



BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA



**ENDORSEMENT BY THE HOD AND
THE HEAD OF THE INSTITUTION**

This is to certify that the thesis entitled "PREVALENCE OF COMMON MORBIDITIES AND THEIR ASSOCIATED RISK FACTORS AMONG BRICK KILN WORKERS IN KANCHEEPURAM DISTRICT: A CROSS SECTIONAL STUDY" is a bonafide research work done by **Dr. KARTHIK.S** under the guidance of **Dr.R.UMADEVI**, Professor and Head, Department of Community Medicine, Sree Balaji Medical College & Hospital.

SEAL AND SIGNATURE

OF THE HOD

PROFESSOR & H.O.D.
Dept. of Community Medicine
Sree Balaji Medical College
Chennai-600 044.

SEAL AND SIGNATURE OF THE

HEAD OF THE INSTITUTION

DEAN

SREE BALAJI MEDICAL COLLEGE & HOSPITAL
7, Works Road, Chromepet,
Chennai-600 044.

**ADDL. CONTROLLER OF EXAMINATIONS
BHARATH INSTITUTE OF
HIGHER EDUCATION & RESEARCH**

DATE: 30/1/2023

PLACE: CHENNAI

**ADDL. CONTROLLER OF EXAMINATIONS
BHARATH INSTITUTE OF
HIGHER EDUCATION & RESEARCH**





BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA

**PREVALENCE OF COMMON MORBIDITIES AND
THEIR ASSOCIATED RISK FACTORS AMONG BRICK
KILN WORKERS IN KANCHEEPURAM DISTRICT: A
CROSS SECTIONAL STUDY.**

By

Dr. KARTHIK.S

Dissertation submitted to the
Bharath Institute of Higher Education & Research, Chennai

**In partial fulfillment
of requirement for the degree of
M.D. COMMUNITY MEDICINE**

**DEPARTMENT OF COMMUNITY MEDICINE
SREE BALAJI MEDICAL COLLEGE & HOSPITAL
CHENNAI -600044**



2020 - 2023



BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA



DECLARATION BY THE CANDIDATE

I hereby declare that this thesis entitled **“PREVALENCE OF COMMON MORBIDITIES AND THEIR ASSOCIATED RISK FACTORS AMONG BRICK KILN WORKERS IN KANCHEEPURAM DISTRICT: A CROSS SECTIONAL STUDY”** is a bonafide and genuine research carried out by me under the guidance of **Dr.R.UMADEVI**, Professor and Head, Department of Community Medicine, Sree Balaji Medical College & Hospital.

Signature of the Candidate

Dr. KARTHIK.S

Date:

Place: Chennai



BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA



CERTIFICATE BY THE GUIDE

This is to certify that the thesis entitled “**PREVALENCE OF COMMON MORBIDITIES AND THEIR ASSOCIATED RISK FACTORS AMONG BRICK KILN WORKERS IN KANCHEEPURAM DISTRICT: A CROSS SECTIONAL STUDY**” is a bonafide research work done by **Dr. KARTHIK.S** under my guidance and supervision, in partial fulfilment of the requirement for the degree M.D in Community Medicine.

Signature of the Guide

Dr.R.UMADEVI,

Professor and HOD,

Department of Community Medicine,

Sree Balaji Medical College and Hospital

Chennai - 600044.

Date:

Place: Chennai



BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA



**ENDORSEMENT BY THE HOD AND
THE HEAD OF THE INSTITUTION**

This is to certify that the thesis entitled “**PREVALENCE OF COMMON MORBIDITIES AND THEIR ASSOCIATED RISK FACTORS AMONG BRICK KILN WORKERS IN KANCHEEPURAM DISTRICT: A CROSS SECTIONAL STUDY**” is a bonafide research work done by **Dr. KARTHIK.S** under the guidance of **Dr.R.UMADEVI**, Professor and Head, Department of Community Medicine, Sree Balaji Medical College & Hospital.

**SEAL AND SIGNATURE
OF THE HOD**

**SEAL AND SIGNATURE OF THE
HEAD OF THE INSTITUTION**

**ADDL. CONTROLLER OF EXAMINATIONS
BHARATH INSTITUTE OF
HIGHER EDUCATION & RESEARCH**

DATE:

PLACE:



BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH

(Declared as Deemed-to-be University under section 3 of UGC Act 1956)
#173, Agharam Road Selaiyur Chennai 600 073 Tamilnadu, INDIA



COPYRIGHT

DECLARATION BY THE CANDIDATE

I hereby declare that the Bharath University, Chennai shall have the rights to preserve, use and disseminate this thesis in print or in electronic format for academic / research purpose.

Signature of the Candidate

Dr. KARTHIK.S

Date:

Place: Chennai

APPROVAL OF INSTITUTIONAL HUMAN ETHICS COMMITTEE

SREE BALAJI MEDICAL COLLEGE & HOSPITAL
CHENNAI – 600 044.

INSTITUTIONAL HUMAN ETHICAL COMMITTEE

Ref. No. 002/SBMC/IHEC/2020/1442

Dated: 23.12.2020

Chairperson:

Dr. Sumathi

Member Secretary:

Dr. Shanthi Edward

Members:

Mr. V. Krishnamoorthy

Mr. Kannan Bhattacharaya

Dr. B. Shanthi

Dr. V. S. Kalai Selvi

Dr. P. Suresh Babu

Dr. N. Senguttuvan

Mrs. L. Anusha

To

DR. S. KARTHIK

1ST YEAR POST GRADUATE

DEPT. OF COMMUNITY MEDICINE

SBMC&H

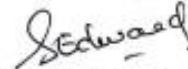
Sir / Madam,

Your proposal for the following project has been approved by the Institutional Ethical Committee meeting held on 23.12.2020

PREVALENCE OF COMMON MORBIDITIES AND THEIR ASSOCIATED RISK FACTORS AMONG BRICK-KILN WORKERS IN KANCHEEPURAM DISTRICT: A CROSS SECTIONAL STUDY.

You are advised to be familiar with ICMR Guidelines on Biomedical Research in human beings. You shall be updating the progress of your research to the Institutional Research Committee and after completion of the study inform the Institutional Ethical Committee through the member secretary.

Yours sincerely,



(DR. SHANTHI EDWARD)
MEMBER SECRETARY
INSTITUTIONAL HUMAN ETHICAL COMMITTEE
SREE BALAJI MEDICAL COLLEGE & HOSPITAL
Chennai-600 044.

ACKNOWLEDGEMENT

At the onset, I wish to acknowledge the institution, Sree Balaji Medical College and Hospital that has given me the base and pillars for acquiring knowledge in my field of interest.

My profound gratitude to my guide, Dr.R.UMADEVI, Professor & HOD, Department of Community Medicine, for her excellent guidance, care and patience. It was her supervision, encouragement, interest and above all her blessings that made this dissertation possible. I would like to thank her for providing me ample time in collecting data with an excellent atmosphere for doing research. I am also thankful to her for reading my reports; commenting on my views and helping me understand and enrich my ideas.

My heart felt gratitude to Dr.SHANTHI EDWARD, Professor, Department of Community Medicine for her encouragement and support.

My sincere thanks to Dr.RASHMI GOUR, Professor, Department of Community Medicine, for her valuable support throughout the study.

I thank Dr.T.STEPHEN, Associate Professor of Community Medicine, for his guidance throughout the study.

I am thankful to Dr.J.KRISHNA KUMAR, Professor of the Department of Community Medicine for his continuous support and guidance.

I extend sincere gratitude to my co - guide Dr.R.ARUN, Assistant Professor of Community Medicine for his guidance and support without whom this study could not have been completed.

I am grateful to Dr. V.M.ANANTHA EASHWAR, Assistant Professor of Community Medicine for his constant encouragement, support and guidance in completing my thesis.

I would also like to thank my other Assistant Professors and Tutors for all their support and encouragement.

I also wish to thank our Chairman, Dean, Vice Principal of Sree Balaji Medical College and Hospital for permitting me to undertake the study.

I would also like to thank the Medical Officer and field staffs, without whom, the data collection in the community would not have been possible.

My sincere thanks to fellow postgraduates for their continuous support and encouragement all these years, and for guiding me in the

right path amidst the hurdles. I thank my seniors and juniors for their support.

I thank my parents Mr.N.SANKAR and Mrs.S.SELVARANI, my Brother Mr.S.SHYAMNATH, and my Close friend Dr.SHARANYA SHANKAR for being my pillar of strength and for the love and trust they have in me.

Above all, from the depth of my heart, I thank the Almighty God for all his blessings showered throughout my college days.

Dr. KARTHIK.S

ABBREVIATIONS

NCEUS	–	National Commission for Enterprises in the un-organised sector
NSSO	–	National Sample Survey Organisation
PPE	–	Personal Protective Equipment
MSDs	–	Musculoskeletal Disorders
ATS-DLD 78	–	American Thoracic Society, Division of Lung Disease 78
DLQI	–	Dermatological Life Quality Index
GDP	–	Gross Domestic Product
GNP	–	Gross National Product
DALY	–	Disability Adjusted Life Years
ILO	–	International Labour Organisation
WMSD	–	Work Related Musculoskeletal Disorders
WHO	–	World Health Organisation
FCK	–	Fixed Chimney Kilns
CK	–	Clamp Kilns
ZZK	–	Zigzag Kilns
NFHS-5	–	National Family Health Survey – 5
NNMS	–	National Non-communicable disease Monitoring Survey
ADL	–	Activities of Daily Living

CONTENTS

S. NO	INDEX	PAGE NO.
1.	INTRODUCTION	
2.	AIMS AND OBJECTIVES	
3.	REVIEW OF LITERATURE	
4.	MATERIALS AND METHODS	
5.	RESULTS	
6.	DISCUSSION	
7.	CONCLUSION	
8.	STRENGTHS AND LIMITATIONS	
9.	RECOMMENDATIONS	
10.	EXECUTIVE SUMMARY	
11.	REFERENCES	
10.	ANNEXURES	

INTRODUCTION

Occupational health is an important component of public health and occupational health hazards pose a significant threat to public health. The Indian economy is driven by employees working in organised sector and unorganised sector. It is surprising to note that the vast majority of the work force in our country is employed in the unorganised sector. According to the National Commission for Enterprises in the Un-organised Sector (NCEUS), the unorganised sector comprises of all unincorporated privately owned enterprises who are engaged in the sale and production of goods and services and employing less than ten workers¹. In India 9 out of 10 workers are employed in the unorganised sector as per the reports of a survey conducted by National Sample Survey Organisation (NSSO) in the year 2009-10.²

Indian economy is growing at a rapid pace which has in turn lead to rapid urbanisation. Urbanisation has in turn lead to construction of numerous buildings in towns and cities and the rate at which the new buildings would be constructed is estimated to be 6.6% per year from 2005 to 2030³.

Fired clay bricks is an important construction material in India. Globally India stands second in the production of fired clay bricks contributing to one tenth of the global production⁴. India's

annual brick production stands at 250 billion bricks and there are about 1.4 lakh brick kilns operating in our country employing about 1.5 crore workers. Most importantly brick kiln workers come under unorganised sector⁵. Since the brick kiln workers are employed in the unorganised sector the terms of their employment is neither fixed nor regular. They are mostly daily wagers. The brick kiln workers employed in Tamil Nadu are mostly migrant workers from other states. The brick kiln workers do not get employed throughout the year because during the rainy season brick kilns do not operate. They work under strenuous conditions in harsh environment without any Personal Protective Equipment (PPE). Most of the workers belong to lower socioeconomic status and have migrated with their families from distant places. Lack of education and skill training, poor living conditions, lack of proper sanitation, lack of access to clean drinking water and harsh working conditions take a huge toll on their health⁶.

The primary source of energy used in Brick kiln industry is coal. Burning of low grade coal generates enormous quantity of air pollutants and leads to air pollution. Inhalation of suspended particulate matter leads to respiratory disorders⁷. The brick kiln workers suffer from musculoskeletal disorders owing to the nature of their job involving repetitive strenuous activity⁸.

COVID-19 pandemic which began in early months of 2020 affected each and every nation adversely and India was no exception to this pandemic. COVID-19 pandemic adversely affected the lives of millions of people in India both health-wise and also economically. The pandemic resulted in loss of jobs for millions of people especially those in the unorganised sector of which the brick kiln workers form a significant part of. The unorganised sector has faced the brunt of the pandemic due to seasonal nature of employment and poor employer-employee relationship ⁹.

