ANALYSIS OF BRICK PRODUCTION UNIT IN PAKISTAN FOR OCCUPATIONAL SAFETY AND HEALTH

ENERGY EFFICIENT BRICK PRODUCTION ISLAMABAD PAKISTAN

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Analysis of Brick Production Units in Pakistan for Occupational Safety & Health

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DEFINITION OF KEY TERMS

Weaning of clay: Quarrying of day and letting it stay as such for 03-04 days
ARI: Acute respiratory Infections.
Pneumonia: Infection of the lungs.
Malaria: Fever with rigors due to infection caused by Mosquito
Dengue Fever: Fever with severe body pains due to infection caused by special Mosquito Aedes Aegepti.
Hepatitis: Inflammation of liver caused by different types of viruses.
Asthma: difficulty in breathing due to exposure to dust and other allergies.
Heat Stroke: High grade fever and infirmity caused by prolonged exposure to heat causing dehydration and imbalance in electrolyte and heat regulation Mechanism of body.
Bacteria: Small Microscopic organisms causing different diseases.
Virus: Very small organisms have seen only under electron Micro Scope causing mostly diarrhea and liver diseases.
Protozoa: Small microscopic organisms mainly causing abdominal diseases.
Neurosis: a form of psychological illness treatable.
Psychosis: a form of psychological illness refractory to treatment.
Dehydration: excessive loss of fluids and salts from body causing severe consequences.
Seizures: fits caused by Heat Stroke or cerebral disorders.
Alveoli: smallest linings of the lung where oxygen and carbon dioxide exchange takes place.
C.N.S: Central Nervous System consisting of brain, spinal cord and a complexity of nerves.
C.V.S: circulatory system consisting of heart, arteries, veins and small capillary carrying blood from heart to all body tissues and bringing back the dirty blood.
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G.I.T: Gastro Intestinal System starting from mouth, stomach, small & large intestines ending in anus for digestion of food and excretion of excreta.

Wheezing: Whistling sound during respiration mostly due to asthma.

Pneumoconiosis: diseases long capacity due to prolonged exposure to irritants such as silica, coal dust etc.

BTK: Bulls trench kilns is an open type brick firing structure which consists of the temporary elliptical trench shaped kiln (size ranging from 23-32 feet wide and 6.5-7.5 feet deep) and a pair of movable sheet metal chimneys (40-50 feet high). BTKs have been in existence in the Kathmandu valley since the early 1950.

Fixed Chimney: Fixed Chimney consists of open type kiln similar to BTK, usually in larger dimensions than BTK. They have fixed type chimney with height larger than BTK (65 – 120 feet). Two types of Fixed Chimney’s are in operation. FCs with Natural Draft and FCs with Forced Draft. In Natural Draft FCs there is no extra supply of air in the kiln, whereas in the Forced Draft FCs the air is passed mechanically for better combustion.
ACKNOWLEDGEMENT

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EXECUTIVE SUMMARY

Brick Kiln workers are exposed to numerous hazards and are often not realized as the sector being informal through most of the South Asian countries. There is no concept of occupational health and safety for them and most of their occupation and living on the kiln is dependent on the whim of the brick kiln owners with whom they have a varied relationship mostly in the form of bonded labor.

The study commissioned by EEBP is the very first of its nature on the brick kilns particularly in Pakistan. The study team through conducting interviews and question answers, filling a questionnaire technique visited brick kilns in Punjab and NWFP. A total of around 10 brick kilns were visited and data was gathered from the different categories of labor, munshis and owners of the kilns.

The study revealed the occurrence of respiratory, intestinal (related to bad quality of drinking water) and skin disorders with 70% prevalence in sick workers. The poor sanitary conditions at the owner provided residences also add to the miserable and pathetic conditions, brick workers are facing and contribute to their low output during the brick making. The workers generally are classified into different categories, each category having its own problems and issues. The majority of workers, who are moulders are faced with problems on sanitation and exposure to heat as they have to work bare footed on the scorching heat. A simple arrangement of a shed would serve the purpose if the kiln owner is aware and realize the value of such measures for the wellbeing of his labor force. The fire masters are constantly facing the heat from the firing of the bricks and they have to work in excessive heat environment and dust which pose a high threat to health and impeding their work.

The study team has made an effort to bring about maximum possible information from the interviewed persons however for additional information a help has also been sought from similar OSH situations in other regions.

Bricks have been around for a few thousand years. There is a huge demand for bricks in the construction industry of both developed and developing countries, and brick making remains one of the largest Employment generating industries in most developing countries. Brick kilns can be classified into three categories based on production Capacity: Small, Medium and Large. Small kilns are known as clamp kilns and are located mainly in rural areas. Medium and large kilns are of Bull’s trench kiln (BTK) type and are generally located near urban and more densely
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populated rural areas. The overall brick productivity of developing countries in Asia still lags far behind that of the developed countries, mainly due to the Predominance of labor-intensive, small-scale handmade techniques and outdated production technologies. The brick making technology varies widely from simple hand making to sophisticated computer-based systems. The capital cost, labour requirements and the quality of products also vary according to the technology used. The labour ratio of small-scale manual traditional brick making technology is about 8-10 times higher than a moderately mechanized factory.

The objectives of the study were: -
- To access the occupational Health Hazards
- To access the living conditions of the Brick workers with respect to Health, Education access to housing, sanitation and clean drinking water.
- To study in detail the diseases amongst different type of work force.
- To identify strengths, weaknesses, potentials, pressing needs as felt by the workers in the context of improving their living and working conditions
- To suggest interventions, strategies and activities to being sustained change in the lives of workers.

The study was carried out using samples from three different parts of the country representing three different cultures and backgrounds. One from Frontier employing typical Pakhtoon labor predominantly Afghans having different set of cultural and traditional background. The other Cluster was taken from Fatehjang having mixed pakhtoon and Punjabi culture and lastly around Rawalpindi having predominantly Punjabi culture with associated vices and difficulties.

The study was mainly focused on the Occupational Health and environmental health of the workers though sociology and educational issues also intermingled with the main crux of study. It discussed in detail the various aspects of hazards, suggested cheap and effective interventions to mitigate the sufferings of the workers and also briefly suggested way forward for the

Government NGOs and entrepreneurs which could very easily be employed in the given circumstances.
INTRODUCTION

Brick making is traditionally an informal sector with or no legislation to control the production, environmental issue, occupational health issues, and educational issues. Field interviews have suggested that there are around 10,000 Brick Kilns in Pakistan, employing at least one million labour, most of these are unskilled Brick makers and excluding NWFP and Baluchistan about 25% of the labour consists of women and children which though not directly involved in brick making are definitely a force without which the Industry would not survive. Most of the labour in NWFP consists of Afghans while they are mixed in Punjab and predominantly low Caste “Musallis” in upper and southern Punjab. While the fire masters or Jallai wallas are predominantly from Kashmir.

As is traditionally thought and reported in the press and Electronic Media, the labour in the Brick Making is not BONDED rather the labour should conveniently be classified as DEBT-BONDAGE where large advances are secured by the family members for the work done which they find difficult to return and hence the whole family is effectively pledged into Debt Bondage. Lack of education, awareness and low income remains primary reasons for Debt Bondage. It is because of these reasons that the labour is exposed to occupational hazards, which will be discussed in detail in this study. The Government should be blamed for this, both Federal and Provincial, for their apathy towards this sector which according to an estimate is providing 1.5% of GNP. There is no legislation in the first instance and it there is any there is no will on the part of Government to enforce the legislation which shall be discussed in some detail in this study.
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BACKGROUND

Brick making in Pakistan is using the techniques that were used centuries ago. These techniques are energy inefficient, environmentally dangerous, labour intensive, economically non viable and last but not the least are putting the human beings to the occupational hazards that are dangerous to their lives and which can easily be averted with little modifications and interventions. Although not within the scope of this study there are issues such as environmental pollution this industry is contributing, child labour that is being directly and indirectly promoted, the psychiatric and Social Problems etc. One of the major problems with this Industry in that it has not yet been recognized as Industry which has resulted in the Industry being run by families who are not interested in change or if interested in change as Mechanization etc do not have enough resources at their ends or are not facilitated by any donor agency in fulfilling their dreams.

