, the compulsion to formulate policies is yet to be matched by action in most of the developing countries.

The failure to attain the goal of "health for all by the year 2000" at the global level is attributable mainly to three factors:

- High cost of providing medical infrastructure and of modern medical treatment is beyond the means of poor nations. This inability is reflected in the fact that the total number of beds in all the public hospitals, MCH centers and Rural and Basic Health centres in Pakistan, for example, is only about 94,000. The number of beds in 1990-91 being 73,000, the increase is only of 21,000 beds over a period of 10 years.
- Health education could provide essential support to preventive health care programme, and lead to demystification of modern medicine, but has yet to be undertaken with sufficient vigour and seriousness of purpose.
- Medical orthodoxy, supported and encouraged by the powerful pharmaceutical industry, has trashed the traditional systems of medicine, and even homeopathy. China is, perhaps, the only exception to this kind of exclusivist view of medical care.

In the context of Pakistan, the public health care system suffers two additional constraints and distortions:

- It is curative in concept and practice, lacking a significant

"Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."



- preventive component.
- In quality and numbers, it is urban-oriented. The lack of quality in the rural areas is, under the circumstances, unavoidable, but not the lack of numbers. The insufficiency of rural health infrastructure is indicated by the fact that out of all private and public hospitals, less than 20% are in rural areas where more than 60% of the population lives.

It is to be assumed, therefore, that the provision of even the primary healthcare services for all the citizens will remain a distant possibility for a long time. Health education, thus, assumes a much greater role, as it is the cheapest and the most important element of any system of preventive health care.

The Trust, conscious of its responsibilities as one of the facilitators of the civil society's initiatives for better quality of life, decided to undertake a programme of health education through Community Resource Persons (CRPs) who would constitute a corps of volunteers to be mobilized by the partner NGOs of the Trust. In order to provide basic information about healthcare to the CRPs, and to the rural communities, the TVO has published four handbooks:

The insufficiency of rural health infrastructure is indicated by the fact that out of all private and public hospitals, less than 20% are in rural areas where more than 60% of the population lives.

- | | |
|---------------------------------|--------------------------------------|
| ● First Handbook on Healthcare | <i>Hygiene & Nutrition</i> |
| ● Second Handbook on Healthcare | <i>Prevention of common diseases</i> |
| ● Third Handbook on Healthcare | <i>Mother and Children Care</i> |
| ● Fourth Handbook on Healthcare | <i>First Aid</i> |

What the Trust has done so far to achieve its objectives cannot be regarded as having created great impact over the vast areas and the large population that has been in its focus. This is but understandable, for in order to achieve a decisive break-through in the crusade against illiteracy, hunger and disease of a magnitude that we are faced with, there has to be a determined, consistent and collaborative effort by the government, civil society and international agencies. Such a paradigm does appear to be taking shape. This augurs well for the developing countries.

Since these handbooks have been written for use by non-professionals in rural areas, effort has been made to present the essential ideas in simple and non-technical language. These handbooks have been translated in Urdu and, if necessary, would be translated in some regional languages also. The Trust would, on request, freely allow any not-for-profit organization to copy, reproduce or adapt any of these handbooks or any part of them.

IQBAL JAFAR
Chief Executive Officer
Trust for Voluntary Organization



Part-1

Hygiene



Chapter 1

Importance of Hygiene



Importance of Hygiene

CHAPTER

1

Hygiene, thus, assumes a pivotal role in a system of healthcare as prevention of most of the diseases, and success of curative process after the onset of disease, is not possible without cleanliness of the body, of living habits, and of the immediate environment.

These aspects of hygiene will be dealt with in some detail in the next two chapters. There is, however, another aspect of hygiene that is more fundamental than the other two mentioned above:

Hygiene can be defined as a branch of healthcare that deals with preservation of health and prevention of disease mainly through cleanliness. The reason why cleanliness is the central theme of hygiene is that most of the common diseases are caused by unclean habits, polluted environment, or intake of unclean food or water. Cleanliness is, therefore, the most effective and the simplest way to protect the body from the harmful effects of contact with such matter (dust, smoke, germs etc.) that can interfere with the normal bodily functions, and cause disease.

Hygiene, thus, assumes a pivotal role in a system of healthcare as prevention of most of the diseases, and success of curative process after the onset of disease, is not possible without cleanliness of the body, of living habits, and of the immediate environment.

Different aspects of hygiene can be broadly classified into two main areas of concern:

- Environmental Hygiene that deals with cleanliness of the immediate environment which consists of both non-living and living elements such as air, water, soil, houses, streets, plants, and animals.
- Personal Hygiene that deals with the cleanliness of the human body itself.





These aspects of hygiene will be dealt with in some detail in the next two chapters. There is, however, another aspect of hygiene that is more fundamental than the other two mentioned above. That other aspect may be called 'mental hygiene'. It could mean an image in the mind of cleanliness of one's own body and of the environment, that is, one's house, farm, office, street, village or town wherever one lives and works. It also means developing the will to reject and remove all that is polluted, unclean, stale or rotten. But most of us have lived under unhygienic conditions for so many generations that it will take some time and effort to create a mental resistance to unsanitary and unhealthy living conditions. Creating awareness about the need and benefits of hygiene is, therefore, the first step that has to be taken to mobilize the will and resources of the people of each village and town to clean up their environment.

CHAPTER 1

Most of the ways and means of cleanliness cost nothing, or very little, but some e.g. good sanitation, do require some expense. But whatever the cost of cleanliness, it is much less than the cost of treatment of frequent illnesses caused by unhygienic conditions.

The next two chapters would show how individuals and communities can improve the quality of their lives through cleanliness. Most of the ways and means of cleanliness cost nothing, or very little, but some e.g. good sanitation, do require some expense. But whatever the cost of cleanliness, it is much less than the cost of treatment of frequent illnesses caused by unhygienic conditions. It is easy to calculate the benefits of cleanliness even in terms of money if, one keeps in mind the fact that diarrhoea, dysentery, hepatitis and tuberculosis are only some of the diseases that can be prevented by hygienic living conditions, habits and environment.



Chapter 2

Environmental Hygiene



Importance of Hygiene

CHAPTER

2

Environment is, in fact, the sum total of all that sustains life on this planet and is, therefore, something that must be maintained in all its beauty and purity. But unfortunately human beings are often guilty of destroying the natural beauty or purity of the environment through man-made gases, chemicals, filth and garbage that pollute the air, soil, water (even sub-soil water), streets and houses.

Disposal of human excreta will be dealt with under 'housing' and 'sanitation', while use of animal excreta, as manure is well known. The other three kinds of waste (i.e. organic, inorganic and infectious) do need to be handled carefully.

Environment of a human being includes all living beings (e.g. plants, bacteria, viruses, insects, animals, and other human beings) and non-living matter (e.g. Air, water, soil, houses, streets), which surround that human being. Environment is, in fact, the sum total of all that sustains life on this planet and is, therefore, something that must be maintained in all its beauty and purity. But unfortunately human beings are often guilty of destroying the natural beauty or purity of the environment through man-made gases, chemicals, filth and garbage that pollute the air, soil, water (even sub-soil water), streets and houses. All this leads to proliferation of insects, parasites, germs and viruses that attack not only the human beings, but also plants and animals. After these introductory general remarks we can now go on to those specific aspects of environmental hygiene that need special attention.

I - Disposal of Waste

In addition to the industrial waste, which is beyond the scope of this handbook, there is the waste produced by humans and their domestic animals, in the houses, shops, streets and farms. It is in the form of human and animal excreta; cooked and uncooked fruit; vegetable and meat; and glass, paper, plastic, cloth, and numerous other kinds of solid and liquid wastes.

Where the refuse and garbage is not collected, disposed of, or recycled, it gets accumulated in unplanned dumps, usually, close to houses. In hot climate, like ours, the organic waste decomposes quickly, gives off offensive smell, noxious gases, and serves as a breeding ground for flies, insects and germs. For the purpose of proper disposal, refuse and garbage can be divided into four main categories: human excreta; animal excreta; organic waste; inorganic waste; and infectious waste. Disposal of human excreta will be dealt with under 'housing' and 'sanitation', while use of animal excreta, as manure is well known. The other three kinds of waste (i.e. organic, inorganic and infectious) do need to be handled carefully, instead of being thrown outside the houses, on the streets or on the nearest



unclaimed piece of land. Much better, and even useful, ways of dealing with these wastes are:

Organic Waste: The best way to deal with this kind of waste (food waste, weeds, unusable fruit, vegetable or their peelings) is to compost them. This can be done by a community on collective basis, or by individuals for their own use. Method is quite simple. For composting the organic waste of one household, all that is needed is a ditch,



CHAPTER 2

The best way to deal with food waste, weeds, unusable fruit and vegetable or their peelings is to compost them. This can be done by a community on collective basis, or by individuals for their own use.

(preferably on the farm for the convenience of use) which should be big enough to contain three to four month's organic waste of the household. The organic waste should be thrown and spread into this ditch everyday. To the household waste can be added animal excreta and the agricultural waste like, weeds. Some more information about composting is given in Annex I.

Inorganic Waste: This kind of waste consists of so many different things (paper, glass, cloth, plastic, wood, metal etc.) that no one method of disposal is possible. Further, proper disposal of this kind of waste needs a little more effort, as recycling is the best disposal of this waste. For this purpose the waste has to be stored, preferably by the community on collective basis, and sorted out in separate heaps for glass, paper, plastic, cloth and metal. Most of this waste is reusable and can be sold or used in small community workshops that can use such paper, plastic or cloth as raw material.





Infectious Waste: This waste consists of such waste as tapes, bandages and cotton swabs, contaminated by blood, or used in the treatment of a person suffering from a disease. The only proper



disposal of such waste is to burn it.

CHAPTER 2

There are many sources of water (rain, river, wells, ponds etc.) but none is free from impurities. These impurities can be classified into two categories: suspended, and dissolved.