Indian brick kiln industry still predominantly uses traditional methods of manufacturing and is reluctant to adapt newer technologies owing to high input cost. This has led the workers to do all the work in the process of manufacturing brick manually. Clay brick manufacturing is a labour intensive, strenuous job with workers being made to work throughout the week many a times. They are exposed to extreme heat and harmful gases. Brick kiln workers suffer from a variety of diseases owing to their adverse working conditions. They suffer from musculoskeletal disorders due to prolonged hours of standing, improper posture, carrying of heavy loads of weight, poor ergonomics and repetitive movements. It is important to note that the prevalence of musculoskeletal disorders increases with increase in the number of years of working⁸.

In addition to musculoskeletal disorders they also suffer from respiratory tract disorders like Chronic Obstructive Pulmonary Disorders, Bronchial Asthma and chronic cough due to inhalation of obnoxious gases like carbon monoxide , sulphur dioxide, nitrous oxide and inhalation of suspended particulate matter and skin diseases due to not wearing personal protective equipment's ^{10,11}. They also suffer from communicable diseases like diarrhoea due to poor sanitary conditions in the work place⁶.

Only a limited number of studies have been done in Tamil Nadu and India, in the past five years to find out the prevalence of various morbidities and their associated risk factors among brick kiln workers . Therefore the present study was conducted to estimate the prevalence of common morbidities and their associated risk factors among brick kiln workers in Kancheepuram district.

JUSTIFICATION FOR THE STUDY

India is witnessing a period of rapid urbanisation which has lead to construction of new buildings at a rapid pace in cities and towns. Fired clay bricks is an important construction material and globally India stands second in the production of fired clay bricks. In India there are about 1.4 lakh brick kilns employing around 1.5 crore workers. These brick kiln workers come under unorganised sector. They are mostly daily wagers belonging to lower socioeconomic status. Covid-19 pandemic has created a havoc in their lives both physically and financially. Many of them lost their jobs and sent to abject poverty.

Brick kiln workers suffer from a variety of diseases owing to the nature of their job. Majority of them suffer from musculoskeletal disorders due to the strenuous nature of their job involving improper posture, repetitive movements, poor ergonomics and intensive manual work. Not only do they suffer from musculoskeletal disorders but they also suffer from respiratory tract ailments due to inhalation of dust and harmful gases emanated from burning of coal and they also suffer from skin diseases due to lack of personal protective measures.

In the past five years , only a limited number of studies have been done in Tamil Nadu and India, to find out the prevalence of various morbidities and their associated risk factors among brick kiln workers.

Therefore the present study was conducted to estimate the prevalence of common morbidities and their associated risk factors among brick kiln workers in Kancheepuram district.

AIM AND OBJECTIVES

- 1) To estimate the prevalence of following common morbidities among the brick kiln workers in Kancheepuram district.
 - a) Musculoskeletal problems
 - b) Respiratory problems
 - c) Skin problems

- 2) To assess the association between the risk factors and common morbidities among the brick kiln workers.

- 3) To assess the practice of protective measures among the brick kiln workers.

REVIEW OF LITERATURE

Occupational health is an important field of work in public health. The goal of the occupational health is to improve the overall health of the workers employed in all the occupations. It addresses the three facets of well-being of workers viz physical, mental and social well-being and it aims to promote and maintain them at the highest possible level ¹². There are several factors in the working place which can affect the health of the workers which includes nature of job, working environment, working hours, salary, provision of health promotion and protection policies among others¹³. Occupational hazards can adversely affect the health of the workers leading to respiratory diseases, cardiovascular diseases, communicable diseases, hearing disorders, musculoskeletal disorders and cancers. Occupational health focuses on the safety of the workers at the workplace with special attention on prevention of occupational hazards¹³. Safety and health of workers have a beneficial impact on productivity as well as economic and social development¹³.

The field of occupational health has got three important objectives-

- The first objective focuses on maintenance and promotion of the health care of the workers along with improvement of their working capacity.

- The second objective concentrates on improving the working conditions and working environment in such a way that it becomes conducive for protecting the safety and health of the workers.
- The third objective lays emphasis on development of effective work organization and work culture which includes efficient managerial systems, policies for workers and principles for quality-related management practices which aims to improve occupational safety and health¹².

The field of occupational health encompasses several disciplines which includes -occupational medicine, ergonomics, nursing, hygiene and psychology¹².

OCCUPATIONAL HEALTH- GLOBAL SCENARIO:

According to the World Health Organization, globally there are an estimated 3.5 billion workers amounting to nearly half of the world's population (7.9 billion). It has been estimated that about 2 million people die every year from occupational diseases and injuries. Occupational diseases cause significant economic loss to the tune of 4% to 6% of annual GDP in most countries¹².

In many countries the informal sector/unorganised sector employs about half of the workers owing to which they do not have access to proper occupational health coverage and it is worrisome to

note that about three fourths of the workers (70%) do not possess any insurance coverage in order to compensate them in the event of occupational diseases and injuries¹⁴.

It has been estimated that on an average an active worker spends about one third of his time at the workplace. Therefore the working conditions should be appropriate for the employees in order to have a favourable outcome on their health. A good working environment has a positive impact on the health of the workers in addition to providing them with social security. The health of the workers is a vital requirement not only for the household income but also for the productivity and economic development. Therefore it is of paramount importance to protect and promote their health¹⁴.

Occupational risk factors affecting the health of the workers include- Excessive noise, Heat, Dust, Hazardous chemicals, Unsafe machinery, Psychological stress and Poor ergonomics . These risk factors cause occupational diseases¹⁴.

The important occupational diseases are Respiratory tract disorders viz, Chronic Obstructive Pulmonary Disorder, chronic bronchitis and wheeze, Musculoskeletal disorders, Noise induced hearing loss, Skin diseases like dermatitis, Cardiovascular diseases, Cancers, Psychological diseases like depression and Injuries¹⁴.

Research data from Global Burden Disease study reveal that worldwide that there were about 519,100 deaths in the year 2016 from chronic respiratory diseases due to exposure to occupational airborne particles. In addition to that inhalation of harmful airborne particles contributed to 13.6 million Disability-Adjusted Life Years (DALYs) in the year 2016¹⁵.

In the year 2017 there were an estimated 319 000 cancer deaths caused due to the combined effect of all occupational carcinogens and these occupational carcinogens also resulted in six and a half million disability-adjusted life years. Among the occupational carcinogens three important agents viz, asbestos, silica dust and diesel engine exhaust contributed to maximum number of deaths. China, United States of America and Japan bore the maximum number of occupational carcinogens-attributable cancer deaths¹⁶.

According to the International Labour Organization (ILO) report each year 321,000 people die from occupational accidents¹⁷.

Occupational noise-induced hearing loss is an important public health problem contributing to one sixth (16%) of the disabling hearing loss in adults¹⁸.

Work-related musculoskeletal disorders (WMSD) affect a significant percentage of workers leading to sickness absenteeism and loss of productivity and economic loss. The prevalence of Work-related musculoskeletal disorders (WMSD) ranged from 40% to 60% with back pain being the most prevalent WMSD (60%)¹⁹.

Even though the occupational diseases pose a significant public health problem worldwide only 1/3rd of the countries have programmes/policies in place to tackle them. In addition to these in majority of countries there is a dearth of competent physicians and nurses to treat occupational diseases and in many countries they do not provide postgraduate education in occupational health¹⁴.

The job of specialized occupational health services is to assess the occupational health hazards and formulate suitable measures to prevent them. Unfortunately only one out of seven workers (15%) worldwide have access to these specialized occupational health services and it is important to note that those workers who are getting the benefits of specialized occupational health services are employed in the organized sector¹⁴.

In the last two and a half years due to COVID-19 pandemic millions of people have lost their job and this has lead to global job crisis which is forcing more number of people to work in the unorganised sector which is devoid of any insurance coverage or

health protection measures. Moreover in the unorganised sector they work under precarious conditions leading to occupational injuries and diseases. In many communities , when the breadwinner of the family becomes sick the entire family experiences hardship due to lack of social protection.

Workplace health initiatives helps to reduce sick leave absenteeism and health-care costs for companies by about one fourth ¹⁴.

Occupational diseases can be prevented by effective interventions such as Encapsulation of pollution sources, Noise reduction, Adequate ventilation, Substitution of hazardous chemicals with less harmful chemicals, Improved ergonomics, Provision of Personal Protective Equipment's (PPE) for workers and Improved organization of work¹⁴.

WORLD HEALTH ORGANIZATION'S (WHO) STRATEGIES TO IMPROVE OCCUPATIONAL HEALTH:

The sixtieth World Health Assembly passed a resolution titled “Workers’ Health: Global Plan of Action” in which it urged all the member nations to develop policies aimed at complete coverage of all workers especially those working in informal/unorganised sector with basic occupational health services for primary prevention of occupational diseases¹⁴.

WHO has proposed the following strategies to improve the health of the workers by working in tandem with the member countries-

1. Improving the skills of primary care providers viz general practitioners, nurses and community health workers in order to provide essential occupational health services such as diagnosing common occupational diseases, monitoring the health status of workers and providing recommendations on improving the working conditions. Greater emphasis is placed on workers employed in small enterprises, informal sector and agricultural sector.
2. Broadening the coverage and enhancing the quality of specialized occupational health services in Medium and Large enterprises and industrial zones. The specialized occupational health services focus on a) assessment of occupational risks and developing ways to reduce them b) surveillance of the work environment and developing ways to improve it c) improvement of the work Organization and machineries d) early diagnosis, treatment and rehabilitation of occupational diseases e) providing first aid to the workers at workplace
3. Establishing linkage between occupational health services and primary health care centres with the aim to provide treatment for workers suffering from chronic diseases and helping them to return to work after long term absence due to sickness.

4. Development of health initiatives at workplace for betterment of the health of workers.
5. All the frontline health care providers should be given training in occupational health.
6. Development of long term road map enabling workers to access occupational health services readily based on the financial and health resources of the country ¹⁴.

OCCUPATIONAL HEALTH SCENARIO IN INDIA:

The Indian economy is driven by employees working in organised sector and unorganised sector. It is surprising to note that the vast majority of the work force in our country is employed in the unorganised sector where the terms of employment is neither fixed nor regular. According to the National Commission for Enterprises in the Un-organised Sector (NCEUS), the unorganised sector comprises of all unincorporated privately owned enterprises who are engaged in the sale and production of goods and services and employing less than ten workers¹. In India 9 out of 10 workers are employed in the unorganised sector as per the reports of a survey conducted by National Sample Survey Organisation (NSSO) in the year 2009-10.²

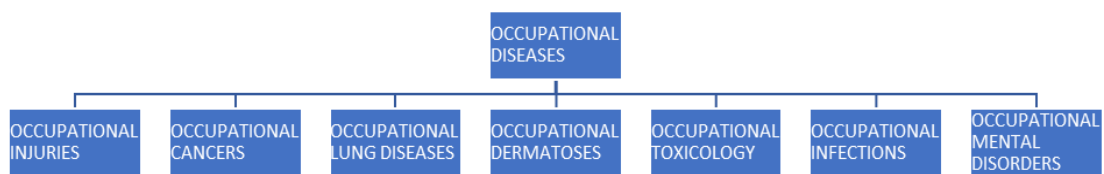
According to **National Programme for Control and Treatment of Occupational Diseases** it has estimated that every year around 1.7 crore occupational non-fatal injuries (one sixth of

the global non-fatal injuries) and 45,000 fatal injuries (nearly half of the total deaths globally due to occupational injuries) occur in India²⁰.

Worldwide one out of six occupational disease-cases and one out of six occupational disease-deaths are contributed by India . Occupational diseases and injuries cause an estimated loss of 2% – 14% of the gross national product (GNP) every year²⁰.

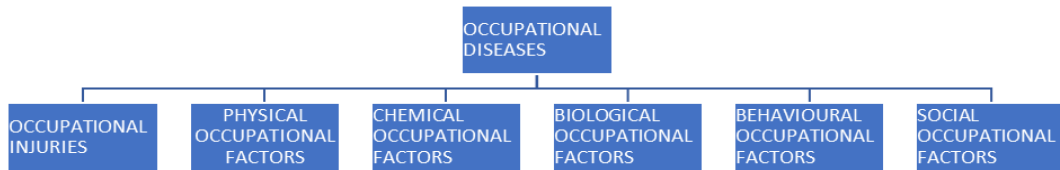
The major occupational diseases prevalent in India have been grouped into seven categories²⁰ (figure 1).