METHODOLOGY

The following methodology was adopted for the study.

a. Briefing the purpose of study.
b. Design of study methodology and questionnaire in consultation with the stake holders.
c. Meeting the entrepreneurs, workers.
d. Group discussion with the different types of labors.

The study was based on a questionnaire developed and onsite interviews done with the stake holders. Four clusters were chosen consisting of 10 brick kilns each at Peshawer Azakhel at Nowshera Fatehjang at Attock and the vicinity of Rawalpindi. Detailed discussions were done and all the major stake holders were interviewed and taken on board.
FINDINGS OF THE STUDY

CASTE

Most of the brick workers represent the oppressed and down trodden faction of the society mostly low caste in the Punjab and Afghans in the NWFP and upper Punjab. Most of the afghans working in the upper Punjab have left for their home but the situation is different in NWFP where there is no scarcity of Afghan laboring. The Upper Punjab these have been replaced mostly by cheap labor from Bahawalpur who are not very skilled at Green Brick making but Still have filled the gap. The Afghan labor mostly is involved in Green Brick Making. While the fire masters predominantly were Kashmiries. From the survey it was revealed the economically well off and above average income group people are less inclined towards working in the Brick Kilns.

AGE STRUCTURES

Small Children adding their share of Labour in chilly morning note they are bare footed.

(Photo by Dr Sultan)
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Most of the workers engaged in the Kilns are above 25 years of age out of these there are around 35% women folk more so in Punjab. As per study the working age group is as follows.

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<td>Below 20 years</td>
<td>12%</td>
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<tr>
<td>20-25 years</td>
<td>22%</td>
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<tr>
<td>More than 25 years</td>
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The Nature of work distribution is also according to age group. The weaning, mixing and making of goblets of mud for the brick making was mostly carried out by the youth and women with youth we should think of young people from around 8 years of age to 16 years of age. Around 75% the molding and 80% of the transportation were carried out by men above 25 years of age.

SEX

Nothing is complete without support from the women force whether direct or Indirect (Photo by Dr. Sultan)

Around 70 % of the workers were males and the rest were females and children. The women and children though are not engaged in active roles mostly they play supportive role in assisting their male counter parts they carry water for mud preparation, pile up bricks for drying, prepare food etc some of these women do
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make bricks but their no is negligible and mostly they are involved in supportive role as described earlier. These roles through sound very menial but are important in their own right.

LITERACY LEVEL

Most of the workers in the Brick Kilns were total illiterates have no access to any kind of formal or informal education which indirectly is adding towards their miseries There is difference in approach of Afghan and local labor towards their every day problems and miseries due to cultural social and economic backgrounds. Afghans mostly are contented people with rich religious backgrounds not so in case of local labor.

YEARS OF WORK IN THE BRICK KILNS

Average number of workers employed in the Kiln with a capacity to produce 15000- 18000 fired bricks per day is his includes fire masters transporters and moulders is 85. They have been working with the kiln for about 12 years in average. Around 57 percent reported that they were involved for more than five years. In relative terms, majority of the transporters fell into this category compared to molder. They should not be labeled as bonded but rather be classified as Debt bondage described else where in detail in the study.
PROBLEMS ENCOUNTERED ABOUT THE WORK BEING UNDERTAKEN

The workers expressed two types of problems
(a) Related to the work, and
(b) Related to the living condition.
Some of the problems mentioned by most of them were as follows:

GREEN BRICK DAMAGES
The moulders are responsible for all damages of the green bricks until they are piled up. They have to bear 50 percent of the damages caused by rain or other factors even if the damage takes place after piling up. Unless the green bricks are stored or entered into the kiln for firing, the maintaining of the green bricks intact are supposed to be the responsibility of moulders. This is not the case everywhere rather the parties agree to the terms and conditions before the start of season the rates in such cases are bit higher in these cases and the moulders out of greed accepts the terms which later on proves disastrous specially in the rainy season. The counting is done by the Munshi in presence of Labor mate usually called Jamadaar.

NO WAGE RISE AS PER THE INFLATION RATE
The moulders and transporters share that they do not get increment in the wage rate according to price hike over the years. Contrary to this, they even do not know what rate would be applied for their payment when the annual molding and transporting bills are settled at the end of the season. The fire masters usually get slight increase in wages.

UNSAFE DRINKING WATER
There is no safe water supply system for the workers. Most of the sources used by the workers are polluted and hygienically not justified because of the practice of using unclean wells and seepage water. There is no system to check the quality of water at the working place. The workers do have the knowledge about the water pollution but because of illiteracy and lack of awareness they are not much bothered, else is described in detail under the heading of water pollution later in the study.
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INADEQUATE MEDICAL SUPPORT
The entrepreneurs provide very small support of up to Rs.200. for the medical treatment of workers in case of injury, while at work. The expenses exceeding this limit are provided by the entrepreneur as advance, which is then deducted at the time of final payment of their wage dues. Medical services offered vary according to the nature of work a worker does. For example, the entrepreneurs favor the transporters and firemen more than the moulders because of difficulty of getting adequate labour for these heavier work. The entrepreneurs argue that providing full cost of the medical service might be expensive for them to finance. The nature of work done by the molders and firemasters has its own peculiar pros and cons. Physically speaking the work done by molders seems heavier but then taking into consideration the extremes of temperatures the firemasters are exposed to their work seems more difficult. No worker has been insured under any social security scheme yet.

COMPROMISED PHYSICAL FACILITIES FOR LIVING
The low leveled ceiling of the houses without any exit for smoke has made the living place miserable for many workers. However, some of them consider that lowering of roof and holding smoke inside their room is important for them to keep the living place warm during the winter. Some women workers said that we are badly hit by the cold and they almost cry every morning during the winter as they need to mould the bricks in the frost. They said that people might die ten years earlier their age. They do not have toilets and are forced to go to the open field for defecation. Some workers were given wood by the entrepreneurs in the past. This was withdrawn after the price rise. The workers said that such withdrawal has added burden to their limited income. The price is not predictable because of occasional shortage of wood in the market. On the other hand, the price of wood has increased tremendously. Cow dung used to be the source for burning but not now for the reason that cow dung is mostly used as fertilizer.

NO SCHOOLING OPPORTUNITY FOR CHILDREN
Since the moulders and transporters migrate temporarily with their children, most of them do not send their Children to school. However, at the same time, majority of them feel that their kids should not get into the type of work they are doing. Despite such interest, many workers are using their children in the brick laying and
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drying work instead. The Kiln owners have shown interest to provide access to
education for some children, if the workers afford to free them from the Helper's
role during the parent's work. However, the owners have not gone so proactive in
this respect.