2- Sanitation

This also relates to disposal of waste, but of particular kind i.e. household waste water and human excreta. The two main aspects of sanitation are: disposal within the house, and disposal outside the house i.e. in the streets and in the whole village. The main requirements of sanitation are:

- Every house should have its latrine, and also be connected with the village sewerage system for the disposal of waste water. This takes care of disposal within the house.
- The village should have a sewerage system to collect all waste water.
- Streets should be paved to prevent accumulation of waste water or rain water on the streets.
- There should be no pond, puddle or garbage dumps within or near the residential area, as they are breeding grounds for mosquitoes, flies and other insects. The design and estimated cost of latrines and of the sewerage system, is given in Annex-II.

3- Housing

The most important part of a person's immediate environment is his house, for that is where he spends most of his time. Bad or inadequate housing can cause many diseases, such as:

- Diphtheria, influenza, whooping cough, measles, chickenpox, polio, and tuberculosis due to overcrowding.
- Rickets and osteomalacia due to poor sunlight.



- Arthritis or bronchitis due to dampness. Typhoid, cholera or dysentery due to improper sanitation.

It is, therefore, essential that:

- Site on which the house is built should be dry and elevated so that rainwater can drain off, and the soil does not remain damp. Walls should not be less than 12 feet high and must have ventilators and windows to allow more air and light in the house.
- Kitchen should be located away from the living rooms and should have an outlet for smoke. There should not be many trees close to the house, as they would reduce the sunlight and air and cause dampness. The more useful tree in the vicinity of houses is the "neem" tree that has some antiseptic effect on the environment.
- Cattle and poultry should be housed in a separate portion, away from the living quarters.
- In order to avoid overcrowding a floor space of at least 56 sq. ft (about 8x7) should be provided for each adult.

CHAPTER 2

Growing recognition of the fact that health should be treated as a 'fundamental right' of all citizens, and that the promotion and protection of the health of the people is essential to sustained

4- Clean Water

All of us know that life is not possible without air and water, but not many of us know that unclean, or contaminated water can cause numerous diseases including diarrhoea, dysentery, typhoid and hepatitis. Saline water can cause decay of bones. Clean drinking water is, therefore, so important that a separate section has been devoted to various aspects of access to clean water.

There are many sources of water (rain, river, wells, ponds etc.) but none is free from impurities. These impurities can be classified into two categories: *suspended*, and *dissolved*. The impurities usually found in these categories are:

Suspended Impurities: Usually include such substances as mud, dust, paper, plastic, and decaying vegetable and manure etc.

Dissolved Impurities: Usually include such mineral salts, as calcium carbonate, magnesium chloride, calcium sulphate etc. All these salts cause hardness of water, which is not good for drinking, cooking or even bathing.

There are many ways to clean the water of suspended impurities, and treat the hard water to make it at least less saline, if not totally free of



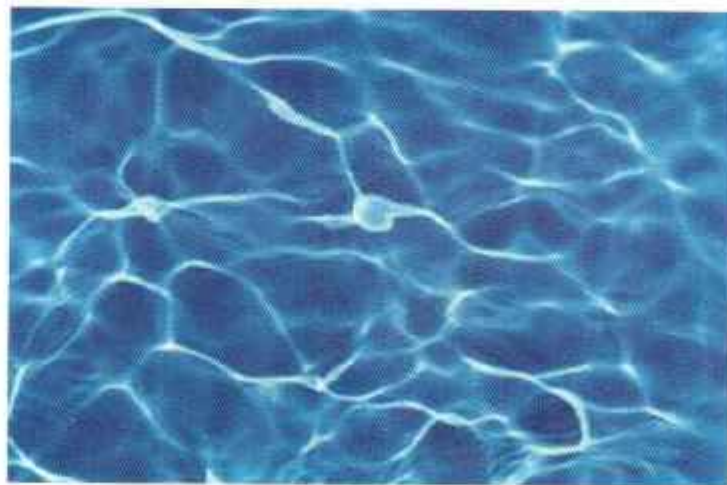
salts. Some of the methods that can be used to purify the water of suspended impurities are as follows.

- ▶ The simplest way to clean impure water from ponds or water channels is to do the cleaning in four steps:
 - Let the water stay in a container for about 8 hours. Some of the impurities would settle at the bottom. If the water appears too impure, put a few grains of alum. It will make the process more effective.
 - Drain the upper layers of water through a piece of cloth into another container, and throw away the impure water at the bottom.
 - Boil the purified water for about 15 minutes, and let it cool down, or fill a transparent glass or plastic container with water and put it under the sun for atleast four hours. Most of the germs will be killed,
- ▶ The water from wells too should be strained through cloth and boiled before drinking. In addition, during rainy season, it is better to clean up the wells and ponds by using potassium permanganate, which kills bacteria. Half a grain of it is enough to disinfect one gallon of water. For disinfecting a well potassium permanganate should be dissolved in a bucket of water, which should, then, be lowered into the well and emptied. For a small well 50 grams and for a big well 100 grams of potassium permanganate should be enough.

CHAPTER 2

The water from wells too should be strained through cloth and boiled before drinking. In addition, during rainy season, it is better to clean up the wells and ponds by using potassium permanganate, which kills bacteria.

Dealing with the dissolved impurities, i.e. salts, is not easy, especially if the water is too saline. However, there are methods to reduce salinity to some extent. These are some of the methods that can be used to achieve desalination to some extent:





- Let the water stay in a container for about 24 hours, and then strain the cleaner water through a piece of cloth into another container and boil it for about 15 minutes. This releases carbon dioxide, and precipitates, calcium or magnesium carbonate.
- In case there are chlorides and sulphates of calcium or magnesium in the water a little more elaborate method is required. One of the methods that is particularly suitable for hot and dry areas like Cholistan in the Punjab, Thar in Sindh, and coastal areas of Balochistan, is desalination through solar energy.

In addition to purification of water, the sources of water themselves need attention. For this purpose wells and ponds, the two main sources of contaminated water, should be designed and maintained with great care. The followings are some of the precautions that can be taken in the construction and maintenance of wells and ponds:

CHAPTER 2

In addition to purification of water, the sources of water themselves need attention. For this purpose wells and ponds, the two main sources of contaminated water, should be designed and maintained with great care.

Wells. Wells should be constructed and looked after in the following manner:

- There should be no latrines, soak-pits, ponds or garbage dumps nearby;
- The inside should be lined with bricks and plastered with cement, up to the surface of water;
- There should be a parapet wall, about two feet high, all around the top of the well;
- There should be a circular sloping platform all around the well, and a drain all along the platform to carry the spill water into a tank, so that water is not wasted, nor any puddles formed around the wall;
- The top of the well should be covered by a lid of tin, or any other material to prevent pollution through dust or garbage.
- The water well should be treated with potassium permanganate at least once a year to cleanse the water of bacteria that may have found their way through any organic matter.

Ponds. Ponds can get contaminated because of bathing or washing near the pond of people, things and animals, inflow of surface water, or strong winds. All of these may introduce into the pond decaying organic matter or injurious chemicals. The following precautions may be taken to reduce the possibility of contamination:



CHAPTER 2

- There should be no latrines, soak-pits, or garbage dumps near the pond;
- In places where pond water is needed for animals also, there should be a separate pond for animals;
- Where a separate pond for animals is not possible, there should be a separate tank, lined by impervious material, where pond water may be stored for the use of human population.
- In no case should the animals be allowed to enter the pond or foul the area around the pond;
- Catchment area of the pond may be designed in such a manner as to let the rain water pass over a two-feet high obstruction, consisting of one foot high solid wall and, over it, another one foot high wire-mesh, to obstruct and entangle substances, such as decaying organic matter, insects or any other refuse or garbage that would otherwise flow into the pond with the rain water.
- The pond should be disinfected with potassium permanganate at least once a year.

5- Rats and Insects

There are numerous varieties of insects, parasites, and worms, some of which, like earthworm, are beneficial for human beings. However, there are some, which live on human beings, and can be as close to human beings as their bedroom or their bed! Six of them need special mention for they are not merely the most persistent nuisance but can even cause fatal diseases. These are: rats, flies, bedbugs, fleas, lice, mites and mosquitoes. Here are some methods to get rid of them.

Rats. From destruction of thousands of tons of grains every year to epidemic of plague, there are many things that the rats are responsible for. They have to be banished from houses, farms and shops. This is what we can do to get rid of them:

- Close the rat holes wherever seen;
- Keep the granary and edibles in the house out of their reach;
- Use poisoned cakes of flour to kill them, but do not use all sorts of poisons indiscriminately for they can kill the domestic animals (cats, dogs, and poultry) also. Safest poison is barium carbonate for it cannot kill cats, dogs or chicken.
- Dead rats should not be thrown out to rot, but buried and disinfected with lime.



Flies. No other pest or insect is responsible for spreading so many diseases and so quickly as flies. It lives on garbage, excreta and any kind of decaying matter, and conveys the germs from there to households. It is, thus, the agent of such contagious diseases as cholera, typhoid, dysentery and tuberculosis.

A fly lays as many as 1 200 to 1 500 eggs in the summer season and it takes no more than 10 days for larva to become a full grown fly. A fly does not live more than six weeks, but during these six weeks, it lays eggs six times. It, thus, proliferates at an incredible rate. Since flies lay eggs on decaying organic waste, including human and animal excreta, the best way to get rid of flies is to keep the houses, streets and shops clean. If organic waste is disposed of in the manner suggested in the section dealing with disposal of waste, there won't be any place for the flies to breed on. Any flies left surviving and breeding can be eliminated with little spray of some disinfectant.

CHAPTER 2

Since flies lay eggs on decaying organic waste, including human and animal excreta, the best way to get rid of flies is to keep the houses, streets and shops clean.

Bedbugs. This is an insect that lives closest to human beings and is not only a major cause of lack of sleep and consequent health problems, but can also transmit disease like *Kala Azar*. Since bedbugs are usually found in the cracks and corners of the beds and chairs etc, the



simplest way to get rid of them is to pour boiling water or kerosene oil into the crevices. Clothes, blankets and bed-sheets should be put under the sun for a few days. This too can kill the bugs for they thrive in dampness.

Fleas. It is an insect that is smaller than an ant, and is usually found in dirty and damp places in the house. It finds its way to beds where it is not only a nuisance like bedbugs, but can cause burning and itching of skin. It also transfers the germs of plague from rats to human beings. Fleas can be exterminated in the same way as bedbugs.