Figure 1: Categories of Occupational Diseases



Occupational diseases can also be classified into six categories based on etiological factors²⁰ (figure 2).

Figure 2: Classification of occupational diseases based on etiological factors



In India, there is a wide variation in the prevalence of occupational diseases among workers employed in different fields. The prevalence of silicosis varied from 4% among manganese workers to about half of the workers among slate-pencil workers. The prevalence of Asbestosis also varied from 3% among asbestos miners to about one fifth of the workers in mill workers. The prevalence of Byssinosis among textile workers ranged from one fourth of the textile workers to about half of the textile workers²⁰.

In India, the Factories Act of 1948 and the Mines Act of 1952 provides for legal framework involved in the protection of health of the workers along with ensuring their safety at workplace. The amendment of Factories Act in the year 1987 provides for compulsory pre-placement medical screening of workers along with their periodic medical examination at workplace. The field of occupational health is governed by two ministries in India viz, Ministry of Labour and Employment and Ministry of Health and Family Welfare. The Ministry of Labour and Employment work in tandem with the State Labour Department to protect the health and

safety of workers while the Ministry of Health and Family Welfare provides medical care to the workers through its healthcare facilities. The Ministry of Labour and Employment is given technical guidance by the Directorate General of Mines Safety and Directorate General – Factory Advisory Services and Labour Institutes regarding maintaining the health and safety of workers in mines and factories²¹.

Article 24 of the Indian Constitution strictly prohibits the employment of children below 14 years of age. Article 39 of the Indian Constitution (e and f) provides for protection of the health of the workers and prevents exploitation of the children. Article 42 of the Indian Constitution provides for humane conditions at work and maternity relief ²¹.

Government of India launched the National Programme for Control and Treatment of Occupational Diseases in the year 1998-99 in order to address the issue of rapidly increasing occupational diseases in India with the aim of preventing them and improving the health of the workers. The National Institute of Occupational Health, Ahmedabad (ICMR) serves as the nodal agency for the programme²⁰.

BRICK KILN INDUSTRY – INDIAN SCENARIO:

Indian economy is growing at a rapid pace which has in turn lead to rapid urbanisation. Urbanisation has in turn lead to construction of numerous buildings in towns and cities and the rate at which the new buildings would be constructed is estimated to be 6.6% per year from 2005 to 2030³.

Fired clay bricks is an essential material used for construction in India. Globally India stands second in the production of fired clay bricks next to China contributing one tenth of the global production ⁴. China is the number one producer of fired clay bricks in the world and it contributes two third of the global brick production(67%)⁵. The South Asia Region (SAR) produces one fifth of the global brick production (21%) with India , Nepal and Bangladesh being the predominant contributors⁵.

India's annual brick production stands at 250 billion bricks and there are about 1.4 lakh brick kilns operating in our country employing about 1.5 crore workers. Most importantly brick kiln workers come under unorganised sector⁵. Since the brick kiln workers are employed in the unorganised sector the terms of their employment is neither fixed nor regular. They are mostly daily wagers . The brick kiln workers employed in Tamil Nadu are mostly migrant workers from other states. The brick kiln workers do not get employed throughout the year because during the rainy season brick

kilns do not operate. They work under strenuous conditions in harsh environment without any Personal Protective Equipment (PPE). Most of the workers belong to lower socioeconomic status and have migrated with their families from distant places. Lack of education and skill training, poor living conditions, lack of proper sanitation, lack of access to clean drinking water and harsh working conditions take a huge toll on their health⁶.

The primary source of energy used in Brick kiln industry is coal . Burning of low grade coal generates enormous quantity of air pollutants and leads to air pollution. Inhalation of suspended particulate matter leads to respiratory disorders⁷. The brick kiln workers suffer from musculoskeletal disorders owing to the nature of their job involving repetitive strenuous activity⁸.

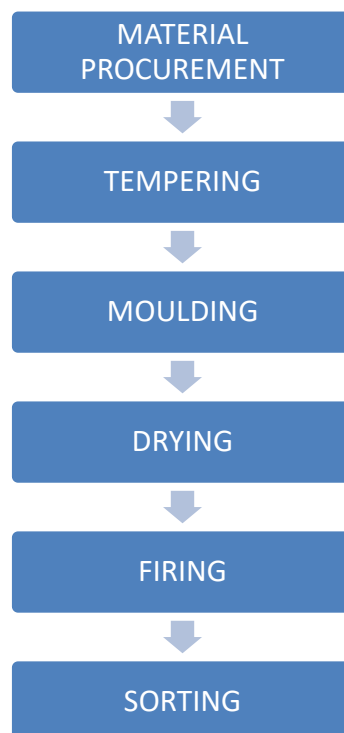
Conventional brick production technologies are predominantly used in India which includes Clamp Kilns (CKs), Mobile Chimney Kilns (MCKs), Fixed Chimney Kilns (FCKs) and Zigzag Kilns (ZZKs). These conventional brick production technologies are labour intensive, poor energy efficient and highly polluting the environment⁵.

Fixed Chimney Kilns (FCK) is predominantly used technology for brick production in India, accounting for more than two third (70%) of the total production. Clamp kilns contributes about 20% of

the entire production while the remaining 10% is contributed by Vertical Shaft Brick Kiln (VSBK), Hoffman Kilns (HK) and Zigzag Kilns (ZZK). Two third of the total brick production (65%) in India is concentrated in the Gangetic plains of North India involving states like Uttar Pradesh and West Bengal while the remaining 35% is concentrated in the peninsular and coastal India consisting of states like Gujarat, Maharashtra and Tamil Nadu . In India there has been a reluctance in accepting newer brick manufacturing technologies such as Hoffman Kilns due to high initial capital investment and lack of trained workers⁵.

Conventionally there are six steps in the process of brick manufacturing²². They are shown in figure 3.

Figure 3: STEPS IN BRICK MANUFACTURING PROCESS.



1. The first step in the process of manufacturing brick is to mine the clay and store it in open so as to make the clay soft.
2. The second step is the tempering wherein the clay is mixed with optimum quantity of water in order to get the appropriate consistency for moulding. This step is done usually with hands and feet manually.
3. The third step is moulding which is done with the help of metal moulds.
4. The fourth step is the drying which involves drying the bricks under the sun in an open field for a period of about two weeks.
5. The fifth step is the firing in which the green bricks are burnt inside a kiln for about a week.
6. The sixth and the final step is the sorting which involves sorting the burnt bricks on the basis of their colour because colour is an indication of the extent of burning. Bricks that are burnt excessively are used for covering the pavement while the bricks that are slightly under burnt are used in the construction of inner walls of the building²².

OCCUPATIONAL DISEASES AMONG BRICK KILN WORKERS IN ASIA:

In a study done by Fernando WIB in Srilanka (year 2016) titled “ Prevalence of work related musculoskeletal disorders in brick industry workers in Chilaw ,Sri Lanka” the prevalence of

Musculoskeletal disorders in different body parts of the workers were as follows :Low back pain (65.87%), Wrist pain (11.11%), Shoulder pain (9.52%), Knee pain (5.55%), Neck pain (3.17%), Elbow pain (2.38%) and Ankle pain (2.38%)²³.

In a study done by Shiraz Shaikh et al in Pakistan (year 2012) titled “Respiratory symptoms and illnesses among brick kiln workers: a cross sectional study from rural districts of Pakistan” the prevalence of respiratory disorders among the workers were as follows: Chronic cough (22.4%), Chronic phlegm (21.2%), Wheeze (19.4%), Grade 1 dyspnea (34.4%), Grade 2 dyspnea (11.8%), Grade 3 dyspnea (7.6%), Grade 4 dyspnea (1.5%), Chronic bronchitis (17.1%)²⁴.

In a study done by Abdul Rahman et al in Pakistan (year 2007) titled “Prevalence of Chronic Obstructive Pulmonary Disease as Occupational Lung Disease among Brick Kiln Workers” the prevalence of respiratory disorders among the workers were as follows: Chronic cough (57%), Phlegm (33%), Dyspnea (14%) and Chronic Obstructive Pulmonary Disease (18.9%).

The study also showed a significant association between inhalation of smoke and respiratory pollutants and development of Chronic Obstructive Pulmonary Disease in brick kiln workers²⁵.

In a study done by Seshananda Sanjel et al in Nepal (year 2017) titled “Respiratory symptoms and illnesses related to the concentration of airborne particulate matter among brick kiln workers in Kathmandu valley, Nepal” the prevalence of respiratory disorders among the workers were as follows: Chronic cough (14.3%), Chronic phlegm (16.6%), Chronic bronchitis (19%), Wheezing (11.3%) and Asthma (6%).

The study also found a significant association between increased duration of work and chronic cough, smoking practice of workers and chronic bronchitis and smoking habit of workers and development of bronchial asthma²⁶.

In a study done by Sajan Das et al titled in Bangladesh (year 2017) titled “Socioeconomic conditions and health hazards of brick field workers: A case study of Mymensingh brick industrial area of Bangladesh” the prevalence of various occupational diseases were as follows: Respiratory distress (31.8%), Chronic cough (17.2%), Blurred vision (58.5%), Eye injury (15.7%) and Hearing loss (47%)²⁷.

In a study done by Tanmoy Roy Tusher et al in Bangladesh (year 2015) titled “Health effects of brick kiln operations: A study on largest brick kiln cluster in Bangladesh” the prevalence of various occupational diseases among the brick kiln workers were as

follows: Skin diseases (32%), Asthma (22%), Headache (16%), Bronchitis (8%) and Eye irritation (8%)²⁸.

OCCUPATIONAL DISEASES AMONG BRICK KILN WORKERS IN INDIA:

In a study done by Manoj Kumar Sain in Rajasthan (year 2021) titled “Musculoskeletal health problems and relationship of risk factors among manual clay brick sector workers” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows : shoulder pain (56.15%), wrist pain (50.77%), low back pain (50%), neck pain (25.38%), upper arm (25.38%), finger(23.85%), knee pain (23%), upper back (21.54%) and lower arm (20%).

The risk factor that was found to be associated with neck pain was increase in workers’ age. The prevalence of neck pain and shoulder pain was higher among workers involved the task of spading when compared with the workers involved in mould filling task. The task of mould filling was significantly associated with wrist pain. Mould evacuating task was found to be associated with wrist and finger pain. The prevalence of low back pain , neck pain and shoulder pain were higher among spading task workers when compared with mould evacuating workers. The task of carrying brick was significantly associated with neck pain and lower arm pain. The prevalence of low back pain and shoulder pain was higher

among spading task workers when compared to brick carriers. The higher the years of working , the higher will be the prevalence of musculoskeletal disorders²⁹.

In a study done by Manoj Kumar Sain et al in Rajasthan (year 2018) titled “Identifying musculoskeletal issues and associated risk factors among clay brick kiln workers” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows : wrist pain (51.52%), low back pain (50%), shoulder pain (47.87%), finger pain (31.7%), upper arm pain (25.91%), knee pain (22.87%), lower arm pain (21.04%), upper back pain (20.43%), and neck pain (18.9%).

Increase in the age of the workers was found to be associated with musculoskeletal disorders. Lower back pain was more among men when compared to females while finger pain was lesser among men when compared to females. The underweight workers were more prone to shoulder pain when compared to overweight workers. Spading task was significantly associated with wrist pain , upper back and lower back pain . Mould filling task was found to be significantly associated with wrist pain and knee pain. Mould evacuating task was found to be significantly associated with wrist pain, finger pain and lower back pain . Workers who have work experience of more than 10 years were found to have higher prevalence of neck pain and upper back pain³⁰.

In a study done by Gogoi B et al in Assam (year 2016) titled “An Assessment of Health Status of Seasonal Migrant Brick Kiln Workers of Jorhat District of Assam” the prevalence of various occupational diseases are as follows: nutritional anaemia (90.5%), skin problems (86%), musculoskeletal pain (76.5%), underweight (38.3%), physical injuries due to accidents (32.1%), chronic obstructive pulmonary disorder (29.6%), hypertension (27.2%), stress (23.8%) and depression (15.4%)³¹.