SOURCE OF ENERGY USED
Majority of workers uses wood as a source of lightening the house; with only 1
percent using the electricity. About 98 percent workers get support from kiln
owners on their light bills. Kerosene, fuel wood and unburnt coal brought from the
kin are major sources of energy being used for cooking. Majority of the worker
families use wood followed by kerosene oil. The use of particular type of energy
keeps fluctuating depending upon the availability of unburnt coal and fuel wood.
Kerosene is purchased only when there is no choice. Some families have access
to electricity facility, which is used only for light. Such families reported that they
have been using firewood for cooking because of high rise in both in the Kerosene
and electricity prices. Many workers did not have toilets. These toilets are for
exclusive use by the owners. Mostly the workers are not provided with toilets as
discussed in the later part of study Therefore, they made open field defecation.
The survey team found that the toilets built for the entrepreneurs were locked not
to allow the workers to use them

DISEASES OF COMMON BRICK MAKERS
The diseases common to the workers can be broadly divided into the following
categories according to the season.
   a. Diseases common round the year.
   b. Diseases common in winters
   c. Diseases common in summer
The diseases that were common round the year were
   i. Body pains & aches.
   ii. Back ache.
   iii. Diarrheas and Dysenteries
   iv. Fevers and Cough
   v. Generalized pains and aches
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4.3 DISEASES COMMON IN WORKERS ACCORDING TO THEIR JOB CLASSIFICATION

4.3.1 BRICK-MOULDERS

(Most of the moulders do not demand for the sheds for two reasons firstly they know it is very costly and the entrepreneur would not listen to their demand secondly it takes longer then usual time for the green brick to dry under shades than in the open which is not in the interest of the workers. Usually the moulders work for around 4-5 months during summer and about 2 months during winter. During rainy season they usually go back to their homes and sustain on whatever they have earned during the working season. Diseases common to women children and men is described in detail in the later part of study)

The Moulders constitute the maximum of the work force in the Brick Kiln, their works starts early in the morning and ends well after the evening, the average working hours of the molder was found out to be around 10-12 hours their work stated in early morning with brick making and continued till late afternoon. After taking some rest and food they again started their Work this time it was preparation
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of mud for the coming day. They all were assisted by the women folk and children. During the course of study following disease were noted most commonly

a) Cough and fever
b) Body pains and aches.
c) Diarrheas and Dysenteries
d) General fatigue and Malaise
e) Backaches.
f) Malaria and dengue fever
g) Hepatitis predominantly A

4.3.2 NIKASI WALLAS AND FILLERS
They are amongst the second work force in terms of man power but their workers start a bit late and end up early. Amongst the labour they are better paid. The most common diseases encountered in the order of frequency amongst these are

a. Fever and cough.
b. Backaches & pains
c. Diarrheas and Dysenteries
d. General weakness and malaria.
4.3.3 FIRE MASTERS

There is generally one fire master who is assisted by around 04-05 assistants. The fire master is the most important man in the process of Brick making as upon his skills rests the financial stability of the brick kilns but the working conditions of the fire masters can at the least be called worst. He has to work 24 hours a day in divided shifts. In adverse conditions especially in summers when outside temperatures so as to 55 oC and the temperature at his feet is generally around 250-400 C. He has to work in the main flue to shut down the side flues in the most hostile and adverse environment.

The diseases common to the fire masters and his community are

a. Fevers and cough
b. Asthma
c. Heat Exhaustion.
d. Body Cramps.
e. Backaches & Body Pains.
f. Diarrheas and Dysenteries
Based on the findings of the study, the disease common to the workers is broadly divided into the following.

4.4 FACTORS CONTRIBUTING TO THE CLASSIFIED DISEASES

4.4.1 PHYSICAL

The physical factors contributing towards the occupational health of the workers are

4.4.1.1 HOUSING AND RESIDENTIAL ENVIRONMENT

(The worse conditions the worker is forced to live. photo by Dr Sultan)
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In the modern concept, housing is more than the physical structure providing shelter. A more descriptive term is “residential environment”, which is defined as the physical structure that man uses for shelter and the environs of that structure including all necessary services, facilities, equipment and devices needed of desired for the physical and mental health and the social well-being of the family and individual (WHO TRS 225).

Housing is a complex process involving phases of public health, planning, architecture and engineering, economics and finance, cultural and social traditions, government and the behavioral sciences, so intertwined with one another that it is difficult to isolate a single element for study, analysis and discussion. It is a multi-sector, multi-disciplinary activity which needs co-operation and co-ordination among different agencies and authorities and different professional groups.

HOUSING AND HEALTH RELATIONSHIP

HOUSING AND RATE OF SICKNESS

It is a common observation that there is a higher rate of sickness in a poorly housed population than in a well-housed one. But a clear cut cause and effect relationship is difficult to establish for the following reasons: -

i. Housing (residential environment) embraces many facets of the total environment, each influencing health in a separate and sometimes different manner; e.g. bad sanitary conditions may cause disease, while inadequate illumination affects vision and may foster an increase in home accidents.

ii. Other socio-economic factors which influence health may accompany poor housing; poverty, ignorance, poor nutrition and lack of medical care. Lack of understanding of the unit of population that should be used as the basis for measurement; e.g. should it be the individual, the household, the community or any other unit.

iii. There is no unified system of measurement of the hygienic quality of housing on the residential environment.
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However, many studies in many countries have shown the relationship between some of the more simple matters of housing and health; and have demonstrated that a reduced incidence of illness or death occurs when the health hazard has been removed or its disease producing potential reduced e.g. reduction of enteric disease when a sanitary water supply is provided.

EFFECTS OF POOR HOUSING CONDITIONS

i. Physiological and Psychological
   It may not fulfill physiological or psychological needs of the workers: or undue stress may be placed on the corresponding responses:
   - Excessive noise, cold, heat or dampness.
   - Noxious odors
   - Poor lighting
   - Lack of privacy for the family or for the individuals within the family

ii. Disease Transmission
   It may encourage disease transmission:
   - Overcrowding and / or poor ventilation.
   - Inadequate or contaminated water supply
   - Defective sewage disposal system
   - Infestation with vermin
   - Attraction of insects
   - Communicable disease

COMMUNICABLE DISEASES

Improved housing condition reduces the risk of transmission of infectious diseases.

1. Air-Borne and Dust-borne Infections
   The elimination of overcrowding, especially the intensity of human contacts (e.g. bed sharing) and more specifically the improvement of air hygiene help to reduce the transmission of air-borne and dust-borne infections. (E.g. Tuberculosis, URTI, Severe Acute Respiratory Syndrome)
2. Water-borne and food borne infections

Improvement in sanitary facilities such as adequate and safe water supply and proper excreta disposal seems to have an effect on the spread of air borne and food borne infections. (e.g. Cholera, diarrheal diseases, food poisoning)

3. Animal-borne and Vector-borne Disease

Improvement in hygiene in and around the dwelling such as proper food storage, proper refuse disposal, assist in the control of infections transmitted by insect, vectors and rodents. (e.g. Dengue, Filariasis, etc)

4. Social well-being and Mental Health

There is a relationship between good housing and good mental health and bad housing and poorer mental health. Many aspects of housing such as crowded housing, excessive noise, shared accommodation, bad smells and dampness, give rise to considerable dissatisfaction, annoyance and stress, and may perhaps contribute to the development of interpersonal conflicts.

HYGIENE AND SANITATION

Sanitation is poor and even worse in the surroundings of worker settlements. Only 3 percent worker families have toilets. Nearly 15 percent children make use of these toilets, while others do not two reasons given for no use of toilets by the children were: congested space, dirty floor and observation of other people’s habit to use open places for defecation. For washing, bathing and cleaning kitchen utensils, most of the workers use water supplied for brick making. The kitchen utensils are poorly cleaned.

The kitchens are of closed type without enough smoke exhaust system. As result, the smoke has made most of their sheds almost black. Use of soap for washing hands before eating is almost non-existent. Most of the workers have their hands dirty with the remains of mud. Both drinking water and sanitation facilities in all the surveyed Kilns are poor.

4.4.1.2 Extremes of Atmospheric Temperatures

The human body usually can regulate its temperature. When the body gets too hot, it uses several strategies to cool down, including sweating. But if a person spends too much time in heat without taking in enough fluids, the body’s cooling processes can’t work properly. When the body becomes dehydrated, it can no longer cool
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itself by sweating. When this happens, body temperature can rise high enough to cause illness.