Lice. It is a parasite found on the clothes and in the hair, and lives on human blood. Since it lives on blood, it can transmit the disease from a sick person to a healthy person. It can survive only on a body, which is not washed frequently and in clothes, which are not washed and changed often.

The simplest way to get rid of them is to put the clothes, infested with lice, in boiling water, and also wash the body, especially the head, with



hot water.

Mites. Mites live in the vegetation growing on damp soil. It feeds on the blood of rats, rodents and, occasionally, of man, and also on organic matter in the soil. Being a parasite it attaches itself to the host and after being fully fed, leaves the host and spends the rest of its life cycle in the soil where it feeds on organic matter. It transmits to its host mite-born typhus. The best way to get rid of mites is to get rid of rats and rodents from the farms. The best precaution is, not to go about barefoot.

Mosquitoes. This is a parasite that is most common in tropical countries. There are many strains of mosquitoes that cause many diseases including yellow fever, elephantiasis and malaria. The strain of mosquito that is common in Pakistan is the one that causes malaria.

CHAPTER

2

Mosquitoes breed during the rainy season, and their breeding ground is usually a place where there is stagnant water and other damp and dark places in the houses, along the streets or on the farms. So far efforts to eradicate or even control malaria have failed all over the world. However, there are some simple measures that can be taken to substantially reduce the breeding of mosquitoes and, thus, reduce the incidence of malaria. Some of these measures are:

- Cleanliness, proper disposal of refuse and garbage, and basic sanitary arrangements, as suggested in the sections on disposal of waste and sanitation.
- If there are damp places, or ponds of stagnant water that cannot be dried up, then, such places should be sprayed with kerosene oil. This will stop the breeding of mosquitoes.
- Unusable ponds, waterlogged and damp areas, that are breeding places, for mosquitoes, can be dried up by planting eucalyptus trees. This measure alone can reduce the incidence of malaria significantly.
- While sleeping cover the body, especially of children, with mosquito netting or a thin cloth.



Personal Hygiene

In the previous chapter we dealt with those aspects of hygienic living conditions for which a community is collectively responsible. In this chapter we shall deal with those aspects of hygienic way of life for which each individual is himself responsible. This aspect of hygiene can be defined as formation of such manner of living and of such habits that promote an adjustment of human physiological and social

CHAPTER 3

In this chapter we shall deal with those aspects of hygienic way of life for which each individual is himself responsible. This aspect of hygiene can be defined as formation of such manner of living and of such habits that promote an adjustment of human physiological and social needs to the available resources and the surroundings in such a way that a healthy body is preserved and diseases due to maladjustment with surroundings and unhygienic habits are averted.



needs to the available resources and the surroundings in such a way that a healthy body is preserved and diseases due to maladjustment with surroundings and unhygienic habits are averted.

Some of the measures that can be adopted as daily routine for creating healthy conditions and habits are as follows:

Fresh Air and Sunlight. Nature has provided air and sunlight in such abundance that we are hardly ever conscious of them. Their



importance for good health is beyond measure. In fact life itself is not possible without them. Air regulates body temperature and provides oxygen to the body that is essential for many physiological and mental functions; and* sunlight provides heat and light, helps the body produce vitamin D, and destroys bacteria. Exposure of the body to sunlight, preferably in the morning when the sunlight is mild and soft, is good for the body as lack of vitamin D can cause rickets and enlargement of liver and spleen among children, and osteomalacia (softening of bones) among adults.

Most of the people living in rural areas do get enough of sunlight as both men and women work outdoors for long hours. There are, however, areas where climate is very cold, and people tend to keep their bodies covered all the time. People living in such areas do need to take special care, especially of children, to expose their bodies to sunlight for a few minutes every day.

CHAPTER

3

Cleanliness of Body. Human body gets polluted or dirty from two sources: *internal and external*. Internal sources are the sweat glands that release toxic and other unwanted matter in the body through millions of pores all over the skin. The external source consists of dust, dirt and smoke in the air, or gases and chemicals released in the atmosphere through any industrial activity or agricultural operations like spraying of insecticide.

If the body is not regularly cleaned, the internal and external accumulations, apart from causing contagious diseases, can close the pores and, thus, interfere with the system of internal cleansing provided by nature. Hence the accumulations on the human body have to be cleaned and washed away regularly to avoid infection and disease.

Teeth. Cleansing of the teeth and the mouth is one of the most important aspects of personal hygiene as it prevents not only many diseases of the teeth and gums but also diseases of the digestive system. The teeth should be brushed and cleaned after every meal or, at least twice a day, preferably after breakfast and dinner. In case a toothbrush is not available, the other alternative, perhaps even better,



is to use twigs of acacia (*kikar*) or neem tree, which is a well-known practice, but not a regular one, in the rural population.

If the teeth have become discolored or have accumulated plaque, the easiest and most effective way to cleanse them is to make toothpaste of bicarbonate of soda (baking powder) to which should be added few drops of lemon to make a paste. The paste should be rubbed on the outer and inner surface of the teeth by a toothbrush or cotton swabs at least once a day. Within a few days the teeth can be restored to their natural colour and lustre.

But cleansing alone will not ensure healthy teeth and gums. To protect teeth and gums, smoking and the use of *pan* or *niswar* must be given up. All three of them are habit forming, and cause not only the diseases of teeth and gums, but many other diseases also. Sweets and soft drinks are also harmful, and should be used with moderation.

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Importance of food hygiene can be judged from the fact that more than 20 different kinds of diseases, including typhoid, tuberculosis and hepatitis, can be caused by contaminated or decaying food.

Hands. It is a good habit to clean the hands often as no other part of the body is constantly exposed and in contact with something, or the other, including things that may cause infection. Hands must be cleaned after going to the toilet and whenever they get soiled, and before and after every meal even if they do not look soiled.

Care of the hands includes paring of fingernails, which, if allowed to grow, harbour, dirt, dust and bacteria that can pass into the digestive tract with food. The other good reason why nails should be kept pared and clean is that intentional or unintentional scratching with unclean and unpaired nails can nick the skin and cause infection.

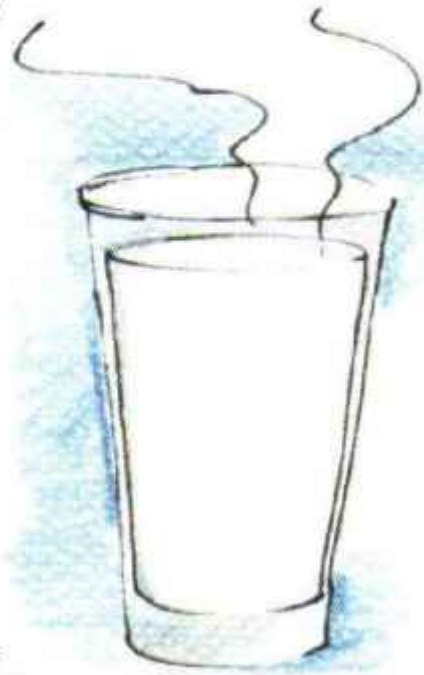
Food. Importance of food hygiene can be judged from the fact that more than 20 different kinds of diseases, including typhoid, tuberculosis and hepatitis, can be caused by contaminated or decaying food. Precautions that should be taken for different kinds of food are as follows:

Milk. It can be a vehicle for no less than 21 different kinds of diseases including tuberculosis, diphtheria and hepatitis. Contamination of milk can be due to the dairy animal itself,



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persons employed in milking, or a host of other factors like vessels or containers, polluted water, flies and dust. Hence, the dairy animal must be clean and healthy; udders must be washed before milking; place where the animal is kept must be clean and free from flies; persons responsible for milking must themselves be clean and healthy, and should wash their hands before milking; vessels must be clean and kept covered. If feasible, the milk should be immediately cooled to below 10 degree centigrade to stop the growth of bacteria.



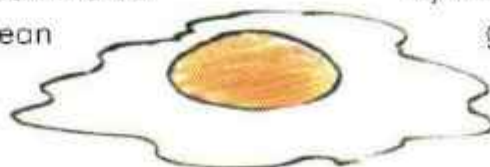
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Meat. It can cause food poisoning and 7 other diseases if it is contaminated or in a state of decay. The first precaution should begin with the animal itself, which should be clean and healthy. Next, the place where the animal is slaughtered should be clean, and the meat should be stored in fly-proof containers or rooms. Stale meat giving off bad smell should never be eaten.

Fish. Stale fish is one of the most common causes to food poisoning. The signs of fresh fish are bright red gills and clear eyes. The best precaution is not to store fish for more than few hours, unless it can be frozen.



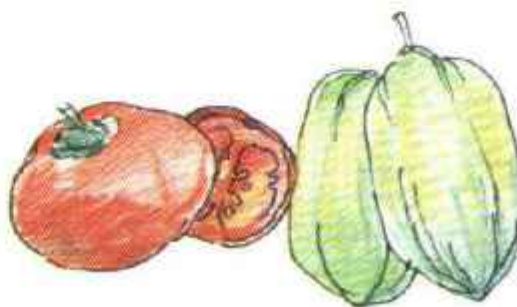
Eggs. Freshly laid eggs are sterile inside, but the shells can become contaminated by faecal matter of the hen or unclean ground where the eggs are laid. The





disease bearing micro-organism can enter the egg if the shell is cracked. It is safer, therefore, not to use an egg if its shell is cracked, and to wash the shell before breaking it.

Fruits and Vegetables. Fruits and vegetables are an important source of pathogenic organisms. Danger is greater in case of vegetables that are usually eaten in raw form. However, precaution in the case of fruits and vegetables is simple: all fruits



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and vegetables should be washed, if feasible with water treated with potassium permanganate in periods of high incidence of an infectious disease. Stale and decaying fruits and vegetables should always be avoided and should not be fed even to animals as is often done.



Part II

Nutrition



Chapter 4

Importance of Nutrition



Importance of Nutrition

CHAPTER 4

Generally people tend to believe that less than the required amount of food (an inaccurate, but workable equivalent of malnutrition) causes only muscular weakness and some loss of body weight.

At the International Conference on Nutrition held in Rome in 1992, representatives of 159 nations adopted a declaration where they expressed their determination to 'eliminate hunger and to reduce all forms of malnutrition'. They also expressed their concern over the fact that: 'more than 2000 million people, mostly women and children, are deficient in one or more micronutrients; Babies continue to be born mentally retarded as a result of iodine deficiency; children go blind and die of vitamin A deficiency; and enormous numbers of women and children are adversely affected by iron deficiency'.