In a study done by V. G Vaidya et.al, in Pune (year 2015) titled “Occupational Health Hazards of Women Working in Brick Kiln and Construction Industry” the prevalence of various occupational diseases among women brick kiln workers are as follows: low back pain (60%), vision problems (48%), nutritional anaemia (30%), breathlessness (20%), cough (18%) and skin problems (5%)³².

In a study done by Banibrata Das et al in West Bengal (year 2014) titled “Assessment of occupational health problems and physiological stress among the brick field workers of West Bengal, India” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows : lower back pain (98%), hand pain (93%), knee pain (86%), wrist pain (85%), shoulder pain (76%), neck pain (65%), elbow pain (41%), upper back pain (15%), feet pain (15%) and ankle pain (5%)³³.

In a study done by Kumar Parimal Shrestha et al in Uttar Pradesh (year 2021) titled “Treatment seeking behavior and level of treatment among brick kiln workers: A Study in Azamgarh District, Uttar Pradesh” , the prevalence of musculoskeletal disorders was high. Every 8 out of 10 workers (82.7%) suffered from musculoskeletal disorders. Half of the workers (53.8%) suffered from respiratory diseases. Vision problems were seen in 29% of workers and skin problems were seen in 31% of workers. Every 1 out of 5 workers suffered from Injuries due to accidents at the workplace³⁴.

In a study done by Vikas Monga et al in Punjab (year 2012) titled “Respiratory Health in brick kiln workers” the prevalence of various respiratory diseases among the workers were as follows:

- chronic cough – males (32.2%) and females (43.3%),
- breathlessness- males (27.7%) and females (30%) and
- asthma – males (11.1%) and females (13.3%)³⁵.

In a study done by Supriya Tandon et al in Punjab (year 2017) titled “Respiratory Abnormalities among Occupationally Exposed, Non-Smoking Brick Kiln Workers from Punjab,India” two-thirds (67%) of the brick kiln workers were suffering from cough and more than half of the workers (60%) suffered from breathlessness. The study also found that increase in the duration of exposure (working years - more than 8 years) to inhaled respiratory pollutants was

significantly associated with increase in the prevalence of respiratory disorders as ascertained from decline in lung function³⁶.

In a study done by Maity Payel et al in West Bengal (year 2015) titled “Evaluation of Work Related Musculoskeletal Disorder and Postural Stress of Brick Kiln Workers during Performing Different Brick Making Tasks” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows: shoulder pain (92%), low back pain (86.4%), knee pain (77.4%), neck pain (58.5%), upper back pain (40.5%), thigh pain (35.1%), feet pain (28%), elbow pain (26.1%) and wrist pain (17%).

There is a significant association between female gender and occurrence of neck pain. The prevalence of neck pain was more among females than males. In addition to this the prevalence of knee pain and feet pain was more among females than males. The prevalence of lower back pain and thigh pain was more among males than females³⁷.

In a study done by Bandyopadhyay Bijetri, Sen D in Kolkata (year 2014) titled “Occupational Stress among Women Moulders: A Study in Manual Brick Manufacturing Industry of West Bengal” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows: ankle pain (98.1%), knees (96.3%), lower back (96.3%), wrist pain (94.5%), thigh pain (92.7%), hip

pain (90.9%), feet pain (89%), upper back (87.2%), neck pain (85.4%), hand pain (83.6%), elbow pain (76.3%), and shoulder pain (72.7%) .

The study also found that more than half of the workers (58.18%) suffered from headache and about two thirds of the workers (63.64%) suffered from depression ³⁸.

In a study done by Dr Sujata Patil et al in Satara district, Maharashtra (year 2017) titled “A Cross Sectional Study of Socio – Demographic and Morbidity Profile of Brick Kiln Workers in Rural Area of Karad, in Satara District” the prevalence of various occupational diseases among workers were as follows: musculoskeletal disorders (51.2%), respiratory diseases (27.5%) and eye problems (28.7%)³⁹.

In a study done by Dr Madhuri Bharatiya in Nagpur (year 2017) titled “Study of Work Related Respiratory Symptoms and Pulmonary Functional Tests in Brick Kiln Workers” one fifth of the workers (20%) were found to have breathlessness and 14.7% of workers were found to have cough⁴⁰.

OCCUPATIONAL DISEASES AMONG BRICK KILN WORKERS IN TAMILNADU:

In a study done by Dr.S.Henry Pandian and Dr.V.Duraisingh in Thoothukudi District, Tamil Nadu (year 2021) titled “A Study on Occupational Health Hazards of Brick Workers in Eral Block, Thoothukudi District” the prevalence of various occupational diseases among brick kiln workers were as follows: Back pain (43.34%), Headache (23.33%), Skin diseases (11.67%) and Anaemia (8.33%).

The study also found that there was a significant association between work experience (more than 10 years) and occurrence of occupational diseases⁴¹.

In a study done by Beena E. Thomas in Thiruvallur district, Tamil Nadu (year 2012) titled “Prevalence of chest symptoms amongst brick kiln migrant workers and care seeking behaviour: a study from South India” the prevalence of chest symptomatic was found to be 9.4%. The variables that were found to be significantly associated with the chest symptoms were illiteracy, alcohol abuse and heavy smoking. The study also found that among those workers with chest symptoms only half of them (50.4%) sought treatment for the same and their awareness about Tuberculosis was also low⁴².

In a study done by Leeberk Raja Inbaraj et al in Vellore district, Tamil Nadu titled “Prevalence of musculoskeletal disorders among brick kiln workers in rural Southern India” the prevalence of Musculoskeletal disorders in different body parts of the workers were as follows : Lower back pain (59%), Knee pain (44.8%), Shoulder (23.5%), Ankle (22.9%), Elbow (20.6%), Hips (20.6%), Wrist (13.9%), Neck (11.3%), and Upper back (8.7%).

The study found that two thirds of the study participants (65%) suffered from moderate or severe form of pain when assessed with the body pain discomfort scale. There was a statistically significant association ($P \leq 0.05$) between working experience more than 10 years and occurrence of chronic back pain and chronic knee pain. Workers employed for more than 10 years had 3.11 times higher odds of suffering from either moderate or severe form of musculoskeletal pain. The study also found that one fourth of the workers (27%) were underweight and malnourished⁴³.

MATERIALS AND METHODS

STUDY DESIGN:

The present study is a community based cross-sectional, descriptive study conducted in brick kiln industries of Kancheepuram district, Tamil Nadu.

STUDY AREA AND STUDY POPULATION:

Kancheepuram district is one among the 38 districts of Tamil Nadu. According to the Census of India 2011, Kancheepuram district covers an area of 4483 Sq.km. The population of Kancheepuram district is 39.98 lakhs which is about 5.54% of the total state population comprising of 20.12 lakh males and 19.85 lakh females. In rural 14.53 lakh and in Urban it was 25.37 lakh people.¹ Scheduled Castes and Scheduled Tribes accounted for 23.71% and 1.03% of the population respectively. Kancheepuram district has a average literacy of 75.37%. A total of 16,73,814 workers comprising 74,761 cultivators, 162,494 main agricultural labourers, 41,149 in house hold industries, 1,088,974 brick kiln workers, 306,436 marginal workers, 14,582 marginal cultivators, 110,020 marginal agricultural labourers, 13,583 marginal workers in household industries and 168,251 other marginal workers.¹

A total of 340 large and small scale brick kiln industries were located in and around Kancheepuram district which also includes

Chennai, Tiruvallur and Chengalpattu district.² About 90% of the workforce is made up of Dalits and people from Scheduled Tribes, with the remaining 10% being members of the Backward Classes or the Most Backward Classes. Brick workers with their families are heavily concentrated in the Tiruvallur and Kancheepuram districts.³ The study area identified for the present study is the brick kiln industries located in Kancheepuram district. Brick kiln workers involved in the production and processing work of manufacturing clay bricks in the age group of 18 to 60 years will be considered for the study. They form the sampling frame for the study.

STUDY PERIOD:

The study was carried out between the period of 1 year (January 2021 to June 2022).

SAMPLE SIZE:

The sample size was calculated based on a previous study conducted by Kumari.S on Occupational Health of Brick Workers of India in the year 2014.⁴ The findings revealed that the self-reported morbidity among brick workers was around 11%.⁴ This prevalence of 11% was taken as the reference value for the sample size calculation for this study.

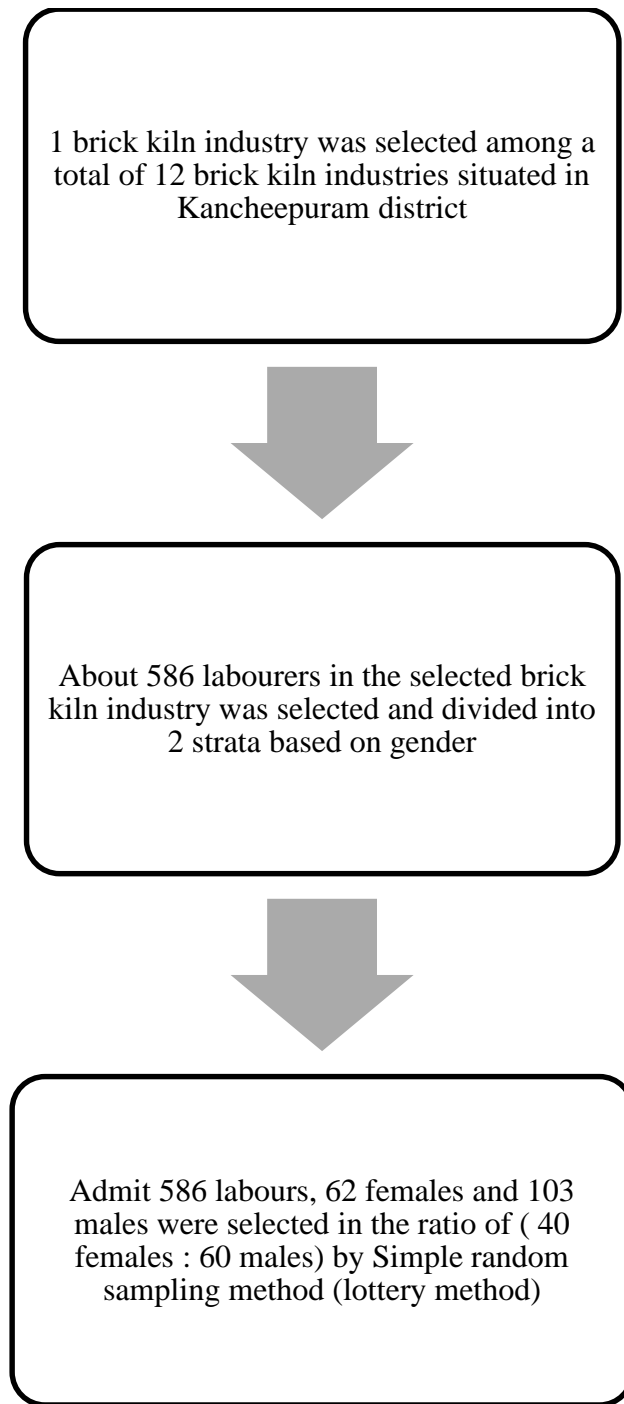
Exclusion criteria:

- 1) Brick kiln workers in administration department and other than production department,
- 2) Brick kiln workers with existing co- morbidities,
- 3) Brick kiln workers with debilitating disease,
- 4) Brick kiln workers previously diagnosed with other occupational disease which may affect the study were excluded from the study.

SAMPLING METHOD:

The sampling method applied to choose the required study population was Stratified Random Sampling. A total of 12 brick kiln industries situated in Kancheepuram district and 1 brick kiln industry were selected randomly using simple random sampling among the brick kilns situated in Kancheepuram district. Around 586 labourers were working currently in the selected brick kiln industry and the labours were divided into 2 strata based on gender. Among the 586 laborers, males and females were distributed in the ratio of 40 females: 60 males. Based on this ratio, 62 females and 103 males were selected randomly using lottery method. If a worker from the list was not able to be contacted due to any illness or absence were excluded and the study was carried out till the required sample size was reached.