The first symptoms of heat illness occur as the body temperature climbs above normal, and can include headache, nausea, vomiting, muscle cramps and fatigue. These early symptoms sometimes are called “heat exhaustion.” If steps are not taken to reduce body temperature, heat exhaustion can progress to heat stroke. Heat stroke is a serious, potentially life-threatening form of heat illness. It occurs when body temperature rises to 105 degrees Fahrenheit or higher and one develops neurological changes, such as mental confusion or unconsciousness. At these high temperatures, body proteins and the membranes around the cells in the body, especially in the brain, begins to destroy or malfunction. The extreme heat can affect internal organs, causing breakdown of the heart-muscle cells and blood vessels, damage to internal organs, and death. There are two main causes of heat stroke:

- **Exertional heat stroke** occurs when someone is vigorously active in a hot environment, such as working in open fields by moulders and fire masters. It typically strikes young, otherwise healthy people, those least likely to be concerned about the effects of heat on their health. Because of the lack of concern, early symptoms may be dismissed or ignored.

- **Nonexertional heat stroke** tends to occur in people who have a diminished ability to regulate body temperature, usually older people, very young children or people with chronic illnesses. High heat in the surrounding environment as in kiln floor, without vigorous activity, can be enough to cause heat stroke in these people.

Factors that can contribute to heat stroke include:

- Dehydration from not drinking enough water
- Wearing bulky or heavy clothing, in the heat
- Being overweight, which causes the body to generate more heat and reduces the body’s ability to cool down (most of these factors are related to brick kiln workers except obesity which is found less in the workers and to some extent the use of medicines or Parkinsonism)
- Sleep deprivation, which can decrease the rate of sweating as working at nights by the fire masters
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- Some medications, most commonly antihistamines (taken for allergies), diuretics (taken for High Blood Pressure or leg swelling), laxatives (taken to relieve constipation), calcium channel blockers (one type of blood pressure or heart medicine), medicines for Parkinson’s disease, some diarrhea treatments and tricyclic antidepressants
- Having had heat stroke in the past
- Use of illicit drugs, including charas, heroin, etc

SYMPTOMS

Heat stroke can come on suddenly, but warning symptoms often appear first. They include:

- Abdominal cramps
- Muscle cramps
- Nausea
- Vomiting
- Headache
- Dizziness
- Weakness
- Heavy sweat or a lack of sweat

When heat stroke starts, neurological symptoms can include:

- Odd or bizarre behavior
- Irritability
- Delusions
- Hallucinations
- Seizures
- Coma
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DIAGNOSIS

A doctor suspects a person has heat stroke when the person has an extremely high temperature and typical symptoms. However, the doctor will examine the person and do tests to check for other possible causes of the high temperature. The doctor also will do urine and blood tests to monitor how well the kidneys are functioning.

EXPECTED DURATION

It is standard for a person with heat stroke to stay in the hospital for one or more days so that any complications can be identified quickly. Complete recovery from heat stroke and its effects on body organs may take two months to a year.

PREVENTION

Most cases of heat stroke can be prevented. When heat outside is especially high:

- Drink lots of water throughout the day.
- Wear lightweight, light-colored clothing, preferably with a loose-weave material that lets air get to your skin.
- Avoid strenuous activity in the hottest part of the day (between 10 a.m. and 4 p.m.) — If you must participate, take frequent breaks, limit the time that you wear a hat by taking it off between activities, and avoid wearing heavy clothing’s
- If you begin to feel tired, dizzy or nauseated, or if you develop a headache, get out of the heat immediately. Seek out shadow and or well ventilated place. Drink water. If possible, take a cool shower or bath or use a hose to soak yourself.
4.4.2 CHEMICAL

Pollution caused by Brick clamps

(Photo by Dr Sultan)

OCCUPATIONAL HAZARDS OF AIR POLLUTION

Urbanization is, as might be expected, associated with the ever-growing problems of pollution, studies have shown that there is a relationship between air pollution, urban residence and the occurrence of chronic bronchitis, asthma and dyspnea. Air pollution has an influence also on acute respiratory diseases. (e.g. London fog 1952, forest fire and Haze in South-east Asia 97) The photochemical smog pollution, caused by toxic fumes containing carbon monoxide, hydrocarbons oxides of nitrogen, and sulphur, is worsened by the inhalation of unburnt coal particles and carbon monoxide emitted by chimneys of the brick kilns. In some areas, industrial, rather than domestic or motor vehicle, fumes are the predominant features of the air pollution. Much Kiln pollution discharged into the atmosphere is deposited as particulate matter, and soils in the vicinity of kilns may, as a result,
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become heavily contaminated with certain substances. In addition, it may affect areas of land and render it unsuitable for housing or horticulture and agricultural activates. City dusts may contain considerable quantities of particulate matters, derived partly from motor vehicle exhaust fumes, partly from kiln emissions, and partly from decaying paintwork.

HUMAN RESPIRATORY SYSTEM

The health of our lungs and entire respiratory system is affected by the quality of the air we breathe. In addition to oxygen, this air contains other substances such as pollutants, which can be harmful. Exposure to chemicals by inhalation can negatively affect our lungs and other organs in the body. The respiratory system is particularly sensitive to air pollutants because much of it is made up of exposed membrane. Lungs are anatomically structured to bring large quantities of air into intimate contact with the blood system, to facilitate the delivery of oxygen. Lung tissue cells can be injured directly by air pollutants such as Dust, Obnoxious gases as nitrous oxide sulphur dioxide, Silica, high concentrations of CO2, metals and free radicals etc. Alveoli -- the individual air sacs in the lung where oxygen and Carbon dioxide are exchanged are the most susceptible. More specifically, airway tissues which are rich in bioactivation enzymes can transform organic pollutants into reactive metabolites and cause secondary lung injury. Lung tissue has an abundant blood supply that can carry toxic substances and their metabolites to
distant organs. In response to toxic insult, lung cells also release a variety of potent chemical mediators that may critically affect the function of other organs such as those of the Cardiovascular system. This response may also cause lung inflammation and impair lung function.

**STRUCTURE AND FUNCTION**

The human respiratory system is dominated by our lungs, which bring fresh oxygen ($O_2$) into our bodies while expelling carbon dioxide ($CO_2$). The oxygen travels from the lungs through the bloodstream to the cells in all parts of the body. The cells use the oxygen as fuel and give off carbon dioxide as a waste gas. The waste gas is carried by the bloodstream back to the lungs to be exhaled. The lungs accomplish this vital process - called gas exchange - using an automatic and quickly adjusting control system. This gas exchange process occurs in conjunction with the central nervous system (CNS), the circulatory system, and the musculature of the diaphragm and the chest. In addition to gas exchange, the lungs and the other parts of the respiratory system have important jobs to do relate to breathing. These include:

- Bringing all air to the proper body temperature.
- Moisturizing the inhaled air for necessary humidity.
- Protecting the body from harmful substances by coughing, sneezing, filtering or swallowing them, or by alerting the body through the sense of smell.
- Defending the lungs with cilia (tiny hair-like structure), mucus and macrophages, which act to remove harmful substances deposited in the respiratory system.
The cardiovascular system has two major components: the heart and a network of blood vessels. The cardiovascular system supplies the tissues and cells of the body with nutrients, respiratory gases, hormones, and metabolites and removes the waste products of cellular metabolism as well as foreign matter. It is also responsible for maintaining the optimal internal Homeostasis of the body and the critical regulation of body temperature and pH. The inhalation of air pollutants eventually lead to their absorption into the bloodstream and transport to the heart. A wide spectrum of chemical and biological substances may interact directly with the cardiovascular system to cause structural changes, such as degenerative necrosis and inflammatory reactions. Some pollutants may also directly cause functional alterations that affect the rhythmicity and contractility of the heart. There also may be indirect actions secondary to changes in other organ systems, especially the central and autonomic nervous systems and selective actions of the endocrine system. An early diagnosis can lead to appropriate treatment and ensure a normal or close to normal quality of life. In many cases however, there is no cure and those affected may die prematurely. The following are the most prevalent diseases:
MINOR LUNG ILLNESSES

The common cold is the most familiar of these, with symptoms including sore throat, stuffy or runny nose, coughing and sometimes irritation of the eyes.