These quotations from the Declaration convey only a brief and partial view of what was said at the conference, and of the consequences of nutritional deficiencies that are not widely known even among comparatively better informed people. Generally people tend to believe that less than the required amount of food (an inaccurate, but workable equivalent of malnutrition) causes only muscular weakness and some loss of body weight. People do not generally associate malnutrition or under-nutrition with the diseases that it can cause. In order to bring home the importance of adequate nutrition, let us take note of some important facts that highlight the problem of malnutrition in Pakistan:

- No less than 60% of the children under five years are malnourished, and more than 30% of childhood deaths are caused by it.
- About 60% of the rural population and 40% of the urban population suffers from protein deficiency. In the case of children it adversely affects their physical and mental growth, and in the case of adults it reaches the span of their active and useful life.
- About 40% of the population suffer from low intake of vitamin A. Pregnant and lactating women are even more deficient in this vitamin. This deficiency can cause serious skin and eye problems, even blindness.



- According to some estimates about 55% of the rural population, and 70% of the urban population is anaemic, due to deficiency of iron. This deficiency can cause a fall in the level of haemoglobin, which transports oxygen to every cell of the body.
- About 50% of the population consumes less than the minimum requirement of vitamin C. This vitamin is easily lost in the process of cooking. The cooking loss can be as high as 70%. Deficiency of vitamin C can cause tiredness, bleeding gums and delayed healing of wounds. Since vitamin C helps the absorption of iron, its deficiency can cause anaemia.

Malnutrition is caused by any one or more of the four main reasons, that is:

- i) Inadequate intake of food;
- ii) Inadequate balance between five major components, of nutrition: *water, carbohydrates, fats, proteins, vitamins and mineral*;
- iii) Defective absorption and utilization of food due to lack of some vitamin or mineral, lack of exercise, or defective cooking of food;
- iv) Parasitic infestation of the digestive system or any other disease that affects absorption and utilization of food.

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It will, thus, be seen that malnutrition and disease are mutually supportive, that is, malnutrition causes disease, and disease causes malnutrition. This can lead to an escalating cycle of malnutrition and disease that can lead to extreme emaciation, or even death, especially among children. In Pakistan about 40% of the mortalities among children up to 5 years of age are caused by diarrhoea, which is a major cause of malnutrition among children.

Since some knowledge of different nutrients and their nutritional value is helpful in taking care of one's nutritional needs, the next chapter would provide some basic information on the subject.



Chapter 5

Various nutrients, their function and sources



Various nutrients, their function and sources

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Lack of vitamin D can cause rickets in children and osteomalacia in women. Because of lack of exposure to sunlight, women who observe *purdah* and hardly ever leave their houses, are more likely victims of osteomalacia. Sunbathing for 5 to 10 minutes in the morning when the sunlight is soft and mild can provide the body with the required amount of vitamin D.

There are eight basic nutrients that are essential for good health. These are: sunlight, air, water, protein, fats, carbohydrates, minerals and vitamins. Basic functions of these nutrients, and their sources (except the sunlight and air that nature has provided in great abundance everywhere) are the subject matter of this chapter. What follows is a brief description of each of these eight nutrients, and some of their more important sources.

Sunlight

It furnishes light and heat, and destroys bacteria. As a nutrient it produces vitamin D in the body which has been exposed to sunlight. Lack of vitamin D can cause rickets in children and osteomalacia in women. Because of lack of exposure to sunlight, women who observe *purdah* and hardly ever leave their houses, are more likely victims of osteomalacia. Sunbathing for 5 to 10 minutes in the morning when the sunlight is soft and mild can provide the body with the required amount of vitamin D. While sunbathing it is not necessary to expose the entire body, nor should one expose the body to extreme heat or cold. Sunbathing is particularly good for infants who remain indoors all the time.



Air

The main function of air is to provide oxygen to the lungs. This is achieved through respiration which is a process to take into the



lungs fresh air, and expel carbon dioxide collected from the impure blood. Supply of fresh air to the lungs can be increased by exercise, running and walking, that have other benefits also. The other simple way to increase the supply of oxygen is to inhale and exhale deeply and slowly, in open air, for ten minutes everyday.

Water

It is the most vital nutrients in our body, and makes up more than 60% of the body weight. It plays an important role in the formation of all body cells and fluids, and helps in the utilization of food and removal of waste produced in the body. It also helps in the regulation of body temperature, and acts as a lubricant and transmitter of chemicals within the body.

As in the case of other nutrients, the body needs water in a balanced quantity which is about 6 to 8 glasses a day. It should be increased or decreased in accordance with the need that is determined by the hot or cold climate, and more or less of physical activity by a person. Too much of water, especially after meals, will dilute the digestive juices or weaken or delay digestion. Insufficient water intake will cause constipation, accumulation of toxins, and damage the kidneys. It can also cause fatigue and dry skin.

Proteins

As a body-component it accounts for 17% of the body, and is, thus, the largest component, after water. It builds the body structure such as cells, tissues, muscles, and skeleton, and also creates hormones, antibodies, and digestive and other secretions. It is essential for growth in the young, and for repair and replacement in the old.

Various proteins, such as those in various cells, tissues, hormones, and immune cells, are constantly being broken down and need to be rebuilt. During the digestive process, protein is broken down to its basic components, which are called 'amino-acids.' In fact protein is a collective noun for 22 amino acids that combine with each other into various forms to create different body parts, such as hair, nails or bones.

Adequate supply of dietary protein is, therefore, of utmost importance to support growth, repair and replacement that goes on continuously in the body. The richest sources of dietary protein are eggs, meat, fish,

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milk, pulses and beans.

Fats

This is a food group that consists of fatty acids, which are a concentrated source of energy. Fats of animal origin are mainly butter and Ghee, while fats of vegetable origin are the oils of corn, coconut, sunflower, safflower and other seeds.

Fats are vital to the bodily functions. They enable the utilization of the fat-soluble vitamins A, E, D and K; stimulate gall bladder activity without which gallstones will be formed; and produce hormones. Certain types of fats insulate the nerves, and some are essential for healthy skin. There are three fatty acids that are known as essential fatty acids (EFAs). These three fatty acids are required for the function of every cell, tissue, gland and organ. They also form red blood cells, promote immunity against disease and are essential for mental function, as half the brain is composed of EFAs. Flaxseed (linseed) oil is the best source of EFAs.

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Adequate supply of dietary protein is therefore of utmost importance to support growth, repair and replacement that goes on continuously in the body. The richest sources of dietary protein are eggs, meat, fish, milk, pulses and beans.

Carbohydrates

These are chemical compounds whose molecules contain carbon, hydrogen and oxygen. They are the main food group for supplying body's energy and are, therefore, known as 'energy food'.

Carbohydrates have several varieties: simple sugars i.e. glucose, fructose and galactose, found in fruits and honey; complex sugars i.e. sucrose (found in cane and beet), lactose (found in milk), and maltose (found in malted barley); and complex carbohydrates, which include starch, cellulose and glycogen.

All carbohydrates (except cellulose) are ultimately converted into glucose, which is the only usable form of energy for the body. The body needs a continuous supply of glucose for all its mental and physical activities. Common sources of carbohydrates are, sugar, honey, milk, sweet fruits, cereals, root-vegetables and dates. The most widely used carbohydrate is refined sugar, which lacks the essential vitamins, minerals, and other nutrients that are contained in the sugar cane from which it is derived.

Excess consumption of refined sugar can have adverse effects on health, such as tooth decay, obesity, fatigue and diabetes. In fact refined sugar is suspected of being associated with as many as 48



different bodily disorders. It is advisable, therefore, to keep the intake of refined sugar at the minimum, and use *gur* and honey also as sweeteners.

Minerals

Minerals are found in almost every thing that we eat, but not in equal quantity. Hence, the need of supplements, where deficiency is indicated. The most important minerals, their function and sources are as follows:

- **Calcium and Phosphorus.** These two minerals are found together in different parts of the body, especially in the bones and teeth, and in much smaller portion in the body fluids and soft tissues. About 2 percent of body weight consists of calcium and about 1 percent of phosphorus. About 50% to 70% of the dietary minerals are absorbed in the body, but this percentage can be much lower in case of calcium if there is deficiency of vitamin D. Deficiency in phosphorus can adversely affect the metabolic process or, in simple words, adversely affect the utilization of proteins, fats and carbohydrates. Deficiency in calcium affects the skeletal growth among the young, and can cause osteoporosis that makes bones fragile leading to fractures of bones in older persons especially women. The richest sources of calcium in the common diet are milk, beans, fenugreek (*methi*), onions, eggs and wheat. Phosphorus is available in milk, meat, fish, pulses and fenugreek.
- **Iron.** Most of the iron in the body is found in the red blood cells, and very small quantities in the liver, spleen, muscles and bone marrow. Main function of iron is to act in formation of haemoglobin that supplies oxygen to various parts of the body. Its deficiency causes anaemia, especially among pregnant and lactating women, whose daily loss of iron, through the usual natural process, is far greater. The best sources of iron in the food eaten most often are meat, especially liver, eggs, fenugreek, spinach, rice and wheat.
- **Magnesium.** It is found in the human body in a small quantity, that is, less than an ounce. It is one of the elements in the bones, and is necessary for the transmission of nerve impulses, and or muscular movement. It is also involved in the

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About 50% to 70% of the dietary minerals are absorbed in the body, but this percentage can be much lower in case of calcium if there is deficiency of vitamin D. Deficiency in phosphorus can adversely affect the metabolic process or, in simple words, adversely affect the utilization of proteins, fats and carbohydrates. Deficiency in calcium affects the skeletal growth among the young, and can cause osteoporosis that makes bones fragile leading to fractures of bones in older persons especially women.



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Since iodine is found in the top layers of the soil, it is usually washed away by rains or blown away by strong winds, especially during long periods of drought. Thus, food grown everywhere in Pakistan is deficient in iodine. Seafood is the only possible source, but it is available only to people living in coastal areas. Since iodine is vital for health and growth, people living away from coastal areas must use iodized salt, which is the only easily available source of iodine.