STUDY FRAME:



STUDY TOOL:

The tool used to interview the study participants for this study was a pre-tested validated semi-structured questionnaire that was prepared in English and Tamil. The questionnaire consisted of the following sections (ANNEXURE I)

SECTION I: Socio-demographic characteristics of the study population which included age, gender, education, No. of family members, individual income, total family income, marital status, dietary pattern and socio-economic status of the family based on modified B.G.Prasad classification ⁵.

SECTION II: Information regarding work related details which included designation, working section, years of working, working timing and about migration history.

SECTION III: Information regarding personal history (smoking, alcohol, any substance abuse, usage personal protective measures during work (masks , gloves), previous medical history), family history, general examination and vitals status (Blood pressure, pulse rate, respiratory rate).

SECTION IV: Information regarding musculoskeletal illness using modified Nordic questionnaire, respiratory illness using American thoracic society, division of lung disease - 78 adult respiratory questionnaire (ATS-DLD 78) questionnaire and dermatological manifestations using Dermatology life quality index (DLQI).

The physical instruments used in the study included a Sphygmomanometer for measuring Blood pressure, pulse oximeter and a stethoscope for examining respiratory system.

RELIABILITY AND VALIDITY :

The questionnaire was evaluated by subject experts including Epidemiologists, Statistician, Orthopaedician, Pulmonologists, and dermatologists to check for validity. The validators had suggested some modifications in the questions which were incorporated and the approved questionnaire was used for data collection. The Cronbach's alpha test was used to calculate the reliability of the questionnaire and was found to be 0.8 which indicated that the tool was highly reliable.

DATA COLLECTION METHOD:

A brief introduction was first given to the study participant about self and purpose of the study by the investigator. Written informed consent in English and Tamil was then obtained from the respondents according to their willingness to participate (ANNEXURE II). Confidentiality maintenance regarding all the collected information was assured to the participant. Data was collected through a face -to- face interview among the study participant by the investigator himself using a pre validated semi – structured questionnaire. The participants were interviewed after building a rapport and questions about demographic details were

collected followed by personal, family and past medical history. Particulars about their working section, general examination, and systemic examination were noted. Each respondent was interviewed for about 15 – 20 minutes along with recording their vital signs.

ETHICAL CONSIDERATION:

The investigator followed all the ethical guidelines which were issued by the Institutional Research Ethical Committee. After a thorough review of the study topic and its inclusions the Ethical committee at Sree Balaji Medical College and Hospital approved the study for its further proceedings (Ref.No: 002 /SBMC/IHEC/2020/1442).

DATA ANALYSIS AND INTERPRETATION:

Data entry was done in Microsoft excel. Appropriate descriptive statistical measures were expressed as frequency and percentage. Chi square test was used to identify the association between factors and selected variables. The results are presented in the form of tables, graphs and figures etc. using SPSS 21.0 version. P value < 0.05 was considered statistically significant.

OPERATIONAL DEFINITIONS:

- **Morbidity-** Refers to having a disease or a symptom of disease, or to the amount of disease within a population.

Morbidity also refers to medical problems caused by a treatment ⁶.

- **Risk factor-** Something that increases the chance of developing a disease ⁷.
- **Brick kiln workers-** Workers working in brick industries within age group of 18 to 60 years working for a minimum of one year without any existing co-morbidities, debilitating disease and previously diagnosed with other occupational disease.
- **Musculoskeletal pain-** It is defined as the pain arising from the musculoskeletal system i.e., muscles, bones, joints and associated tissues such as ligaments and tendons causing limitation in mobility, dexterity and functional ability, reducing people's ability to work ⁸.
- **Respiratory tract infection-** It is defined as any infectious disease of the upper and lower respiratory tract. Upper respiratory tract infections include the common cold, laryngitis, pharyngitis/tonsillitis, acute rhinitis, acute rhinosinusitis and acute otitis media. Lower respiratory tract infections include acute bronchitis, bronchiolitis, pneumonia and tracheitis ⁹.
- **Occupational dermatitis-** It is defined as any alteration in the skin, mucosal or annexes that is directly or indirectly caused, conditioned, maintained or aggravated by agents present in the occupational activity or work environment ¹⁰.

- **Blood pressure:** Mercury sphygmomanometer is used to record systolic and diastolic blood pressure using both palpatory and auscultatory method. Participants were made to relax for 5mins and blood pressure was recorded in sitting position on the left upper arm at the level of the heart.
- **Pulse rate:** Pulse rate is measured using palpatory method by gently placing 2 fingers over the wrist on the radial artery and counted for 1minute in sitting position.
- **Respiratory rate:** Respiratory rate is calculated by observing the movement of the chest wall for 1minute in sitting position.

RESULTS

The data collected among the study participants was entered in Microsoft Excel and analyzed using SPSS 21.0 software version. The descriptive tables were expressed as frequency and percentages. Chi square test was used to identify the association between selected variables and unadjusted odds ratio was calculated. The results obtained were presented in the form of tables and graphs.

Table 1: Demographic profile of study participants (n=165)

Variable	Categories	Number (%)
Age group	>35years	110 (66.7)
	<35years	55 (33.3)
Gender	Male	103 (62.4)
	Female	62 (37.6)
Education	Illiterate	99 (60)
	Literate	66 (40)
Marital status	Married	106 (64.2)
	Unmarried	59 (35.8)
Socio-economic class	Upper class/upper middle	56 (33.9)
	Middle/lower class	109 (66.1)
Migration	Yes	120 (72.7)
	No	45 (27.3)

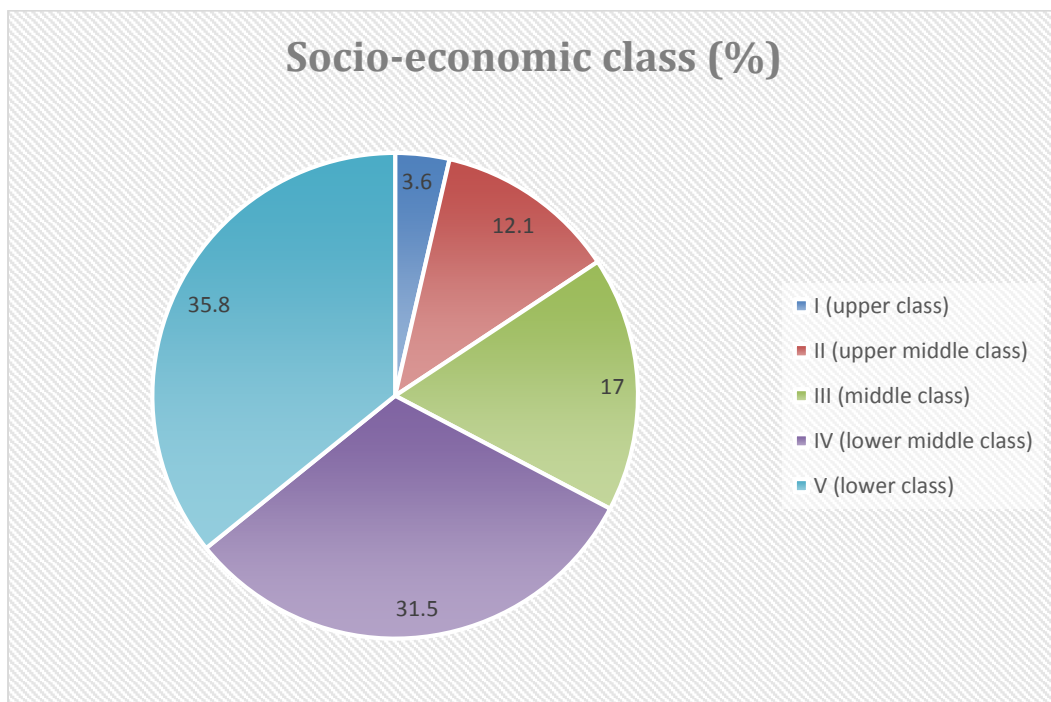
Sociodemographic details of study participants:

The total number of participants were 165. Among them 103 were males (62.4%) and 62 were females (37.6%). Majority of the participants belongs to the age group above 35years (66.7%) and rest of the participants were less than 35years of age (33.3%).

Out of 165 participants, 99(60%) of them were Illiterate, and 66(40%) participants were Literate. Those who are married and living with their partner were 106(64.2%) and 59 (35.8%) of them were unmarried.

As per modified B.G. Prasad socio economic status scale, 109 participants (66.1%) belong to middle class / lower middle class / lower class, followed by 56 (33.9%) participants in upper class / upper middle class.

The migrants comprises of 120 (72.7%) study participants from other states in India, whereas the remaining participants (45) lived in the same state (27.3%).

Figure.1: Socio-economic status of the study participants

The above Pie diagram shows the socio economic distribution of the study participants. It is observed that 35.8% were belonging to lower class, 31.5% to lower middle class, 17% to middle class, 12.1% to upper middle class and 3.6% to upper class respectively.

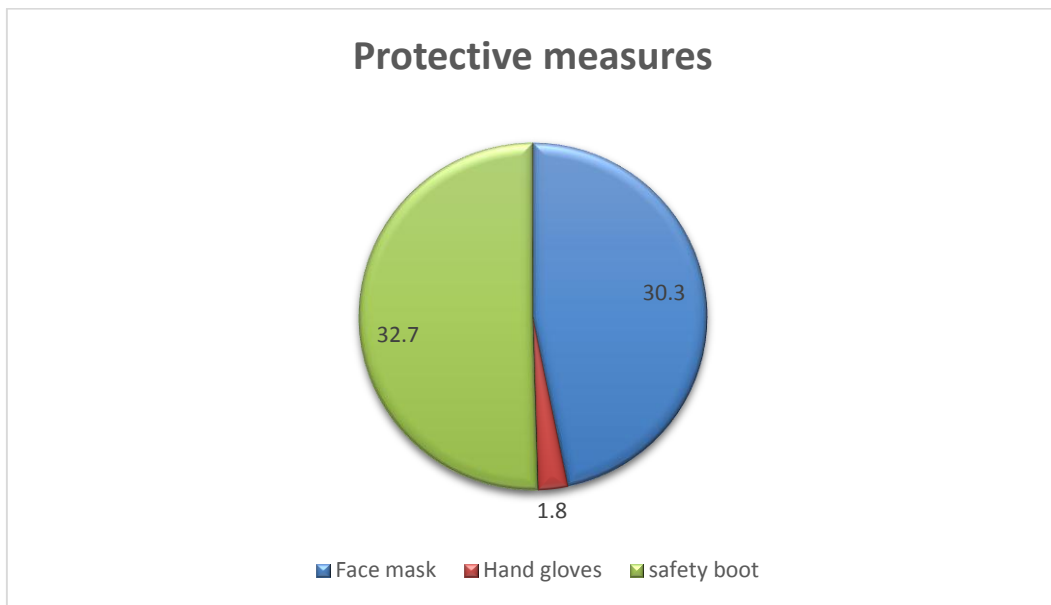
Table 2: Nature of work of study participants (n=165)

Variable	Categories	Number (%)
Designation	Brick workers	142 (86.1)
	Others	23 (13.9)
Use of protective measures	Yes	106 (64.2)
	No	59 (35.8)

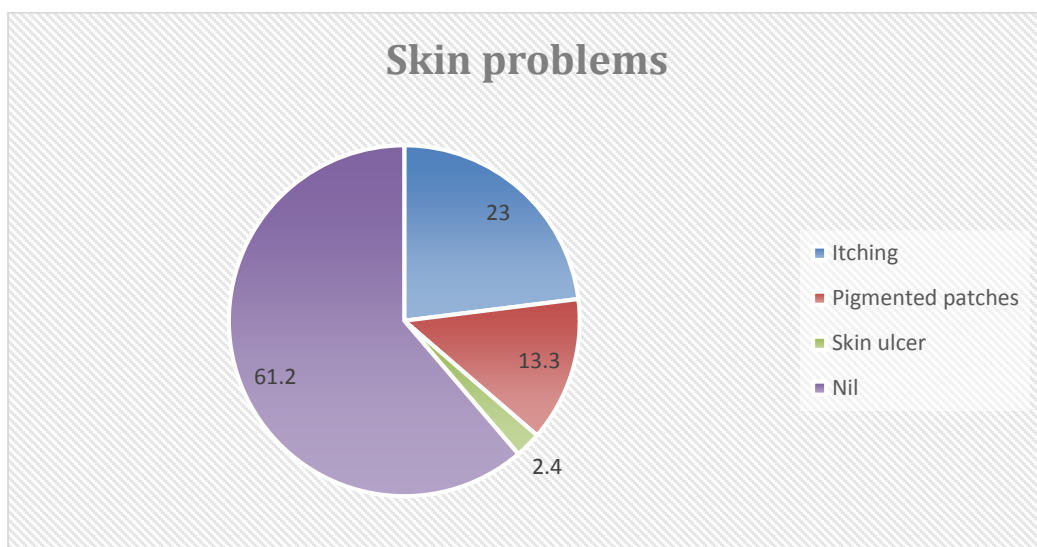
Nature of work of the study participants:

Among the 165 participants, majority (142) of them were brick workers (86.1%) includes brick making, brick cutting, brick loading, brick unloading and brick heating, while other participants (23) of them belong to different working sections i.e., driver, cashier, motorman, farmer (13.9%).