Lung Infections - croup, bronchitis, and pneumonia are caused by viruses or bacteria and are very common. Symptoms may include cough, fever, chills and shortness of breath.

Asthma - is an increasingly common chronic disease among children and adults. It causes shortness of breath, coughing or wheezing or whistling in the chest. Asthma attacks can be triggered by a variety of factors including exercise, infection, pollen, allergies and stress. It can also be triggered by sensitivity to non-allergic types of pollutants present in the air such as smog dust respiratory irritant gases.

Chronic Obstructive Pulmonary Disease (COPD) - is also known as chronic obstructive lung disease and encompasses two major disorders: emphysema and chronic bronchitis. Emphysema is a chronic disorder in which the walls and elasticity of the alveoli are damaged.

Chronic bronchitis is characterized by inflammation of the cells lining the inside of bronchi, which increases the risk of infection and obstructs airflow in and out of the lung. Smoking is responsible for approximately 80% of COPD cases while other forms of air pollution may also influence the Development of these diseases. Symptoms include cough, production of mucous and shortness of breath. It is important to note that no cure exists For people suffering from COPD although healthy lifestyle and appropriate medication can help.

Lung Cancer – is the most common cause of death due to cancer in women and men. Cigarette smoke contains various carcinogens and is responsible for most cases of this often fatal disease others include prolonged exposure to irritants such as dust gases sand etc common in kiln workers. The symptoms of lung cancer begin silently and then progress to chronic cough, wheezing and chest pain. Air pollution has been linked somewhat weakly to lung cancer.

Coronary Artery Disease - refers to the narrowing or blocking of the arteries or blood vessels that supply blood to the heart. This disease includes angina and heart attack which share similar symptoms of pain or pressure in the chest. Unlike angina, the symptoms caused by heart attack do not subside with rest and may cause permanent damage to the heart. Smoking, lack of exercise,
excess weight, and high cholesterol levels in the blood, family history and high blood pressure are some of the factors that may contribute to this disease.

Heart Failure—is a condition in which the heart is unable to cope with its work load of pumping blood to the lungs and the rest of the body. The most common cause is severe coronary artery disease. The main symptoms are shortness of breath and swelling of the ankles and feet. Heart-Rhythm Problems - are irregular or abnormal rhythms of the heart beat. In some cases heart-rhythm problems are caused by coronary artery disease. Symptoms of heart-rhythm problems in fluttering in the chest (palpitation) and feeling light-headed. Some heart-rhythm problems are life-threatening and need emergency treatment.

Air pollution can affect both the respiratory and cardiac systems. The health effects of air pollution can be seen as a pyramid, with the mildest but not common effects at the bottom of the pyramid, and the least common but more severe at the top of the pyramid. The pyramid demonstrates that as severity decreases the number of people affected increases.

POPULATION AT RISK

Although everyone is at risk from the health effects of air pollution, certain sub-populations are more susceptible. Individual reactions to air contaminants depend on several factors such as the type of pollutant, the degree of exposure and how much of the pollutant is present. Age and health are also important factors. The elderly and people suffering from cardio-respiratory problems such as asthma appear to be the most susceptible groups. Children and newborns are also sensitive to the health effects of air pollution since they take in more air than adults for their body weight and consequently, a higher level of pollutants. Kiln workers and their children who work outdoors on hot and smoggy days are at greater risk due to their increased exposure to pollutants in the air. That includes high concentrations of hydrogen sulphide nitrous oxide particulate matter which induces insomnia. Ammonia, methane, and carbon monoxide, which can also be released from Kiln emissions cause different clinical syndromes and can be responsible for the manifestations seen. We think that the development of a mild fibrosis as a sequel to the toxic exposure could explain the maintenance of exertion dyspnea and the decrease in lung Volumes particularly when it is associated with clay minerals, such as illite, kaolinite, and smectite,. The heavy clay industry
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manufactures bricks, pipes, and tiles for general and special construction purposes. Refractory products are also made but these processes have not been included in this study. Previous investigations of dust conditions in the industry have been made in Canada, the United States, the United Kingdom, and more recently in South Africa. Dust concentrations have exceeded relevant control limits in some instances. Studies of the health effects of exposure to dust in the heavy clay industry have also been carried out in Europe, North America, and South Africa during the past 60 years. Sayers et al/10 found no serious health risk in the United States industry, and limited evidence of respiratory disease, including silicosis, is apparent from several other studies. Five percent of brick makers were reported to have abnormal chest radiographs. In a recent cross sectional study of South African brickworks there was prevalence of pneumoconiosis (category >1/0)of 4%, which increased With cumulative exposure to respirable dust and years of service in the brick making industry. No such in depth study has been conducted in Pakistan but I am sure it would reveal startling results.

RISK FACTORS FOR OCCUPATIONAL LUNG DISEASES

Occupational lung diseases are caused primarily by long-term exposure to irritating or toxic agents in the workplace (dust sand toxic fumes from chimney emissions etc). It is possible, however, to develop occupational lung diseases from several or single exposures, the latter most common to brick workers Smoking can increase the severity of occupational lung diseases Smoking is most common amongst the workers. Smokers who also are exposed to cancer-causing agents, such as dust silica sand greatly increase their chances of developing lung cancer and other lung diseases.

The mechanism through which exposure to air pollution increases the risk of disease and death is not fully understood, but the exposure impacts both the lung and circulatory systems. One study recorded problems with blood vessel widening in healthy men 24 hours after exposure to diesel exhaust. This research was built on and supported a similar study that found blood vessel expansion immediately after diesel exhaust exposure. Such research offers insight into the possible connection between lung disease and exposure to air pollution or other occupational hazards. Although occupational lung diseases may not be cured, they
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can be prevented by improving ventilation, wearing Protective equipment, changing work procedures and educating workers about on-the-job hazards.

**Occupational or work-related asthma** is the most common form of occupational lung disease. An estimated 15 percent to 23 percent of new adult asthma cases in the country are due to occupational exposures (these figures mostly have come from studies conducted mostly in India unfortunately not much has been done in Pakistan in this regard). These exposures in the workplace also can worsen pre-existing asthma. Symptoms usually occur while the worker is exposed at work but, in some cases, they develop several hours after the person leaves work and then subside before the worker returns to the job. In later stages of the disease, symptoms may occur away from work after exposure to common lung irritants such as air pollution or dust. Many occupational lung diseases are related to a specific occupation or exposure to hazardous materials, such as asbestosis, coal workers' pneumoconiosis (black lung), silicosis (exposure to fine sand), Workplace exposures cause or worsen adult-onset asthma, chronic obstructive pulmonary disease (COPD, which includes emphysema and chronic bronchitis) and lung cancer.

**Coal workers' pneumoconiosis** (black lung disease)
is a chronic condition caused by inhaling coal dust that becomes imbedded in the lungs, causing them to harden and making breathing very difficult. It is estimated that 60 percent of Fire masters are affected and about 3 percent have scarring in the lungs, the worst form of the disease. (again the source of the information is based on study conducted in India)

**Silicosis** is caused by exposure to free crystalline silica, it is most common in Brick moulders who use sand and soil in abundance during brick making. Inhaling the dust can cause swelling in the lungs, either gradually over many years or in a very short amount of time. Severe forms of the disease include fluid buildup in the lungs and sometimes lung tissue scarring (fibrosis) Evidence shows that workers who do not actually have silicosis but who have experienced long exposures to silica dust may be at increased risk of developing tuberculosis. It is recommended that tuberculosis tests be given to persons with silicosis and to those without silicosis who have at least 25 years of occupational exposure to dust and sand.
Inside of a shallow well note that there is no cover for the well:

Shallow well used for drinking etc note there is no covering
(Photo by Dr Sultan)
WATER POLLUTION

Water pollution has been, and in many parts of the world, still is, one of the major health hazards. Different sources of drinking water are accessed by the workers depending upon the location specific facilities prevailed. More than 60 percent workers use "well" as a major source for many workers do not have access to safe drinking water. Some drink the seepage water supplied for brick making. They do not bother to boil such water giving reasons of Opportunity cost of bricks making (about 300). Some said that they cannot afford as the price of wood has gone up. Such "wells" are often dug with the Assistance of brick Kiln owners. Around Remaining 3 percent workers access water from the public taps installed in the nearby village households. Both male and female including children fetch water. More than 66 percent adult male and 61 percent adult female were found fetching water. Among the children, around 15 percent boys and 14 percent girls were supporting their parents to fetch water.