- metabolism of carbohydrates, protein and fat. Its deficiency can cause muscular convulsions, and a long-term deficiency can lead to renal and cardiovascular diseases. Its best sources in the usual dietary regime of the rural population are pulses, meat and wheat.
- **Iodine.** It is essential for the manufacturing of Hormones by the thyroid gland, which regulate metabolism, and are necessary for growth and development of the young, and also for successful pregnancy and lactation. Lack of iodine can retard the physical development of a child, cause goiter i.e. enlargement of the thyroid gland in its effort to compensate for the deficient intake of iodine. Deficiency of iodine during foetal or neonatal life of a child can lead to mental retardation, deaf mutism, short stature and retarded physique. Women suffering from iodine deficiency are likely to have miscarriages, stillbirth, and other problems of pregnancy and birth.

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Vitamins

Finally, the last of the eight groups of nutrients, that is, vitamins, that are found in the body in very minute quantities but play a crucial role in the growth of the body structure and in regulating the numerous bodily processes. A brief description of the functions of various vitamins and their sources is as follows:

- **Vitamin A.** This vitamin is necessary for healthy eyes, vision, skin, digestive and urinary tract, and for healthy development of bones and teeth. Its deficiency can cause night blindness, drying up of the skin and linings of various body passages and cavities, such as the eyelids, nose, mouth and the respiratory and digestive tract. Its main dietary sources are butter, eggs, milk, tomato and papaya.



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- **Vitamin B-1 (Thiamine).** It is essential for carbohydrate metabolism, and development of muscular and nervous system. Its deficiency causes beriberi (dry skin, irritability, disorderly thinking and paralysis), dyspepsia and loss of appetite. Its deficiency is more common where polished rice is a staple food. Its main dietary sources are milk, eggs, wheat, rice, pulses and green vegetables.
- **Vitamin B-2 (Riboflavin).** It is essential for carbohydrate metabolism, healthy skin and eyesight, and helps growth. Its deficiency is indicated by cracking of lips at the corners and redness of the eyes. Its main dietary sources are milk, eggs, wheat, rice and green vegetables.
- **Vitamin B-3 (Niacin).** It is essential for the normal functioning of tissues and skin, and helps in growth. Its deficiency causes Pellagra (soreness of skin and digestive disorders) that develops in three stages: dermatitis to diarrhea to dementia, and if not cured it can even cause death. Its main dietary sources are wheat, rice, groundnuts, pulses and meat.
- **Vitamin B-5 (Pantothenic Acid).** It is essential in the metabolism of carbohydrates. Its deficiency can cause burning of palms and soles, weak memory and baldness. Its main dietary sources are milk, eggs, meat, rice and wheat.
- **Vitamin B-6 (Pyridoxine).** It is essential in metabolism of proteins. Its deficiency can cause nervousness, irritability, and convulsive seizures in infants and anaemia. Its main dietary sources are wheat and pulses.
- **Vitamin B-12 (Cobalamin).** It is necessary for the production of healthy red blood cells. Its deficiency can cause degeneration of liver cells and anaemia. Its main dietary sources are milk, eggs and organ meat.
- **Vitamin C (Ascorbic acid).** It is necessary for the formation and maintenance of walls of the capillaries, helps produce a substance that binds the cells together; regulates calcium metabolism; helps to resist infections; and facilitates absorption of iron. Its deficiency can cause bleeding of gums, loose teeth, anaemia, delay in the healing of wounds, and retarded growth.



Its main dietary sources are lemon, orange, tomatoes and green pepper.

- **Vitamin D.** It regulates the absorption of calcium and phosphorus and, thus, promotes development of strong bones and teeth. Its deficiency can cause rickets in children, and osteomalacia in adults, in addition to general weakness of bones and teeth. In the usual daily diet it is found in milk, butter and eggs, but it is largely produced in the body by the action of ultra-violet rays of the sun.
- **Vitamin E.** Its primary function is that of an antioxidant, that is, it protects the body from uncontrolled oxidation. It minimizes destruction of vitamin A, and helps in utilization of sex hormones, cholesterol and Vitamin D. It is used in the treatment of many diseases including angina, hypertension and anemia. Its main dietary sources are wheat, rice, eggs, and green vegetables.

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In addition to these vitamins there are some other vitamins such as vitamin H (biotin), vitamin K and choline, but those have not been discussed, as their deficiency is very rare. For the purpose of quick references the major nutrients, their function and their dietary sources are given in the following table:



Major Nutrients and their best common dietary sources

Nutrients	Function			Dietary Sources
	Energy	Growth & Repair	Regulation of body function	
Fat	✓	x	✓	milk, ghee, cooking oils, peanuts
Carbohydrates	✓	x	x	sugar, honey, milk, sweet fruits, cereals, root vegetables, dates
Proteins	✓	✓	✓	milk, eggs, pulses, meat, curd
Minerals				
• Calcium	x	✓	✓	milk, eggs, curd, fenugreek, pepper, peanuts
• Phosphorus	x	✓	✓	milk, eggs, pulses, meat, peanuts, fenugreek (<i>methi</i>), pepper
• Sodium	x	x	✓	salt, beets, carrots, pepper
• Potassium	x	x	✓	pulses, lemon, green leafy vegetables, bananas, tomatoes, potatoes, peppers
• Chlorine	x	x	✓	salt, meat
• Iodine	x	x	✓	sea food, iodized salt
• Iron	x	✓	✓	eggs, liver, fenugreek amaranth (<i>chanlai ka saag</i>), mint & other green
• Copper	x	✓	✓	Vegetables
• Magnesium	x	✓	✓	pulses, wheat, liver
• Manganese	x	x	✓	pulses, green vegetables, lemon
• Cobalt	x	x	✓	pulses, cereals, peanuts, green leafy vegetables
• Sulphur	x	✓	✓	cereals, green leafy vegetables, fruits, eggs, pulses, meat, cabbage, onions
Vitamins				
• Vitamin A	x	x	✓	milk, liver, green vegetables, papaya
• Vitamin B-1	x	x	✓	cereals, pulses
• Vitamin B-2	x	x	✓	milk, eggs, liver, green vegetables
• Vitamin B-3	x	x	✓	eggs, fish, liver, cereals
• Vitamin B-5	x	x	✓	eggs, cereals, liver
• Vitamin B-6	x	x	✓	milk, eggs, wheat
• Vitamin B-12	x	x	✓	eggs, fish, liver, kidneys
• Choline	x	x	✓	eggs, liver, green vegetables
• Folic Acid	x	x	✓	eggs, cereals, green vegetables
• Vitamin C	x	x	✓	citrus fruits, lemon, tomatoes, pepper
• Vitamin D	x	x	✓	eggs, milk and butter
• Vitamin E	x	x	✓	eggs, wheat, vegetable oils, green vegetables



Chapter 6

Nutritional requirement during various stages of life cycle



Nutritional requirement during various stages of life cycle

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Apart from her own nutritional requirement, the mother needs additional nutrition for the foetus, and for the breast tissues and blood that increase during the first four to five months of pregnancy. During the next few months additional nutrients are needed for the fast growing foetus which needs nutrients.

It should be ensured that the mother gets balanced diet that should include milk, eggs, white-grain, wheat, rice and pulses. In addition, if there are signs of anaemia, daily intake either amaranth or fenugreek should produce quick results.

From infancy to old age, the human body is in a state of constant change through the process of growth, maintenance, repair and decline because of age, or degeneration because of disease. The process of growth is the earliest phase that begins nine months before the birth. The rate of growth during that period is faster than during any other period of life. Since life begins in the womb of the mother, and the nutrition of the foetus depends directly upon the nutrition of the mother, it is but logical to begin with the nutritional requirement of the pregnant women and deal with the other stages of life cycle later.

Pregnant Women. For obvious reasons the nutritional needs of a pregnant woman are greater than at any other stage of life. Apart from her own nutritional requirement, the mother needs additional nutrition for the foetus, and for the breast tissues and blood that increase during the first four to five months of pregnancy. During the next few months additional nutrients are needed for the fast growing foetus which needs nutrient not only for growth but also for nutrients stores, especially those of vitamin A, iron and energy stores of fat. Increased diet during pregnancy helps the mother to gain extra weight that ensures normal weight of the baby at the time of birth.



Poor nutrition of pregnant women, especially those who continue work and have little rest, can lead to abortions, miscarriages and stillbirths. Dietary deficiency can also lead to deformed foetus, or at least less than the normal weight that can itself be the cause of many complications.



In Pakistan, like many other developing countries, 50 to 75 percent of pregnant women suffer from anaemia due to deficiency of iron, and also deficiency of vitamin A and C. In order to prevent these deficiencies it should be ensured that the mother gets balanced diet that should include milk, eggs, white-grain, wheat, rice and pulses. In addition, if there are signs of anaemia, daily intake either amaranth or fenugreek should produce quick results.

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Lactating Mothers. The nutritional needs of lactating mothers are even greater than those of pregnant women for the simple reason that they have to breast feed the baby (who should have nothing but mother's milk for the first three months) and also recoup the losses of nutrients during pregnancy and the loss of blood during childbirth. Best foods for lactating mothers, and also for pregnant women, are those that are easily digestible. These include milk, soft-boiled eggs, pulses (especially moong), vegetables, (especially those that can be eaten raw e.g. tomatoes, green pepper, carrots, onions) and boiled rice and moong (*khichri*) with yogurt.

Infants. If the mother has enough of breast milk, no other food or supplement, not even water, is needed during the first six months. However, if the nutrition of the mother is very poor, the baby can suffer from the deficiency of vitamins and minerals. In such a situation the baby can be fed yogurt, very soft fruit or mashed potatoes even after 3 months of birth rather than 6. Later, and up to 2 years of age, the baby can be fed *kichri*, soft-boiled eggs, soft minced meat, and easily digestible fruits like soft bananas, mangoes and papayas, in addition to breast milk.

School-age Children. It is not always easy or possible for mothers to cook fresh food for the children early in the morning before they go to school. In such cases rice or bread (*chapatti*) left over from the previous day should be served with milk or yogurt sweetened by brown sugar (*gur*). Eggs too are a good source of protein and other nutrients to begin the day. At midday or in the late afternoon (if the family takes only two meals a day) whole-grain cereals and a dish of pulses, or vegetables would be a good meal. Those who can afford may have meat or poultry twice or thrice in a week or even more frequently. Rice cooked in *gur* and blended with milk makes an easy and nutritious food.