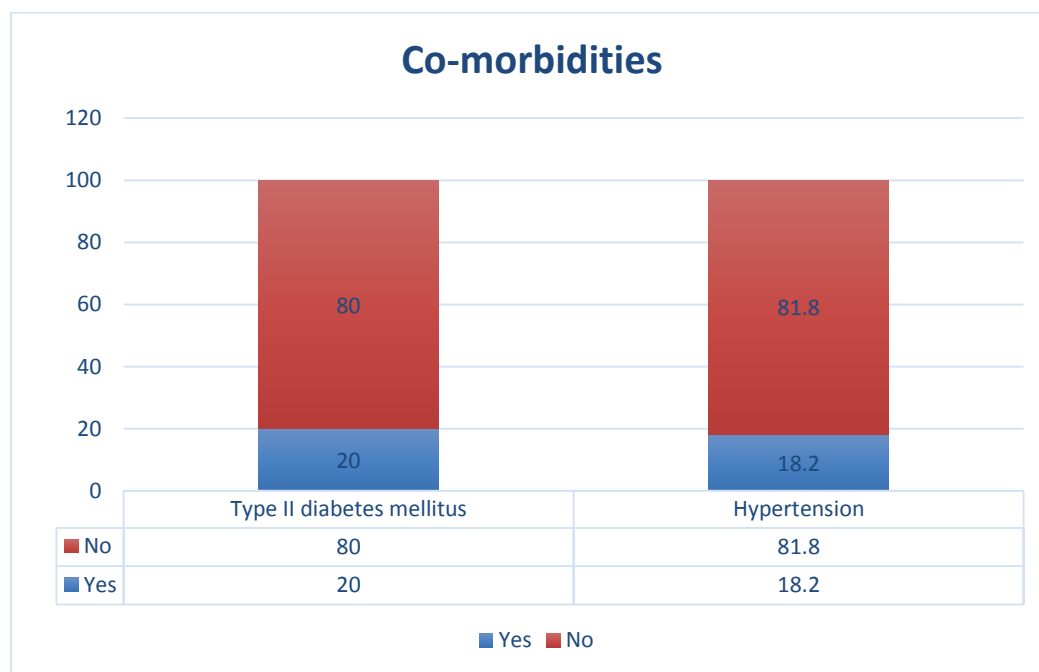
Out of 165 workers, 106 were working with protective measures like wearing face mask, hand gloves, googles and safety boots (64.2%), remaining workers (59) were working without any protective measures (35.8%).

Figure.2: Use of protective measure by the study participants

From the fig 2, it is observed that 32.7 reported with usage of safety boot, 30.3% with usage of face mask and 1.8% with usage of hand gloves respectively.

Figure.3: Skin problems among the study population

From the Pie chart it is evident that 23% had complaints of itching, 13.3% had pigmented patches, 2.4% reported with skin ulcer respectively.

Figure.4: Co-morbidities among the study population

From the above bar diagram, 20% and 18.2% of the study participants are found to be diabetic and hypertensive respectively.

Table 3: Personal habits and co-morbidities of study participants (n=165)

Variable	Categories	Number (%)
Alcohol use	Yes	66 (40)
	No	99 (60)
Tobacco use	Yes	32 (19.4)
	No	133 (80.6)
Type 2 diabetes mellitus	Yes	33 (20)
	No	132 (80)
Hypertension	Yes	30 (18.2)
	No	135 (81.8)

Personal habits and co-morbidities of study participants:

Out of 165 study participants, about 66(40%) of them were alcoholic, 32(19.4%) of them are consuming tobacco both smoked and smokeless form.

Of the 165 study participants, only a few were known to be diabetic (20%) or hypertensive (18.2%), while the rest were free of comorbidities (80%).

Table 4: Descriptive analysis of the one year pain-regional distribution among the study participants (n=165)

Region	Male n (%)	Female n (%)	Total n (%)
Neck	20 (19.4)	14 (22.6)	34 (42)
Shoulder	22 (35.5)	14 (22.6)	36 (58.1)
Elbow	20 (19.4)	13 (21)	33 (40.4)
Wrist	7 (6.8)	10 (16.1)	17 (22.9)
Upper back	9 (8.7)	16 (25.8)	25 (34.5)
Lower back	24 (38.7)	20 (32.3)	44 (71)
Hips	13 (12.6)	10 (16.1)	23 (28.7)
Knee	21 (20.4)	19 (30.6)	40 (51)
Ankle	9 (8.7)	4 (6.5)	13 (15.2)

During last 12 months on assessing the pain distribution of the study participants, majority (71%) of the workers had lower back pain (males (38.7%), females (32.3%)), followed by shoulder

pain (58.1%) (males (35.5%), females (22.6%)), knee pain (51%) (males (20.4%), females (30.6%)), and 42% of them had neck pain (males (19.4%), females (22.6%)), while few experienced pain in other regions of the body.

Table 5: Descriptive analysis of the seven days pain-regional distribution among the study participants (n=165)

Region	Male n (%)	Female n (%)	Total n (%)
Neck	22 (35.5)	17 (27.4)	39 (62.9)
Shoulder	24 (38.7)	8 (12.9)	32 (51.6)
Elbow	15 (14.6)	8 (12.9)	23 (27.5)
Wrist	5 (4.9)	9 (14.5)	14 (19.4)
Upper back	22 (35.5)	14 (22.6)	36 (58.1)
Lower back	53 (51.5)	26 (41.9)	79 (93.4)
Hips	20 (19.4)	9 (14.5)	29 (33.9)
Knee	40 (38.8)	19 (30.6)	59 (69.4)
Ankle	2 (1.9)	3 (4.8)	5 (6.7)

When assessing the pain distribution of study participants in the past 7days, the majority (93.4%) of workers had low back pain (men (51.5%), women (41.9%)), followed by knee pain (69.4%) (men (38.8%), women (30.6%)), neck pain (62.9%) (men (35.5%), women (27.4%)), and 58.1% had upper back pain (men (35.5%), women (22.6%)), while rest of the workers had pain in the other body regions.

Table 6: Descriptive analysis of the activity limitation due to aches and pain in past one year-regional distribution among the study participants (n=165)

Region	Male n (%)	Female n (%)	Total n (%)
Neck	8 (7.8)	3 (4.8)	11 (12.6)
Shoulder	10 (9.7)	2 (3.2)	12 (12.9)
Elbow	7 (6.8)	2 (3.2)	9 (10)
Wrist	3 (2.9)	4 (6.5)	7 (9.4)
Upper back	4 (3.9)	2 (3.2)	6 (7.1)
Lower back	16 (15.5)	2 (3.2)	18 (18.7)
Hips	8 (7.8)	1 (1.6)	9 (9.4)
Knee	5 (4.9)	6 (9.7)	11 (14.6)
Ankle	2 (1.9)	2 (3.2)	4 (5.1)

When evaluating the regional distribution of activity limitations due to pain in the past year among participants, few workers had difficulty performing their daily activities and going to work. About 61.2% of men had difficulty going to work and about 38.6% of women had activity limitations in the past year.

Table 7: Association between related variables and upper limb aches and pain for past 12months among study participants (n=165)

Variable		Upper limb aches and pain			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=53) (%)	No (n=112) (%)	Total (n=165) (%)			
Age group	>35years	14 (26.4)	96 (85.7)	110 (66.7)	56.93	0.000*	16.714 (7.45-37.5)
	<35years	39 (73.6)	16 (14.3)	55 (33.3)			
Gender	Male	28 (52.8)	75 (67)	103 (62.4)	3.06	0.080	1.810 (0.93-3.53)
	Female	25 (47.2)	37 (33)	62 (37.6)			
Education	Illiterate	35 (66)	31 (27.7)	66 (40)	22.06	0.000*	5.081 (2.52-10.26)
	Literate	18 (34)	81 (72.3)	99 (60)			
Marital status	Married	48 (90.6)	58 (51.8)	106 (64.2)	23.55	0.000*	8.942 (3.31-24.12)
	Unmarried	5 (9.4)	54 (48.2)	59 (35.8)			
Socio-economic class	Upper class/upper middle	28 (52.8)	28 (25)	56 (33.9)	12.43	0.000*	3.364 (1.69-6.69)
	Middle/lower class	25 (47.2)	84 (75)	109 (66.1)			
Designation	Labor	44 (83)	98 (87.5)	142 (86.1)	0.61	0.438	1.432 (0.58-3.56)
	Others	9 (17)	14 (12.5)	23 (13.9)			

Migrated	Yes	35 (66)	85 (75.9)	120 (72.7)	1.76	0.184	0.618 (0.30-1.26)
	No	18 (34)	27 (24.1)	45 (27.3)			
Alcohol consumption	Yes	25 (47.2)	41 (36.6)	66 (40)	1.67	0.196	1.546 (0.80-3)
	No	28 (52.8)	71 (63.4)	99 (60)			
Tobacco consumption	Yes	7 (13.2)	25 (22.3)	32 (19.4)	1.91	0.167	0.530 (0.21-1.32)
	No	46 (86.8)	87 (77.7)	133 (80.6)			
Protective measures	Yes	17 (32.1)	42 (37.5)	59 (35.8)	0.46	0.497	0.787 (0.39-1.57)
	No	36 (67.9)	70 (62.5)	106 (64.2)			
Type 2 diabetes mellitus	Yes	13 (24.5)	20 (17.9)	33 (20)	1.00	0.317	1.495 (0.68-3.30)
	No	40 (75.5)	92 (82.1)	132 (80)			
Hypertension	Yes	19 (35.8)	11 (9.8)	30 (18.2)	16.38	0.000*	5.131 (2.22-11.86)
	No	34 (64.2)	101 (90.2)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 7. shows the association between upper limb aches and pain for past 12 months and related variables. More than 71% of those who were less than 35 years of age had upper limb pain for one year and the association between them was found to be

statistically significant ($P < 0.05$) with an odds ratio of 16.71. It was found that, workers having upper limb aches and pain for the past one year had 5.08 times increased odds of being illiterate. (OR = 5.08). About 45% of the married workers had experienced upper limb pain for the past one year which is found to be statistically significant ($P < 0.05$). It was found that, workers having upper limb aches and pain for the past one year had 3.364 times increased odds of being upper/upper middle class (OR = 3.364). About 35.8% of the hypertensive workers had experienced upper limb pain for the past one year which is found to be statistically significant ($P < 0.05$)

Table 8: Association between related variables and lower limb aches and pain for past 12months among study participants (n=165)

Variable		Lower limb aches and pain			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=113) (%)	No (n=52) (%)	Total (n=165) (%)			
Age group	>35years	61 (54)	49 (94.2)	110 (66.7)	25.96	0.000*	13.923 (4.1-47.3)
	<35years	52 (46)	3 (5.8)	55 (33.3)			
Gender	Male	60 (53.1)	43 (82.7)	103 (62.4)	13.30	0.000*	4.22 (1.88-9.47)
	Female	53 (46.9)	9 (17.3)	62 (37.6)			
Education	Illiterate	50 (44.2)	16 (30.8)	66 (40)	2.70	0.101	1.786 (0.89-3.58)
	Literate	63 (55.8)	36 (69.2)	99 (60)			
Marital status	Married	87 (77)	19 (36.5)	106 (64.2)	25.37	0.000*	5.812 (2.84-11.87)
	Unmarried	26 (23)	33 (63.5)	59 (35.8)			
Socio-economic class	Upper class/upper middle	42 (37.2)	14 (26.9)	56 (33.9)	1.67	0.197	0.623 (0.30-1.28)
	Middle/lower class	71 (62.8)	38 (73.1)	109 (66.1)			
Designation	Labor	101 (89.4)	41 (78.8)	142 (86.1)	3.29	0.070	0.443 (0.18-1.08)
	Others	12 (10.6)	11 (21.2)	23 (13.9)			