MICROORGANISMS ASSOCIATED WITH WATERBORNE DISEASE

The following groups of microorganisms have been linked with the occurrence of waterborne disease. As each pathogen is isolated and identified as a threat to water quality.

BACTERIA

The most common cause of water borne diseases is Bacteria. Key bacterial pathogens responsible for waterborne disease includes Legionella, Salmonella typhi, Shigella, and Vibrio cholera.

VIRUSES

Viruses are inactive when outside of a living host cell. Viruses linked to waterborne disease have protein coats that provide protection from environmental hazards. Key pathogens include hepatitis A and Rota virus responsible for infantile and small age group Diarrhea.

PROTOZOA.

Protozoa, common in bodies of water, are much larger than bacteria and viruses. To survive harsh environmental conditions, some species can Secrete a protective covering and form a resting stage called a "cyst." Encasement can protect...
protozoa from drinking water disinfection efforts and facilitate the spread of disease. Key protozoa being studied as Agents of waterborne disease include *Giardia* and *Cryptosporidium*.

**WHY CAN’T WATERBORNE PATHOGENS BE ELIMINATED?**

Microorganisms are present everywhere in our environment. Invisible to the naked eye, vast numbers of these microbes can be found in soil, air, food and water. Although humans are essentially free of microorganisms before birth, constant circumstances of exposure (e.g., breathing, eating, and drinking) quickly allow the establishment of harmless microbial flora in our bodies. Microbial pathogens (microorganisms capable of causing disease), however, can and often do harm those who become infected. Moreover, diseases that healthy individuals “weather” well may prove fatal to individuals with compromised immune systems. In some cases, an infection can persist to create a “carrier state” where a disease causing agent is harbored by the body (and spread) without any apparent symptoms. Waterborne diseases are typically considered to be those diseases resulting from ingestion of contaminated water. Since voluntary water ingestion (drinking water) and bathing are Universal practices inadequate protection of water integrity could lead to widespread outbreaks (the Centers for Disease Control defines an outbreak to be two or more cases of illness that can be traced to a Common source). Because symptoms can be mild and short-lived, it is estimated that only a fraction of waterborne outbreaks is recognized, reported and investigated. Of these, the pathogenic agent is identified only half of the time. Bacteria, viruses and protozoa are the microorganism groups containing Pathogens of primary concern in the study of waterborne diseases.

To eliminate these pathogens from our water, especially from our drinking Water, seems theoretically straightforward. Simply mix in a disinfectant, allow adequate contact time to assure inactivation (rendering the microbes unable to produce disease), and then drink .In reality, many conditions render the above scenario unworkable. The physical characteristics of the water, primarily represented by dissolved and suspended solids content, can affect the disinfection process. The chemical content, both naturally occurring and anthropogenic (i.e., generated by humans), can also interfere with the chemical reactions desired during treatment and disinfection. Finally, pathogens associated (i.e., imbedded in or clumped) with higher organisms (e.g., algae, rotifers, worms) may be protected from the action of
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disinfectants. To overcome these obstacles to disinfection, successful treatment of drinking and waste water generally includes a series of steps which is not possible in the conditions and background that these workers live in.

SOME WATERBORNE DISEASES OF CONCERN IN THE BRICK KILN WORKERS

PROTOZOAN (Entamoeba histolytic Dysentery)
Abdominal discomfort, fatigue diarrhea, flatulence, weight loss Fever, diarrhea, bloody stool Fever,

BACTERIUM (Vibrio cholera, Salmonella)
Abdominal pain, Watery diarrhea, vomiting, occasional muscle cramps

PROTOZOAN (Giardia lamblia, amoebiosis)
Diarrhea, dysentery abdominal discomfort Fever, chills,

VIRUS (hepatitis A, Rota virus)
Jaundice, dark urine

DISEASES MOST COMMON
1. Amebiasis
2. Cholera
3. Giardiasis
4. Hepatitis
5. Shigellosis
6. Typhoid fever
7. Viral Gastroenteritis

The provision of safe drinking water has been a high priority in public health ever since John Snow removed the handle from the Broad Street pump more than century ago to quell an epidemic of cholera in London. Today, three main issues surrounding the provision of safe drinking Water is emerging. These are: to better define the burden of gastroenteritis attributable to drinking water and the organisms which cause it; to identify those water treatment systems which are cost effective and safe; and To determine the optimal methods for monitoring drinking water to ensure its continuing safety. True burden of disease defining the amount of gastroenteritis that is attributable to drinking water in kiln workers is difficult, especially when cases are widely distributed in time and space. Water treatment is
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expensive. In some cases, major changes to treatment are clearly justified. In recent years, concern has been expressed about the safety of some methods used to disinfect and otherwise treat drinking water. Chlorine, for example, is known to react with organic matter within drinking water making it undrinkable. An accurate, cheap, and effective means of testing water to ensure that it is safe from all pathogens does not currently exist. The only choice left for the kiln labors is to boil the water before drinking which they usually avoid considering the high cost of fuel wood and their meager resources.

4.4.4 SOCIAL AND PSYCHIATRIC

a) Frustration
b) Sexual vices
c) Drug Addictions
d) Neurosis and Psychosis

Health as defined is state of complete physical mental and social well being and not merely absence of disease or infirmity’s sound mind in a sound body has been recognized as a social ideal. For long only mentally ill had been diagnosed to be possessed by devils and were treated with traditional healers and Pirs etc. Mentally Healthy person have three main characteristics.

i. He feels comfortable about himself, he has self respect.
ii. he feels comfortable towards other
iii. He is able to meet the demands of his family and does something about the problems as they arise; he is not bonded over by emotions, fear, anger, love or guilt.

The causes of mental sickness are may as organic, Hereditary, social etc but the most important amongst the kiln workers are social and environmental factors, which are associated with mental health. Worries,, anxieties, job insecurity, Debt Bondage, broken homes, poverty, cruelty, rejection. All these factors responsible for ill health are very much present in the kiln workers in some intensity leading to social vices as during addition, prostitution etc. Amongst the workers at NWFP the most common addiction is charas, bhang, naswar (snuff) followed by alcohol whereas in Punjab Alcohol, Charas and heroin are the major drugs of addition.
The factors contributing towards the Drug addiction and social vices are Many but some of them are. Unemployment, job insecurity, living away from house low income, easy access to drugs etc. The prevention of social vices and drug addiction is a very long way which is bumpy and has many hurdles. To prevent these social vices are has to eliminate or at least decrease the suffering of the works, alleviate their poverty give them what is due to them, educate their children give them congenial atmosphere; provide them with proper housing and safe drinking water. All at this is not possible by an individual or agency, the enter perverse, NGOs, Govt. and philanthropists all have to play their role provide labors with alternate activeness which may help to prevent drug abuse.

4.4.5 ERGONOMICS

Ergonomics is the science an art of “fitting the job to the worker” the job demands, the machinery, furniture, work environment, and work-and-rest schedule are adapted, modified and manipulated to suit the capacities, limitations and the expectations of the workers.

OBJECTIVES

The objectives of ergonomics are to enable the workers to do the following:
- work with the least degree of thermal, muscular or mental stress,
- work at the maximum level of efficiency, and,
- quickly initiate, when faced with an emergency, corrective measures to meet it successfully.