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At midday or in the late afternoon (if the family takes only two meals a day) whole-grain cereals and a dish of pulses, or vegetables would be a good meal. Those who can afford may have meat or poultry twice or thrice in a week or even more frequently.


Young Persons. Young persons, especially those engaged in hard physical work, need a lot of energy and strength. It means that they need more of everything i.e. fats, carbohydrates, proteins, vitamins and minerals. They also need to take three good meals everyday or, better still, four or five smaller meals to avoid overloading the digestive system with one or two big meals. They, men and women, need substantial quantities of all the necessary nutrients to maintain their health and strength. In the last chapter we will discuss how even the poor people can get all the necessary nutrients, in the required quantities, with no extra burden on their financial resources.

Older Persons. After a certain age, not earlier than about 45, we need to reduce the quantity of food intake, for the simple reason that older people need nutrients only for maintenance and repair or renewal, but not for growth, as younger people require. Older people also need to avoid, or at least substantially reduce, such foods that cause or worsen the diseases associated with old age, such as arthritis, hypertension, heart diseases and digestive problems. It is better, therefore, to avoid meat, beef, things that are fried, or not easily digestible. Older people should eat more cereals, milk, yogurt, eggs, fruits and vegetables, especially those that can be eaten raw like carrots, peas, green pepper (very rich in vitamin C), tomatoes, beets, onions, cucumbers etc.

Caution: persons suffering from arthritis should avoid tomatoes as it can interfere with the absorption of calcium.

In the last chapter we shall suggest ways how the households with smaller financial resources can meet the requirement of all the essential nutrients with only little more effort, imagination and dietary discipline.

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Chapter 7

Cooking of Food



Cooking of Food

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The process of cooking begins with the selection of the utensils in which the food is to be cooked. What is important from the point of view of health is the material, which the utensils are made of, because some materials can be toxic if used regularly.

We need to know some basic facts about the methods of cooking that determine the retention or loss of the nutrients contained in the food in its natural state.

Ever since the invention of cooking that followed the use of fire by humans, the range of dietary options increased manifold to include things, especially animal flesh, that the human digestive system is not designed to assimilate in raw form. The other advantage of cooking is that it kills organism that causes infection. But cooking, especially the wrong method of cooking has its disadvantages also.

The process of cooking begins with the selection of the utensils in which the food is to be cooked. What is important from the point of view of health is the material, which the utensils are made of, because some materials can be toxic if used regularly. The materials that can cause toxicity are brass, copper and aluminium. Copper is an essential nutrient, but only in very small quantity. Even small excess of copper can cause such disorders as depression, arthritis, hypertension and heart attack. Utensils made of copper and of brass, which is alloy made of copper and zinc, should, therefore, be avoided for cooking purpose. Utensils made of aluminium, though very common, are also not safe as aluminium can find its way into the food through erosion of the utensils in the process of cooking. This is bad for health as aluminium disturbs the calcium-phosphorus balance, causes loss of vitamin B-1, and increase in aluminium salts that can accumulate in the brain and affect memory. Pressure cookers, made of special quality of aluminium, are comparatively safe.

We are now left with utensils made of iron, steel, tin, nickel, and glass. These are safe, but the metal utensils can heat up the food to a very high temperature that can destroy many nutrients, especially vitamins. Care should, therefore, be taken not to let the food get over-heated while using utensils made of iron, steel, tin and nickel. Finally, we



should not ignore the oldest, and for some purposes, the best, class of utensils, that is, earthenware. Foods cooked in earthenware taste and smell much better, never heat up to temperatures reached in metal utensils, and nothing toxic is introduced in the food due to erosion of the utensils. However, since the surface of earthenware is not smooth, cleaning them needs more effort. This problem can be solved by using enamelled earthenware, provided the enamel does not contain lead which is highly toxic. This precaution applies to all enamelled utensils.

Next, we need to know some basic facts about the methods of cooking that determine the retention or loss of the nutrients contained in the food in its natural state. Except fruits and some vegetables, all foods need to be cooked. Cooking makes meat, cereals, and high-starch foods (e.g. rice, wheat, potatoes) digestible. Each method of cooking has its advantages and disadvantages that are as follows:

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Eggs need special mention as it is being suggested in the next chapter that eggs are the best, cheapest, and more easily available source of almost complete food. The best way to cook eggs is to have them boiled. This leaves all the nutrients intact. Next best method is to have them lightly fried in water that is already hot. But omelettes, the most popular form of cooking eggs, cannot be ignored. All that we need to do while making omelettes is to use very small quantity of vegetable oil and lightly fry the mixture of eggs, vegetables and spices.

Frying

This method consists in letting the food simmer in very hot fat or oil till it becomes soft enough for eating, and is made more tasteful by homogenising the taste and aroma of all the ingredients. However, frying is not the best way of cooking as it results in significant loss of vitamins and minerals. Frying in animal fat is even worse as it makes the food difficult to digest, apart from causing harm to the cardiovascular system. Best way to fry is to use vegetable oil and not to let the food simmer at high temperature for longer than necessary.

Roasting

This process is similar to frying to the extent that melted fat is sprinkled over the meat to prevent loss of juice and drying up. It is a little better than frying as fat does not penetrate the substance so deeply as in frying.

Boiling

This is the best way of cooking for retention of the nutrients if the water is not thrown away as the soluble proteins, vitamins and minerals pass into the water. The best way to cook is by steaming with closed lid, allowing the water and steam to be absorbed by the food. This method is especially suitable for cooking rice. The usual method where water is drained out results in loss of some proteins and minerals, and all of vitamin B-1 (Thiamine) B-2



(Riboflavin) and B-3 (Niacin)

In conclusion, the best ways of cooking, for different kinds of food, can be summarized as follows:

- Vegetables that can be eaten in raw form (e.g. tomatoes, green chillies, onions) should usually be eaten in raw form. The vegetables that need to be cooked should be lightly boiled with closed lid, and never fried.
- Meat may be fried or roasted, but frying or roasting should not be longer than absolutely necessary.
- Eggs need special mention as it is being suggested in the next chapter that eggs are the best, cheapest, and more easily available source of almost complete food. The best way to cook eggs is to have them boiled. This leaves all the nutrients intact. Next best method is to have them lightly fried in water that is already hot. But omelettes, the most popular form of cooking eggs, cannot be ignored. All that we need to do while making omelettes is to use very small quantity of vegetable oil and lightly fry the mixture of eggs, vegetables and spices.

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Chapter 8

Improving household food supply



Improving Household Food Supply

CHAPTER 8

It has been said that all undernourished people are not poor, but most of the poor people are undernourished. Poverty is, thus, the basic cause of undernourishment.

It has been said that all undernourished people are not poor, but most of the poor people are undernourished. Poverty is, thus, the basic cause of undernourishment. This is stating the obvious. But the obvious has to be kept in view to bring into focus the context in which the problem of under nourishment has to be understood and solved. In other words it is not enough to explain the benefits of the nutritional value of meat, milk, fruits, vegetables, and other nutritious foods. Since poverty is the basic cause of under nourishment, the correction of the deficiency must be made feasible within the given resources of the people who are handicapped by their insufficient financial resources. With this purpose in view, an effort has been made in this chapter to identify the foods that are easily available, comparatively inexpensive, and can meet all the nutritional needs of a healthy human being.

Next, lack of knowledge about nutrition is also a cause of nutritive deficiency, but it is more a cause of malnutrition than under nourishment. Moreover, it is not a problem of only the poor sections of the society. In fact persons belonging to the affluent classes have a greater tendency to eat the wrong kinds of food, and produce more noticeable examples of what has been described as over-fed and undernourished people. This handbook provides some basic information about the wrong kinds of food and wrong methods of cooking. This information is useful for the rich and the poor alike.

The third most important cause of under nourishment is the imbalance between the expenses on two kinds of foods, that is:

- i) Foods and drinks (e.g. milk, eggs, fruits and vegetables) that are needed by the body for growth, repair, maintenance and



immunity from diseases.

- ii) Foods and drinks (e.g. sweets, soft drinks and tea) that are not a nutritional requirement, but a compulsion of habit, custom or borrowed taste or craze, and can even be harmful.

As we shall see later, in this chapter, even poor people waste incredibly large portion of their expenses on food, on what can best be described as junk food or things that are not merely junk but a serious health hazard.

This in brief, is the socioeconomic context within which we have to find ways and means of improving household food supply, especially in rural area, for that segment of the society which has very low purchasing power.

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Best and the cheapest food

Now, let us begin with the identification of the foods that are easily available, comparatively less expensive, and provide all nutritional needs. If you look at the chart given at the end of the previous chapter and list out the most nutritious of the foods, you will notice that, apart from fats and water, all the nutritional needs can be met by just five foods that are found, and can be produced, in abundance. These are: *wheat, rice, pulses, milk and eggs*. Meat and vegetables, if cooked properly, and fruits, are good and tasteful addition to one's diet if one can afford, but are not essential for meeting the requirements of a healthy body. It is, therefore, necessary that the daily diet of an adult should include these minimum quantities of the four basic foods:

Flour or rice	6 chapattis or 2 plates of rice
Pulses	2 plates
Milk (or curd or lassi)	2 glasses
Eggs	1 or 2

Those who can afford may have meat and vegetables, in place of pulses, for two or three times in a week. Persons doing hard physical work for long hours, and pregnant and lactating women need more than the minimum recommended above. Fruits are always a welcome and useful addition, but there is no minimum requirement. It all depends upon what one can afford what one likes and what is available.



Increasing food supply

Of the five basic foods (i.e. wheat, rice, pulses, milk and eggs) two are such that each household, at least in the rural areas, can have its own supply of them. Those two are: milk and eggs. Buffaloes, cows and goats, the common sources of milk, are already available in fairly large numbers. The rural households have the choice, depending upon the income of the household, to breed or purchase more of these animals, to ensure that each member of the household does get the minimum recommended quantity of milk, curd or *lassi*. Dairy farming at the collective community level is yet another option as a source of income and of nutrition to the community as a whole.