Migrated	Yes	76 (67.3)	44 (84.6)	120 (72.7)	5.41	0.020*	0.373 (0.16-0.87)
	No	37 (32.7)	8 (15.4)	45 (27.3)			
Alcohol consumption	Yes	30 (26.5)	36 (69.2)	66 (40)	27.03	0.000*	0.161 (0.08-0.33)
	No	83 (73.5)	16 (30.8)	99 (60)			
Tobacco consumption	Yes	10 (8.8)	22 (42.3)	32 (19.4)	25.50	0.000*	0.132 (0.06-0.31)
	No	103 (91.2)	30 (57.7)	133 (80.6)			
Protective measures	Yes	43 (38.1)	16 (30.8)	59 (35.8)	0.82	0.364	1.382 (0.69-2.79)
	No	70 (61.9)	36 (69.2)	106 (64.2)			
Type 2 diabetes mellitus	Yes	28 (24.8)	5 (9.6)	33 (20)	5.12	0.024*	3.096 (1.12-8.55)
	No	85 (75.2)	47 (90.4)	132 (80)			
Hypertension	Yes	27 (23.9)	3 (5.8)	30 (18.2)	7.86	0.005*	5.128 (1.48-17.78)
	No	86 (76.1)	49 (94.2)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 8. shows the association between lower limb aches and pain for past 12 months and related variables. Nearly 61% of those who were more than 35 years of age had lower limb pain for one year and the association between them was found to be statistically

significant ($P < 0.05$) with an odds ratio of 13.923. It was found that, workers having lower limb aches and pain for the past one year had 4.22 times increased odds of being males. (OR = 4.22). About 77% of the married workers had experienced lower limb pain for the past one year which is found to be statistically significant ($P < 0.05$). Migration were found to have a statistically significant association with lower limb aches and pain for past one year. But since their odds ratio was less than 1 (OR = 0.373) can be considered to be protective against lower limb aches and pains. About 30% and 10% of the workers who had experienced lower limb pain for the past one year had alcohol and tobacco consumption which is found to be statistically significant ($P < 0.05$)

Table 9: Association between related variables and upper limb aches and pain for past 7days among study participants (n=165)

Variable		Upper limb aches and pain			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=144) (%)	No (n=21) (%)	Total (n=165) (%)			
Age group	>35years	89 (61.8)	20 (95.2)	109 (66.1)	12.03	0.001*	0.809 (0.74-0.89)
	<35years	55 (38.2)	1 (4.8)	56 (33.9)			
Gender	Male	82 (56.9)	20 (95.2)	102 (61.8)	14.48	0.000*	0.796 (0.72-0.88)
	Female	62 (43.1)	1 (4.8)	63 (38.2)			
Education	Illiterate	61 (42.4)	5 (23.8)	66 (40)	2.63	0.105	2.352 (0.82-6.77)
	Literate	83 (57.6)	16 (76.2)	99 (60)			
Marital status	Married	102 (70.8)	4 (19)	106 (64.2)	21.40	0.000*	10.321 (3.28-32.5)
	Unmarried	42 (29.2)	17 (81)	59 (35.8)			
Socio-economic class	Upper class/upper middle	53 (36.8)	3 (14.3)	56 (33.9)	4.15	0.042	0.286 (0.81-1.02)
	Middle/lower class	91 (63.2)	18 (85.7)	109 (66.1)			
Designation	Labor	125 (86.8)	17 (81)	142 (86.1)	0.52	0.469	0.646 (0.20-2.13)
	Others	19 (13.2)	4 (19)	23 (13.9)			

Migrated	Yes	101 (70.1)	19 (90.5)	120 (72.7)	3.82	0.051	0.247 (0.06-1.11)
	No	43 (29.9)	2 (9.5)	45 (27.3)			
Alcohol consumption	Yes	45 (31.3)	20 (95.2)	65 (39.4)	36.10	0.000*	1.467 (1.24-1.73)
	No	99 (68.8)	1 (4.8)	100 (60.6)			
Tobacco consumption	Yes	26 (18.1)	6 (28.6)	32 (19.4)	1.30	0.255	0.551 (0.20-1.56)
	No	118 (81.9)	15 (71.4)	133 (80.6)			
Protective measures	Yes	91 (63.2)	15 (71.4)	106 (64.2)	0.54	0.462	1.456 (0.53-3.98)
	No	53 (36.8)	6 (28.6)	59 (35.8)			
Type 2 diabetes mellitus	Yes	32 (22.2)	1 (4.8)	33 (20)	3.50	0.062	5.714 (0.74-44.23)
	No	112 (77.8)	20 (95.2)	132 (80)			
Hypertension	Yes	30 (20.8)	1 (4.8)	31 (18.8)	5.35	0.021*	0.844 (0.79-0.91)
	No	114 (79.2)	20 (95.2)	134 (81.2)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 9. shows the Association between related variables and upper limb aches and pain for past 7days among study participants . More than 61.8% of those who were more than 35 years of age had upper limb pain for seven days and the association between them

was found to be statistically significant ($P < 0.05$) with an odds ratio of 0.809. It was found that, workers having upper limb aches and pain for the past one week had 0.796 times increased odds of being male. (OR = 0.796). About 70.8% of the married workers had experienced upper limb pain for the past one week which is found to be statistically significant ($P < 0.05$). It was found that, workers having upper limb aches and pain for the past one week had 1.467 times increased odds of having alcohol consumption (OR = 1.467). About 20.8% of the hypertensive workers had experienced upper limb pain for the past one week which is found to be statistically significant ($P < 0.05$)

Table 10: Association between related variables and lower limb aches and pain for past 7days among study participants (n=165)

Variable		Lower limb aches and pain			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=48) (%)	No (n=117) (%)	Total (n=165) (%)			
Age group	>35years	15 (31.3)	95 (81.2)	110 (66.7)	38.21	0.000*	9.50 (4.41-20.45)
	<35years	33 (68.8)	22 (18.8)	55 (33.3)			
Gender	Male	24 (50)	79 (67.5)	103 (62.4)	4.50	0.035*	2.079 (1.05-4.13)
	Female	24 (50)	38 (32.5)	62 (37.6)			
Education	Illiterate	34 (70.8)	32 (27.4)	66 (40)	26.81	0.000*	6.451 (3.07-13.57)
	Literate	14 (29.2)	85 (72.6)	99 (60)			
Marital status	Married	43 (89.6)	63 (53.8)	106 (64.2)	18.92	0.000*	0.136 (0.05-0.37)
	Unmarried	5 (10.4)	54 (46.2)	59 (35.8)			
Socio-economic class	Upper class/upper middle	27 (56.3)	29 (24.8)	56 (33.9)	15.03	0.000*	0.256 (0.13-0.52)
	Middle/lower class	21 (43.8)	88 (75.2)	109 (66.1)			
Designation	Labor	41 (85.4)	101 (86.3)	142 (86.1)	0.02	0.878	1.078 (0.41-2.81)
	Others	7 (14.6)	16 (13.7)	23 (13.9)			

Migrated	Yes	29 (60.4)	91 (77.8)	120 (72.7)	5.17	0.023*	0.436 (0.21-0.9)
	No	19 (39.6)	26 (22.2)	45 (27.3)			
Alcohol consumption	Yes	21 (43.8)	45 (38.5)	66 (40)	0.40	0.529	1.244 (0.63-2.46)
	No	27 (56.3)	72 (61.5)	99 (60)			
Tobacco consumption	Yes	7 (14.6)	25 (21.4)	32 (19.4)	1.01	0.317	0.628 (0.25-1.57)
	No	41 (85.4)	92 (78.6)	133 (80.6)			
Protective measures	Yes	31 (64.6)	75 (64.1)	106 (64.2)	0.01	0.953	0.979 (0.49-1.98)
	No	17 (35.4)	42 (35.9)	59 (35.8)			
Type 2 diabetes mellitus	Yes	14 (29.2)	19 (16.2)	33 (20)	3.56	0.059	2.214 (0.96-4.69)
	No	34 (70.8)	98 (83.8)	132 (80)			
Hypertension	Yes	17 (35.4)	13 (11.1)	30 (18.2)	13.52	0.000*	4.387 (1.92-10.02)
	No	31 (64.6)	104 (88.9)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 10. shows the association between lower limb aches and pain for past one week and related variables. Nearly 68.8% of those who were less than 35 years of age had lower limb pain for one week and the association between them was found to be statistically

significant ($P < 0.05$) with an odds ratio of 9.50. It was found that, workers having lower limb aches and pain for the past one week had 2.079 times increased odds of being males. ($OR = 2.079$). About 89.6% of the married workers had experienced lower limb pain for the past one week which is found to be statistically significant ($P < 0.05$). Marital status and Socioeconomic status were found to have a statistically significant association with lower limb aches and pain for past 1 week. But since their odds ratio was less than 1 ($OR = 0.256$ and 0.436 respectively) married and belonging to upper Socioeconomic Status can be considered to be protective against lower limb aches and pains. Around 35.4% of hypertensive workers had lower limb aches and pain for the past one week, which is found to be statistically significant ($P < 0.05$)

Table 11: Association between related variables and daily activity limitation due to upper limb aches and pain among study participants (n=165)

Variable		Activity limitation upper limb			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=45) (%)	No (n=120) (%)	Total (n=165) (%)			
Age group	>35years	13 (28.9)	97 (80.8)	110 (66.7)	39.74	0.000*	10.381 (4.72-22.85)
	<35years	32 (71.1)	23 (19.2)	55 (33.3)			
Gender	Male	24 (53.3)	79 (65.8)	103 (62.4)	2.18	0.140	1.686 (0.84-3.38)
	Female	21 (46.7)	41 (34.2)	62 (37.6)			
Education	Illiterate	33 (73.3)	33 (27.5)	66 (40)	28.65	0.000*	7.25 (3.35-15.7)
	Literate	12 (26.7)	87 (72.5)	99 (60)			
Marital status	Married	40 (88.9)	66 (55)	106 (64.2)	16.36	0.000*	0.153 (0.06-0.41)
	Unmarried	5 (11.1)	54 (45)	59 (35.8)			
Socio-economic class	Upper class/upper middle	26 (57.8)	30 (25)	56 (33.9)	15.68	0.000*	0.244 (0.12-0.5)
	Middle/lower class	19 (42.2)	90 (75)	109 (66.1)			
Designation	Labor	38 (84.4)	104 (86.7)	142 (86.1)	0.14	0.714	1.197 (0.46-3.14)
	Others	7 (15.6)	16 (13.3)	23 (13.9)			

Migrated	Yes	19 (42.2)	26 (21.7)	45 (27.3)	6.97	0.008*	0.378 (0.18-0.79)
	No	26 (57.8)	94 (78.3)	120 (72.7)			
Alcohol consumption	Yes	21 (46.7)	45 (37.5)	66 (40)	1.15	0.284	1.458 (0.73-2.92)
	No	24 (53.3)	75 (62.5)	99 (60)			
Tobacco consumption	Yes	7 (15.6)	25 (20.8)	32 (19.4)	0.58	0.445	0.70 (0.28-1.75)
	No	38 (84.4)	95 (79.2)	133 (80.6)			
Protective measures	Yes	28 (62.2)	78 (65)	106 (64.2)	0.11	0.740	1.128 (0.55-2.29)
	No	17 (37.8)	42 (35)	59 (35.8)			
Type 2 diabetes mellitus	Yes	13 (28.9)	20 (16.7)	33 (20)	3.06	0.080	2.031 (0.91-4.54)
	No	32 (71.1)	100 (83.3)	132 (80)			
Hypertension	Yes	15 (33.3)	15 (12.5)	30 (18.2)	9.55	0.002*	3.50 (1.54-7.97)
	No	30 (66.7)	105 (87.5)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 11. shows the Association between related variables and daily activity limitation due to upper limb aches and pain among study participants. More than 71.1% of those who were less than 35 years of age had daily activity limitation due to upper limb

aches and pain and the association between them was found to be statistically significant ($P < 0.05$) with an odds ratio of 10.381. It was found that, workers having daily activity limitation due to upper limb aches and pain had 7.25 times increased odds of being illiterate. (OR = 7.25). About 88.9% of the married workers had experienced daily activity limitation due to upper limb aches and pain which is found to be statistically significant ($P < 0.05$). Socioeconomic status were found to have a statistically significant association with workers having daily activity limitation due to upper limb aches and pain. But since their odds ratio was less than 1 (OR = 0.244) married and belonging to upper Socioeconomic Status can be considered to be protective against workers having daily activity limitation due to upper limb aches and pain. 19% of the migrated workers had daily activity limitation due to upper limb aches and pain and found to be statistically significant. About 33.7% of the hypertensive workers had experienced daily activity limitation due to upper limb aches and pain which is found to be statistically significant ($P < 0.05$)