The direct effects of working environment and conditions are fatigue, low back ache, musculoskeletal pain, numbness of fingers and hands, blisters, abrasions, corns, callosities and cumulative trauma disease or repetitive stress injury. The last mentioned includes the following: Raynaud’s phenomenon, tenosynovitis, carpal tunnel syndrome, and tendinitis and cervicobrachial syndrome.

The indirect consequences are accidents, heat stress disorders, decreased morale and reduced productivity.
The worker is not required to put a part of his body to any use contrary to physiological principles. He is trained so that his activities correspond to the true functions of the bodily part. For instance he is trained not to use his spine for lifting a weight such as a bucket of water, load of bricks etc for physiologically the vertebral column is not meant for weight bearing. The Right method of lifting pile of bricks is to keep the back straight, flex the knees till the hand reached the load of coal or pile of bricks, the knees are inflexed. While putting it down also the spine is kept erect, the knees are bent till the load comes to rest on the ground; the grip is released and the knees straightened. While working a joint, its physiological position of comfort is kept in mind. For instance, work at the shoulder joint is carried out with arm at 60° to the body. All work is carried out with symmetrical and free-swinging motions as they are the most comfortable. For instance, while bringing the upraised spade down, the arms is held lose. While typing the fingers are kept gently flexed and relaxed.
5. WAY FORWARD
The problems faced by the Brick Industry are multi-faceted and cannot be redressed by a single individual, society or government at their own. There is a dire need for multiple pronged approaches to this complex problem and not by a single entity.

5.1 ALLEVIATION OF POVERTY
The basic problem of these workers is poverty which drives them to this low level of work and they are forced to enter into contractile bondage which becomes perpetual over period of time. There is need to fix minimum daily wages or per 1000/brick labour for these people so as to enable them to earn a decent living and educate their children. Here the role of government is most important through law it can fix the minimum daily wages etc and enforce through labour department.

5.2 EDUCATION
The next most important issue of these kiln workers is lack of education which is mother of all the evils. We can quote the example of Indian State of Kerala which is a very poor state but has 100% rate of literacy due to which the health indicators of that state are highest in India and infect are comparable to any developed nation in the world. The level of literacy would give good level of conciseness which would enable them to understand their rights and privileges in a better way. This would help them improve their working, living, eating environment which in live would lead to a better atmosphere.

The government, Semi Government, NGOs have a special role to play in this regard as to help the poor worker in educating their children and educating them selves through adult literacy schools.

5.3 HEALTH EDUCATION
Needles to say the health of individual as a country cannot be improved unless he is educated in basic health, like washing hands before eating, after defecation, how to ensure availability of safe drinking water, immunization of his children against vaccine preventable diseases. In this regard Provincial Health Departments can be engaged to run awareness campaigns in the proximally of Brick Kilns through audio video aids or through Print Media, the NGOs are of great help in this regard.
5.4 HOUSING
The housing that these poor people are forced to live in is another area which needs drastic changes the stake holders (owners) should be persuaded to ensure that at least basic living standard of housing should be given to these labours. Where at least there should be provision of water, latrines, ventilation and last but not the least enough space to decrease over crowding which is a major source of disease spread especially in winters.

5.5 PROVISION OF SAFE DRINKING WATER
Nothing can emphasize more than the availability of safe drinking water to the Brick Kiln workers. It is estimated that more than 30% of Daily average loss of working hours can be saved only by providing safe drinking water. Very simple techniques can be helpful in reducing the bacteriological contamination of water in these circumstances.

Mostly water used by Brick Kiln workers is from the supply that is used for Brick Making that water is full of impurities and bacteria. Installation of hand pumps at the site with deep water suction can drastically improve the situation, studies have shown that when a pump is fitted there is marked improvement in the bacteriological quality of water, the hand pump should be of robust construction to withstand rough handling by the people, there should be efficient maintenance service and arrangements for immediate repair if the pump goes out of order. Another innovation which is very simple is improvement of dug wells usually found at the brick kilns. The following points should be noted which constructing wells

LOCATION
it should be constructed at a place where bacterial contamination can be avoided should be not less than 50 feet from the likely source of contamination, it should be at a relatively higher site, it should be located at a place where it is convenient for the users to carry water.

LINING
The lining should be built of bricks or cement.

PARAPET
There should be a parapet wall up to a height of at least 70-75cms above the ground.
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PLATFORM
There should be a concrete platform all around the well.

DRAIN
There should be a drain to carry out the spilled water well beyond the cone of filtration of well.

COVERING
The top of the well should be covered by either concrete or iron cover. Studies have shown that nicely covering the well caused marked improvement in the bacteriological quality of water. The next step in the process is purification of water simple and cheap methods of purification can be used to purify the water, some of these are

BOILING
The Brick Kiln workers can be educated to use boiled water which is the cheapest to be affective water must be bought to rolling boil for 5-10 minutes. It kills all the bacteria, spores, cysts and over and yields sterilized water, the taste of water is altered but it is harmless.

CHEMICAL DISINFECTION
CHLORINE TABLETS
These are cheap and are freely available in the market. One tablet is enough to disinfect about 20 liters of water.

BLEACHING POWDER
Bleaching powder or chlorinated line is white amorphous powder with pungent smell it can be sued to purify the water.

5.6 REDUCTION IN AIR POLLUTION
As described earlier air pollution is the major source of chest and respiratory infections and unfortunately is adding to the environmental pollution to a large extent in addition to industry and transport which is adding to pollution. Environment Protection Agency of Pakistan, NGOs, Govt. and all the stake holders should be made to sit and draw a
strategy to reduce the air pollution caused by Brick Kilns. The following methods might improve the situation and mitigate the problems of the workers.

i. LEGISLATION
There is need to have suitable legislation in place. Unfortunately in our country there has been legislation in the form of Act but there are no standards or parameters for control of Air Pollution in context to Brick Kilns. There is a dire need to set down the standards for air pollution controls its regular monitoring and enforcement through law enforcing agencies.

ii. ALTERNATE TECHNOLOGY
The brick kilns in Pakistan are using centuries old technology which is emitting thick black fumes a horrible site to look at, there is a dire need to revisit the technology and suggest alternate technologies which not only are environment friendly but also fuel efficient.

5.7 DISPOSAL OF HUMAN EXCRETA
Human excreta are a source of infection and an important cause of environmental pollution. Every society has a responsibility for its safe removal and disposal so that it does not constitute health problem. The health Hazards of improper excreta are i. Soil Pollution ii. Water Pollution iii. Contamination of food and iv. Propagation of flies and mosquitoes. The resulting diseases are typhoid, dysenteries, Diarrheas, Cholera, Hookworm disease, viral hepatitis etc. These diseases are not only a burden on community in terms of sickness, mortality etc but a basic deterrent to social and economic progress. The workers in kilns are using centuries old techniques of going into open fields which is socially unacceptable and environmentally hazardous. There is a need to improve this and every worker in the kiln should have access to safe human excreta. Simple but efficient techniques may be use for this purpose some of which are as follows.
5.7.1 Sanitary Latrines
A sanitary latrine is one which fulfills the following criteria.

a. Excreta should not contaminate the ground or surface water.
b. Excreta should not pollute the soil.
c. Excreta should not be accessible to flies, rodents, animals etc.

Some of the suggested sanitary latrines are

5.7.1.1 BORE HOLE LATRINES
First introduced by Rockefeller Foundation during 1930, it consists of a circular hole 30-40 cm in diameter dug vertically into the ground to a depth of around 06 meters with the central opening and foot rest is placed over the hole. This hole is enough for a family of 5-6 people for a year.

5.7.1.2 DUG WELL LATRINES
Dug well or pit latrine is an improvement over bore hole latrine. The size of the pit is around 75 cm and depth of around 4 meters with concrete squatting platform. The dug well of the above mentioned dimensions will last for 4-5 years for a family of 5-6 persons and when filled a new pit can be constructed.