Next, eggs, the best source of protein, vitamins and much else, are also the cheapest source of high quality nutrition. As in the case of milk, the availability of eggs has to be increased within the household itself and also, through poultry farming, at the community level that would provide yet another source of income as well.

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The rural households have the choice, depending upon the income of the household, to rear or purchase more of these animals, to ensure that each member of the household does get the minimum recommended quantity of milk, curd or *lassi*. Dairy farming at the collective community level is yet another option as a source of income and of nutrition to the community as a whole.

There is a possibility of low-income households diverting a significant amount of their financial resources on nutritious foods and drinks rather than those that are harmful.

It would, thus, be seen that the best sources of high quality nutrition are already available to the rural population. All that we have to do is to increase their quantity at the individual and the community level.

But this is not all that we can do. Fortunately nature has provided a way to increase the nutritional value of all seeds (which include wheat, rice and pulses also) without increasing their quantity! The method requires a bit of effort, but is quite easy. The method consists in germinating or sprouting seeds in a container, without soil or fertiliser. This increases their food value to incredible levels. Experiments have shown that during germination vitamin C, content of soyabeans increased 550 percent. And in dried peas increased by 69 mg. per 100 grams in 48 hours: Vitamin B2 in oats increased 1350 per cent in 5 days; folic acid increased four times in wheat, as did other B Vitamins in large amount; in moong also the increase was significant. These are only some examples, but the principle is the same, that is, sprouting arouses the latent food value of all seeds to an incredible extent. The sprouted seeds can be stored for weeks, and be cooked as porridge, *kheer* or *halva*.

Method of sprouting seeds is simple: wash the seeds and soak them in water overnight. Next day transfer them to a tray and cover them with a moist cloth or paper. Keep them away from light for a few days and keep the cloth damp all the time. Pulses take 3-4 days to sprout and wheat 2 days.



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Additional resources for food

It is a relevant and common concern that a large number of households, especially those 30 percent that are living below the poverty line, cannot have access to a minimum daily nutrition, as they cannot afford even that kind of economical foods, which have been identified earlier in the chapter. There is a solution to that problem also, within the given resources of low-income households.

According to a short survey conducted by the TVO the expenses on tea (tea-leaves, milk, sugar and fuel) and soft drinks even in the case of low income households work out to an average monthly expenditure of about 1500 to 2500 rupees. This does not include expenses on many other things that are not only unnecessary but even harmful, such as cigarettes, *pan* and *niswar*. It means that there is a possibility of low-income households diverting a significant amount of their financial resources on nutritious foods and drinks rather than those that are harmful.

While it is not easy to give up cigarettes, *pan* or *niswar*, because these are addictive, it is quite easy to use inexpensive substitutes for tea and soft drinks. These substitutes are:

- It so happens that the best substitute for the imported tea is the home grown tea. Lemon grass, which is a shrub, can be grown anywhere. It needs little attention and its prunings can be used. It has good taste and aroma and does not need milk. Salt can also be used in place of sugar that can cause no less ailments. Perhaps it will not be feasible to give up the usual tea, with milk, at breakfast, where the food is such that tea cannot be eliminated, but during the rest of the day and for guests, a good and beneficial substitute.



- The substitute for soft drinks is equally easy and beneficial. The



best substitute (apart from *lassi*, *sherbut* and *suttu* etc) is home made lemonade. Lemon plants can be grown even in the houses, and can supply the entire requirement of lemons for the household. All that has to be added is water and sugar. Rural communities can even have their own supply of the best sweetener in the world, honey, by having their own bee-colony. Even more feasible than bee keeping is local manufacture of gur, which can easily be done by the rural communities.



In conclusion, we can say that good and complete nutrition is within the given financial resources of low-income households if the following steps are taken:

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- All members of the family, especially the children, must be given the minimum daily combination of the most economical and nutritious foods described in this chapter. Those who can afford can have meat, fish, fruits and vegetables in place of or in addition to the foods suggested.
- By reducing or eliminating expenditure on unnecessary and harmful food or drinks a household can save at least Rs. 1500 a month. This can buy more than 12kgs of meat, or about 38kgs of pulses, or about 150kgs of *atta*!
- An ideal, though easy and inexpensive, arrangement would be to have one's own supply of milk, eggs, tea (green tea) and honey.

Any household that can implement all the three recommendations can enjoy the benefits of the most nutritious foods in the world without spending more on foods that it does now. Thus, good and optimum nutrition is within the reach of even low-income households.



Annex I

Compost Making



Compost Making

What to Compost

A great variety of things can be composted at home, reducing garbage and turning them into valuable soil enrichment for home use. Usually those materials, which are capable of being decomposed can be used for composting. The following is the list of some of the different green and dry material that can be composted. It is not a complete list. Other materials may also be added.

Greens

- Green Leaves
- Weeds collected after weeding
- Vegetable/fruit peels and scraps
- Spoiled food
- Green grass clippings
- Tea bags
- Egg shells (crushed)
- Cooked rice
- Flowers

Dry (carbon rich materials usually are dry)

- Dry leaves of trees and sugarcane
- Dried brown grass clippings
- Bark chips
- Rice and wheat straw including bhoosa
- Rice brawn
- Pruning and cuttings of trees and plants
- Bird cage cleanings
- Sawdust

Materials to Avoid

Avoid composting following materials as they are very attractive to pests and cause odours.

- Meat, bones and fish scraps
- Dairy products
- Fatty/oily foods including butter and oil
- Weeds with mature seeds
- Pet wastes
- Plants and grass clippings that have been treated with chemicals
- Charcoal and coal ashes



How to Compost

Generally there are two popular methods of composting. They are through building **heaps** or digging **pits**.

Heaps

There are a number of things to keep in mind when constructing a compost heap. To begin with, the aim of composting is to produce partially, not totally decomposed humus. Compost is applied to the soil to finish the breakdown process as it is this dynamic rotting action which does the most good. The breakdown of compost is largely carried out by a whole host of organisms, ranging from bacteria to earthworms. To be active these creatures need an environment that is **warm and moist with plenty of air**.

Size of Heaps: The size of the heap is important as there must be enough bulk present to promote really hot temperatures in the center of the pile. The minimum dimensions of the heap should be 6ft wide and 5ft high, and it can be of any length.

Method of Making Heaps: Place a six inch layer of coarse vegetation at the bottom to act as a ventilation channel and cover this with a two inch layer of manure (but only 1 inch if poultry manure is used because it is so strong). If manure is not available, municipal compost, sewage sludge can be used as an alternative. Over this sprinkle water and 1/8 inch layer of earth and limestone. Repeat the layers: six inch plant material, two inch manure, a liberal sprinkling of earth, until the heap is 5ft high. Press the sides of the heap down as you are building to stop wind blowing through it and excessive cooling and drying it down. Finally cover the whole heap with earth, wheat or rice straw or hay to conserve the heat and moisture. The heap is turned and mixed all together after three weeks and again after three weeks. The compost should be ready to use about three months later.

The 14 day Method

The compost can also be prepared much quicker than above method. The secret of this speedier process involves the shredding up of all the material that goes into a compost pile. Because particles are smaller they are broken down quicker with fewer nutrients being lost. Shredded heaps are better insulated, aeration is improved and, because chopped up material retain moisture easier, even in hot summers.

Using this method, the wastes are not layered, but are all mixed up together, and moistened. Manure is essential for rapid breakdown, although other



matter rich in nitrogen can be used. The pile is made 5ft high and turned every three days to thoroughly aerate it. Shredded compost is high and fluffy and easily mixed. After a fortnight the temperature drops and the compost is then sufficiently decayed to apply to the soil where the composting process is continued.

PITS

When we do not want an untidy pile above ground or where place is limited a compost pit dug into soil forms a suitable container. Pits are efficient because they help off the wind and rain and the soil acts as an insulator. This is good in cold weather because surface heap slows decomposing during winter months. The pits once filled with waste material should be covered with wheat or rice straw to act as an insulator, and finally with polythene to protect it from rain.

Pits can be dug according to space and material available. However, at farm level the ideal size should be 30 ft long, 14 ft wide and 3 ft deep. In pits deeper than 3ft, the process of decomposing is much slower. The pit should first be filled with a 6 inch layer of dried grass or rice straw sprinkled with animal urine and a thin layer of soil. This should be repeated till the pit is filled one foot above the surface. For good composting the important thing is that materials in a pit need proper moisture and ventilation.

Farmers can use all kind of farm wastes and residues, such as, manure, poultry droppings, dried leaves of sugarcane, weeds, rice and wheat straw and tree leaves etc. including solid waste for composting.

How do we know that the Compost is ready?

Compost is ready to use when it is soft and has a rich dark colour. If examined closely individual plants may be seen. It should also smell "earthy" rather like damp forest soil, but if it is heavy and tightly packed and smells musty it has not broken down enough.



Annex II

Sanitation



SANITATION

In this annexure sanitation is dealt with under three broad categories, that is, (a) household latrines, (b) community latrines, and (c) drainage system. It contains suggested designs and estimated costs of the sanitation systems for the disposal of human excreta and for drainage system for the disposal of liquid waste and rainwater in the streets.

(A) HOUSEHOLD LATRINES

There are at least five different designs for household latrines, among them Pour Flush Latrines provide good service (privacy and few odors) at a reasonable cost. Design and cost estimate of pour flush latrine is as follows:

Design Procedure:

Twin pit latrines are a low cost latrine and, as the name implies, 2 pits are dug for this type of latrine. The size of each pit is 5' in depth x 3' in diameter. Brick walls of thickness of 4-1/2" are constructed in a honeycomb shape around the pits. The purpose behind the construction of the brick walls is to keep the mud from falling.

A platform for the Water Closet (size 3' x 3') is constructed where one commode and one trap (size 4" dia) are fixed with cement and sand. The water closet is connected through a PVC pipe measuring 10' x 4' to a junction box measuring 12" x 12" which is connected to the pits through a similar PVC pipe (see illustration).

One pit is used for storage of human excreta while the other pit is blocked. When the first pit is filled the other comes under use. After a period of one year, the first pit should be emptied. The wastage from the emptied pit can be used as manure in the field as there are no bacteria in that wastage. One pit can be used for several years depending on the number of users.

The pit of the Twin Pits Pour Flush Latrine should be at least at a distance of 15 metres from open water.

This type of latrine however does not contaminate the underground water of bore hole even if the pits are near the bore hole.

ESTIMATED COST FOR ONE POUR FLUSH LATRINE

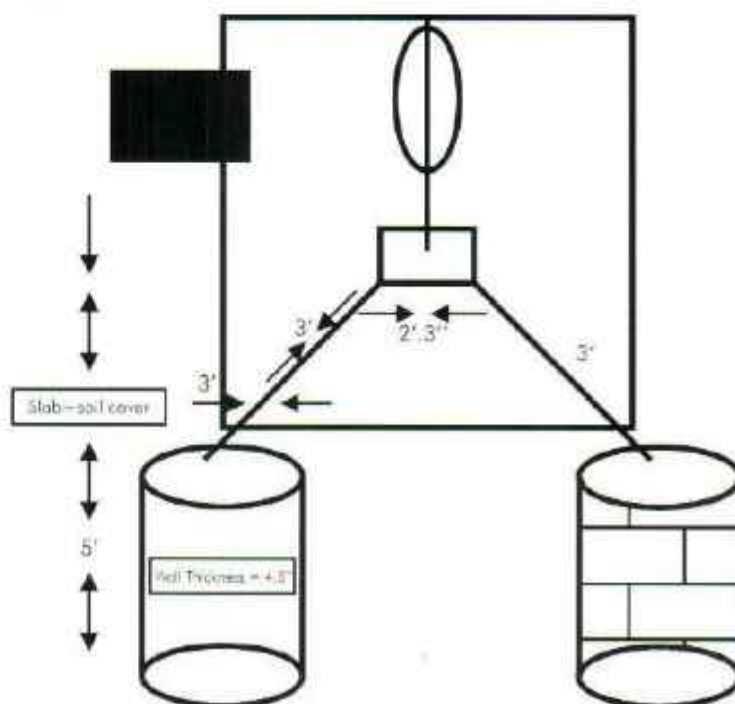
Items	Rate
Pan & Seal	250
Flushing Pipe	230
Cement (Two Bags)	500
Mason Wages for 03 days @ Rs. 250/day	750
Labor Wages for 03 days @ Rs. 120/day	360
Bricks 500 # (@Rs. 1200/1000)	600
Sand & Gravel	300
Round Slabs for Pits	450
Labor for Digging of Pits	200
Superstructure including roof and door	4,000
Total	7,640

Note: Rates of material and labour charges may vary due to inflation and area.



POUR FLUSH LATRINE

Superstructure



No. of Bricks = 500

Flushing Pipe =

10 ft (4 in. Dia)

(B) COMMUNITY LATRINES

The closed latrines from outside the houses are an alternative into household latrines where provision of latrine for each house separately is non-feasible. A closed latrine has a platform of slab with a hole in it and a lid over the hole. The slab can be made of wood or cement. Cement is better because the slab fits more tightly and will not rot.

One way to make a closed latrine:

1. Dig a shallow pit, about one meter square and 7 cm deep. Be sure the bottom of the pit is level and smooth.
2. Make or cut a wire mesh or grid 1M Square. The wires can be $\frac{1}{4}$ to $\frac{1}{2}$ cm thick and about 10 cm apart. Cut a hole about 25 cm across the middle of the grid.
3. Put the grid in the pit. Bend the ends of the wires, or put a small stone at each corner, so that the grid stands about 3 cm off the ground.
4. Put an old bucket in the hole in the grid.
5. Mix the cement with sand, gravel and water and pour it until it is about 5 cm thick.



(with each shovel of cement mix 2 shovels of sand and 3 shovels of gravel)

6. Remove the bucket when the cement is beginning to get hard (about 3 hours). Then cover the cement with damp cloths, sand, hay, or a sheet of plastic and keep it wet. Remove slab after 3 days.

If you prefer to sit when you use the latrine, make cement seat like this: Make a mould, or you can use 2 buckets of different size, one inside the other.

To close the latrine, the slab should be placed over a round hole in the ground. Dig the hole a little less than 1 meter across and between 1 and 2 meters deep. To be safe, the latrines should be at least 20 meters from all houses, wells, springs, rivers or streams. If it is anywhere near where people go for water, be sure to put the latrine **downstream**.

Keep your latrine clean. Wash the slab often. Be sure the hole in the slab has a cover and that the cover is kept in place. A simple cover can be made of wood.

S/No.	Items	Rates	Total Expenditure
01	Excavation	31 Cft @ Rs.01	Rs. 31
02	Brick Wall	29.25 Cft @ Rs.43	Rs. 1257.75
03	R.C.C. slab	1.75 Cft @ Rs.55	Rs. 960.25
04	Steel 1/2"	12 Kgs @ Rs.21	Rs. 252
05	Asbestos Pipe 2"	8 Rft @ Rs.15	Rs. 120
06	Roofing (Steel)	12.25 Sft @ Rs.105	Rs. 1286.25
	Total		Rs. 3907.25

ABSTRACT OF COST

Note: Rates of material and labour charges may vary due to inflation and area.

(C) DRAINAGE SYSTEM

Types of Sewerage Systems

A sewer is an underground pipe for conveyance of rainwater and sewage. There are two types of sewerage systems.

1. Separate System
2. Combined System

Separate System

A separate system is mainly used for the drainage of rainwater.



Combined System

The combined system is one in which surface drainage and rainwater is carried in the same channels as sewage.

STAGES OF LOW COST SANITATION PROGRAMME

Before starting any sanitation programme in an area the following stages are required:

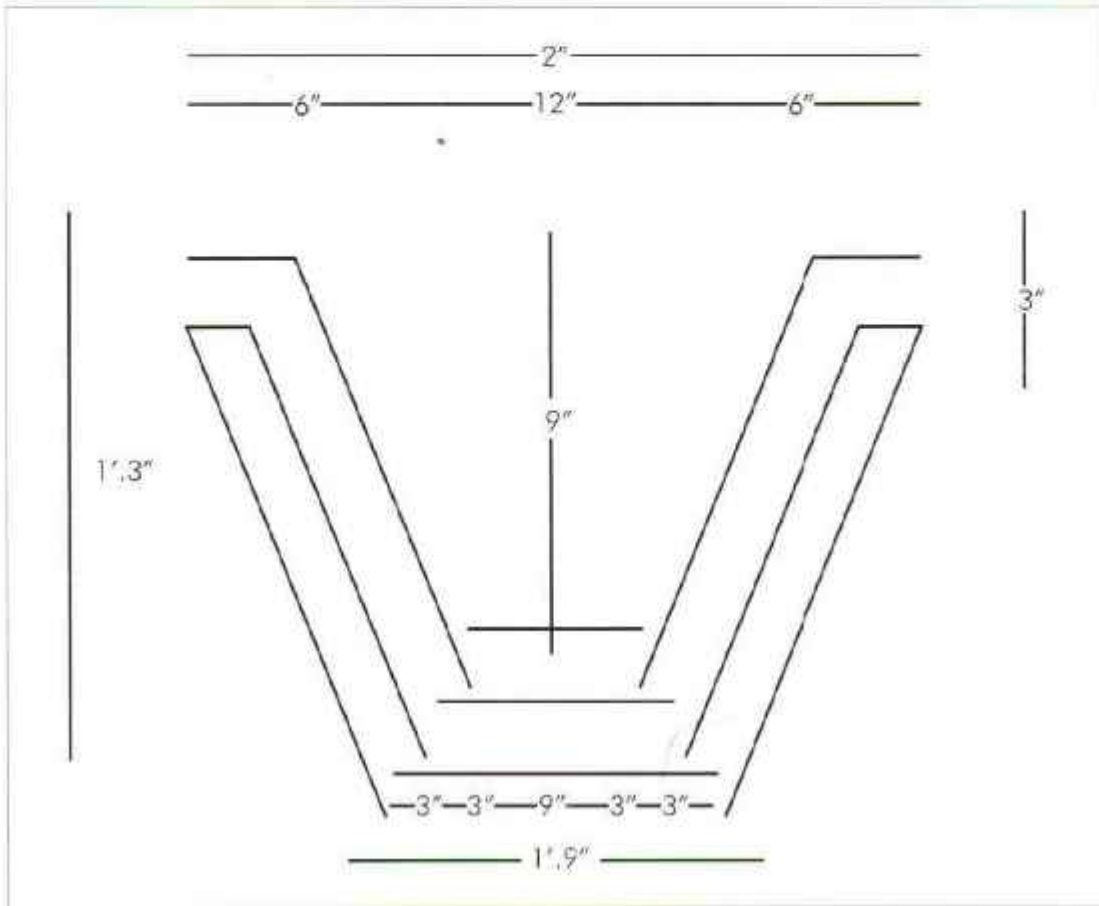
1. Detail survey and map of the area.
2. Total estimate of cost
3. Mohallah Committees for designing and maintenance of the sewerage system.

Design Procedure:

The process is initiated by digging the soil up to 1'-3" and filled with a layer of PCC (Port land Cement Concrete) to the ratio of 1 : 4 : 8 (1 ratio means one bucket of Cement, 2 ratio means two buckets of Crush and 8 ratio means eight buckets of Sand) mixed in the soil. The soil is dug for the sidewall and filled with a 3" layer of PCC to the ratio of 1:2:4. The house drain is then connected to a point where it will continue to flow to the main sewer or septic tank.

COST OF ESTIMATE

Sr.No	Item	Qty	Unit	Rate	Cost
01	Cement	26	Bag	220/Bag	5720/-
02	Sand	100	Cft	600 per 100 cft	600/-
03	Crushed Stone (Aggregate)	155	Cft	700 / 100 ft	1085/-
04	Mason Charges (01 No)	03	Days	250/Days	750 /-
05	Mazdoor (02 No)	03	Days	100/Days	600 /-
06	Excavation Charges of Mazdoor (01 No)	03	Days	100/Days	300/-
07	Transportation Charges (Lum sum)	-	-	-	2000/-
	Total				11055/-



"Cost of 100 ft Long Drain as per Drawing"

Note: Rates of material and labor charges may vary due to inflation and area.

SECTION OF THE DRAIN

For further information please contact TVO Regional Offices.