5.7.1.3 WATER SEAL LATRINES
It is bit costly but has the advantage that it prevents access by flies that might soil is sealed off from flies by a small dept of water contained in a bent pipe called trap it also prevent escape of odors and foul gases and thus eliminates foul smell.
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ANNEXURES

QUESTIONNAIRE

| NAME OF BRICK KILN | ____________________________ |
| NAME OF OWNER     | ____________________________ |
| NAME OF MUNSHI    | ____________________________ |
| NAME OF JAMADAAR  | ____________________________ |
| TYPE OF BRICK KILN| ____________________________ |

WORKING STRENGTH

BRICK MAKERS
FILLERS
FIRE MASTERS
NIKASSI/EXTRACTERS

| AVERAGE DURATION OF DAILY WORK | ____________________________ |
| AVERAGE DURATION OF YEARLY WORK| ____________________________ |
| WHETHER FAMILY JOB OR NEW       | ____________________________ |

LIVING ENVIRONMENT

- LIVING IN
  - TENTS
  - SEMI BUILT
  - BUILT

- AVERAGE PERSONS / ROOM
  - 2-3
  - 3-5
  - 5-7
  - 7-10

- AVERAGE BEDS IN ROOM
  - 2
  - 3
  - 4
  - 5

AVAILABILITY OF WATER

- WHETHER CONTINUES
  - YES
  - NO

- WHETHER AVAILABLE IN THE HOUSE
  - YES
  - NO
Environmental Hazards of Brick Kiln Workers

- **SOURCE OF SUPPLY**
  - WELL
  - HANDPUMP

- **OTHER**
  - DEEP BORE

- **COLOUR OF WATER**
  - CLEAR
  - TURBID

- **TASTE OF WATER**
  - TASTELESS
  - TASTE

- **ODOUR OF WATER**
  - ODOURLESS
  - ODOUR

- **DO YOU BOIL WATER FOR DRINKING**
  - YES
  - NO

**ACCESS TO LATRINES**

- **TYPE**
  - OPEN FIELD
  - LATRINES

- **WHETHER WASHES HAND AFTER DEFECATION**
  - YES
  - NO

**DISEASES ENCOUNTERED**

1. BRICK MAKERS & FILLERS
2. FIVE MASTERS
3. EXTRACTORS

- **HOW MANY DAYS OF YEAR YOU GET SICK**
  - 5 DAYS
  - 10 DAYS
  - 20 DAYS

- **WHAT ARE THE COMMON AILMENTS IN WINTER**
  - FEVER
  - YES
  - NO
  - COUGH
  - YES
  - NO
  - CHILLS
  - YES
  - NO
  - COUGH WITH SPUTUM
  - YES
  - NO
  - SHORTNESS OF BREATH
  - YES
  - NO
  - BODY PAINS & ACHES
  - YES
  - NO
  - BACKACHE
  - YES
  - NO

- **AILMENTS COMMONLY ENCOUNTERED IN SUMMER**
  - FEVER
    - YES
    - NO
  - COUGH
    - YES
    - NO
Environmental Hazards of Brick Kiln Workers

- BODY PAINS
  - YES
  - NO
- LOOSE MOTIONS
  - YES
  - NO
- LOOSE MOTIONS WITH PAIN
  - YES
  - NO

ABDOMEN
- LOOSE MOTIONS WITH
  - YES
  - NO

BLOOD & MUCOUS
- BODY PAINS & ACHES
  - YES
  - NO
- EXHAUSTION
  - YES
  - NO
- BACK ACHE
  - YES
  - NO
- SEVERE BACKACHE
  - YES
  - NO
- HIGH GRADE TEMPERATURE
  - YES
  - NO
- DEATHS
  - YES
  - NO

DISEASES COMMON TO CHILDREN & WOMEN

WOMEN

- AVERAGE PREGNANCIES
  - 2
  - 3
  - 4
  - 5
  - MORE
- WHETHER ANY ANTENATAL IS DONE
  - YES
  - NO
- DELIVERY CONDUCTED AT HOME
  - YES
  - NO
- DELIVERY CONDUCTED OUT SIDE
  - YES
  - NO
- DELIVERY CONDUCTED BY RELATIVES
  - YES
  - NO
- DELIVERY CONDUCTED BY DAI/TBA
  - YES
  - NO
- FEVER AFTER DELIVERY
  - YES
  - NO
- DURATION OF FEVER IN DAYS
  - 3-4
  - 4-5
  - More than 5 days
- WHERE DO YOU GO IN CASE OF
  - PRIVATE
  - GOVT
  - EMERGENCY
  - HOSPITAL
- WHATS ARE COMMON AILMENTS OF NEW BORN
  - FEVER
  - COUGH
  - DIARHOEA
  - ANY OTHER
- WHATS ARE COMMON AILMENTS OF CHILDREN
  - COUGH
  - FEVER
  - DIARHOEA
  - ANY OTHER
Environmental Hazards of Brick Kiln Workers

ACCESS TO MEDICAL FACILITIES

- WHERE DO YOU GO WHEN SICK
  - PRIVATE
  - GOVT. HOSPITAL
- WHETHER YOU VISIT QUALIFIED
  - YES
  - NO
- WHAT IS AVERAGE COST OF TREATMENT
  - 100-150
  - 150-200 MORE
- WHO PAYS FOR YOUR TREATMENT
  - SELF
  - OWNER
- WHAT IF YOU GET SERIOUSLY SICK
  - GO HOME
  - VISIT HOSPITAL

ACCESS TO EDUCATIONAL FACILITIES

- ARE YOU EDUCATED
  - YES
  - NO
- IF YES THEN
  - Primary
  - Middle
  - Matric
- DOES YOUR CHILDREN ATTEND SCHOOL
  - YES
  - NO
- IF YES THEN
  - GOVT
  - PRIVATE

COOKING HABITS

- NATURE OF FUEL USED FOR COOKING
  - WOOD
  - COAL
  - GAS
  - COWDUNG
- WHAT IS GENERAL FOOD ITEM COOKED
  - VEGETABLES
  - LENTILS
  - MEAT
- HOW OFTEN DO YOU EAT MEAT
  - DAILY
  - ONCE A WEEK
  - ONCE A MONTH
- HOW OFTEN DO YOU EAT FRUITS
  - DAILY
  - ONCE A WEEK
  - ONCE A MONTH

FAVORITE PAST TIME

- WHAT DO YOU DO IN YOUR SPARE TIME
  - OFFER NAMAZ
    - YES
    - NO
  - WATCH T.V.
    - YES
    - NO
  - WATCH MOVIES
    - YES
    - NO
  - GUP SHUP
    - YES
    - NO
  - NOTHING
    - YES
    - NO
Environmental Hazards of Brick Kiln Workers

ADDITION

- DO YOU SMOKE   YES  NO
- DO YOU USE ANY NARCOTIC SUBSTANCE   YES  NO
- DO YOU USE SNUFF (NASWAR)   YES  NO
- DO YOU USE HUQQA   YES  NO
- DO YOU DRINK   YES  NO
- IF YES WHERE DO YOU GET IT FROM
- DO YOU GAMBLE   YES  NO

PSYCHIATRIC EVALUATION

- ARE YOU SATISFIED WITH YOUR JOB   YES  NO
- DO YOU WANT TO LEAVE IT   YES  NO
- DO YOU FEEL FRUSTRATED   YES  NO
- DO YOU HAVE HEADACHES   YES  NO
- DO YOU FEEL LIKE FIGHTING   YES  NO
- DO YOU FEEL HOME SICK   YES  NO
- DO YOU FEEL LIKE DRINKING, SMOKING   YES  NO

IF GIVEN CHOICE, WHAT WOULD YOU DO TO EARN LIVING?
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