Table 12: Association between related variables and daily activity limitation due to lower limb aches and pain among study participants (n=165)

Variable		Activity limitation lower limb			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=42) (%)	No (n=123) (%)	Total (n=165) (%)			
Age group	>35years	11 (26.2)	99 (80.5)	110 (66.7)	41.54	0.000*	11.625 (5.12-26.39)
	<35years	31 (73.8)	24 (19.5)	55 (33.3)			
Gender	Male	23 (54.8)	80 (65)	103 (62.4)	1.41	0.235	1.537 (0.75-3.13)
	Female	19 (45.2)	43 (35)	62 (37.6)			
Education	Illiterate	32 (76.2)	34 (27.6)	66 (40)	30.75	0.000*	8.376 (3.72-18.88)
	Literate	10 (23.8)	89 (72.4)	99 (60)			
Marital status	Married	37 (88.1)	69 (56.1)	106 (64.2)	13.96	0.000*	0.173 (0.06-0.67)
	Unmarried	5 (11.9)	54 (43.9)	59 (35.8)			
Socio-economic class	Upper class/upper middle	25 (59.5)	31 (25.2)	56 (33.9)	16.45	0.000*	0.229 (0.11-0.48)
	Middle/lower class	17 (40.5)	92 (74.8)	109 (66.1)			
Designation	Labor	35 (83.3)	107 (87)	142 (86.1)	0.35	0.554	1.338 (0.51-3.52)
	Others	7 (16.7)	16 (13)	23 (13.9)			

Migrated	Yes	24 (57.1)	96 (78)	120 (72.7)	6.90	0.009*	0.375 (0.18-0.79)
	No	18 (42.9)	27 (22)	45 (27.3)			
Alcohol consumption	Yes	20 (47.6)	46 (37.4)	66 (40)	1.36	0.243	1.522 (0.75-3.07)
	No	22 (52.4)	77 (62.6)	99 (60)			
Tobacco consumption	Yes	7 (16.7)	25 (20.3)	32 (19.4)	0.27	0.605	0.784 (0.31-1.97)
	No	35 (83.3)	98 (79.7)	133 (80.6)			
Protective measures	Yes	25 (59.5)	81 (65.9)	106 (64.2)	0.55	0.460	1.311 (0.64-2.69)
	No	17 (40.5)	42 (34.1)	59 (35.8)			
Type 2 diabetes mellitus	Yes	12 (28.6)	21 (17.1)	33 (20)	2.59	0.108	1.943 (0.86-4.4)
	No	30 (71.4)	102 (82.9)	132 (80)			
Hypertension	Yes	15 (35.7)	15 (12.2)	30 (18.2)	11.64	0.001*	4 (1.74-9.18)
	No	27 (64.3)	108 (87.8)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 12. shows the Association between related variables and daily activity limitation due to lower limb aches and pain among study participants. Nearly 73.8% of those who were less than 35 years of age had daily activity limitation due to lower limb aches

and pain and the association between them was found to be statistically significant ($P < 0.05$) with an odds ratio of 11.625. It was found that, workers daily activity limitation due to lower limb aches and pain had 8.376 times increased odds of being Illiterate. (OR = 8.376). About 88.1% of the married workers had experienced daily activity limitation due to lower limb aches and pain which is found to be statistically significant ($P < 0.05$). Marital status, Socioeconomic status and migration were found to have a statistically significant association with workers having daily activity limitation due to lower limb aches and pain. But since their odds ratio was less than 1 (OR = 0.173, 0.229 and 0.375 respectively) married and belonging to upper Socioeconomic Status can be considered to be protective against workers having daily activity limitation due to lower limb aches and pain. 35.7% of hypertensive workers had daily activity limitation due to lower limb aches and pain, which is found to be statistically significant ($P < 0.05$)

Table 13: Association between respiratory symptoms and related variables in past 6months among study participants (n=165)

Variable		Respiratory symptoms			Chi-Square	P value	Unadjusted Odd's Ratio (95%CI)
		Yes (n=46) (%)	No (n=119) (%)	Total (n=165) (%)			
Age group	>35years	34 (73.9)	76 (63.9)	110 (66.7)	1.51	0.220	0.624 (0.29-1.33)
	<35years	12 (26.1)	43 (36.1)	55 (33.3)			
Gender	Male	34 (73.9)	69 (58)	103 (62.4)	3.59	0.058	0.487 (0.23-1.03)
	Female	12 (26.1)	50 (42)	62 (37.6)			
Education	Illiterate	18 (39.1)	48 (40.3)	66 (40)	0.02	0.887	0.951 (0.47-1.91)
	Literate	28 (60.9)	71 (59.7)	99 (60)			
Marital status	Married	27 (58.7)	79 (66.4)	106 (64.2)	0.85	0.355	1.390 (0.69-2.80)
	Unmarried	19 (41.3)	40 (33.6)	59 (35.8)			
Socio-economic class	Upper class/upper middle	12 (26.1)	44 (37)	56 (33.9)	1.75	0.185	1.662 (0.78-3.54)
	Middle/lower class	34 (73.9)	75 (63)	109 (66.1)			
Designation	Labor	43 (93.5)	99 (83.2)	142 (86.1)	2.93	0.087	0.345 (0.98-1.22)
	Others	3 (6.5)	20 (16.8)	23 (13.9)			

Migrated	Yes	35 (76.1)	85 (71.4)	120 (72.7)	0.36	0.547	1.273 (0.58-2.79)
	No	11 (23.9)	34 (28.6)	45 (27.3)			
Alcohol consumption	Yes	23 (50)	43 (36.1)	66 (40)	2.66	0.103	1.767 (0.89-3.52)
	No	23 (50)	76 (63.9)	99 (60)			
Tobacco consumption	Yes	8 (17.4)	24 (20.2)	32 (19.4)	0.16	0.686	0.833 (0.34-2.02)
	No	38 (82.6)	95 (79.8)	133 (80.6)			
Protective measures	Yes	30 (65.2)	76 (63.9)	106 (64.2)	0.03	0.871	0.943 (0.46-1.92)
	No	16 (34.8)	43 (36.1)	59 (35.8)			
Type 2 diabetes mellitus	Yes	8 (17.4)	25 (21)	33 (20)	0.27	0.602	0.792 (0.33-1.91)
	No	38 (82.6)	94 (79)	132 (80)			
Hypertension	Yes	6 (13)	24 (20.2)	30 (18.2)	1.13	0.287	0.594 (0.23-1.56)
	No	40 (87)	95 (79.8)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 13. Association between respiratory symptoms and related variables in past 6months among study participants. Nearly 73.9% of those who were more than 35 years of age had respiratory symptoms and there is no association between them and was found

not to be statistically significant ($P>0.05$) with an odds ratio of 0.624. It was found that, workers respiratory problems had 0.951 times increased odds of being Illiterate. (OR = 0.951). About 58.7% of the married workers had experienced respiratory problems which is found not to be statistically significant ($P<0.05$). It was found that, workers having respiratory problems had 1.662 times increased odds of belonging to upper/upper middle class(OR =1.662). About 76.1% of the workers who had respiratory problems had 1.273 times increased odds of being migrated population.

Table 14: Association between skin problems and related variables among study participants (n=165)

Variable		Skin problems			Chi-Square	P value	Unadjusted Odd's Ratio (95% CI)
		Yes (n=34) (%)	No (n=131) (%)	Total (n=165) (%)			
Age group	>35years	23 (67.6)	87 (66.4)	110 (66.7)	0.02	0.892	0.946 (0.42-1.12)
	<35years	11 (32.4)	44 (33.6)	55 (33.3)			
Gender	Male	25 (73.5)	78 (59.5)	103 (62.4)	2.25	0.133	0.530 (0.23-1.23)
	Female	9 (26.5)	53 (40.5)	62 (37.6)			
Education	Illiterate	11 (32.4)	55 (42)	66 (40)	1.04	0.307	0.661 (0.30-1.47)
	Literate	23 (67.6)	76 (58)	99 (60)			
Marital status	Married	24 (70.6)	82 (62.6)	106 (64.2)	0.75	0.386	0.697 (0.31-1.58)
	Unmarried	10 (29.4)	49 (37.4)	59 (35.8)			
Socio-economic class	Upper class/upper middle	7 (20.6)	49 (37.4)	56 (33.9)	3.41	0.065	2.305 (0.93-5.69)
	Middle/lower class	27 (79.4)	82 (62.6)	109 (66.1)			
Designation	Labor	30 (88.2)	112 (85.5)	142 (86.1)	0.17	0.681	0.786 (0.25-2.46)
	Others	4 (11.8)	19 (14.5)	23 (13.9)			

Migrated	Yes	29 (85.3)	91 (69.5)	120 (72.7)	3.41	0.065	2.549 (0.92-7.07)
	No	5 (14.7)	40 (30.5)	45 (27.3)			
Alcohol consumption	Yes	9 (26.5)	57 (43.5)	66 (40)	3.27	0.071	0.467 (0.20-1.08)
	No	25 (73.5)	74 (56.5)	99 (60)			
Tobacco consumption	Yes	13 (38.2)	19 (14.5)	32 (19.4)	9.73	0.002*	3.649 (1.67-8.50)
	No	21 (61.8)	112 (85.5)	133 (80.6)			
Protective measures	Yes	24 (70.6)	82 (62.6)	106 (64.2)	0.75	0.386	0.697 (0.31-1.58)
	No	10 (29.4)	49 (37.4)	59 (35.8)			
Type 2 diabetes mellitus	Yes	4 (11.8)	29 (22.1)	33 (20)	1.82	0.178	0.469 (0.15-1.44)
	No	30 (88.2)	102 (77.9)	132 (80)			
Hypertension	Yes	5 (14.7)	25 (19.1)	30 (18.2)	0.35	0.555	0.731 (0.26-2.08)
	No	29 (85.3)	106 (80.9)	135 (81.8)			

* P Value < 0.05 - Statistically significant at 95% Confidence

Interval, OR – Odd's Ratio, χ^2 – Chi-square

Table 14. Association between skin problems and related variables among study participants. Nearly 67.6% of those who were more than 35 years of age had skin problems and there is no association between them and was found not to be statistically

significant ($P>0.05$) with an odds ratio of 0.946. About 70.6% of the married workers had experienced skin problems which is found to be statistically significant ($P<0.05$). It was found that, workers having skin problems had 2.305 times increased odds of belonging to upper/upper middle class ($OR = 2.305$). About 85.3% of the workers who had skin problems had 2.549 times increased odds of being migrated population. 38.2% of workers with habit of tobacco consumption had reported with skin problems and has association between them and is found to be statistically significant ($p<0.05$).

DISCUSSION

One of the major industry for middle class and lower middle class sector is brick kiln industry providing lot of employment opportunities for people all over India. There is lack of proper literature regarding the morbidity profile of brick kiln workers especially the musculoskeletal morbidity among them. The present study done to address this lacunae is discussed below in comparison with studies done in India and elsewhere.

SOCIODEMOGRAPHIC CHARACTERISTICS OF THE STUDY

PARTICIPANTS:

In the present study a little more than half of the study participants were males (62.4%) which is similar to the findings of the study done by Thomas BE et al in Tamil Nadu in the year 2014 and Inbaraj LR et al in Tamil Nadu in the year 2013 which showed the male predominance in brick kiln industry.^{42,43}

In the present study 60% of the study participants were illiterates which is comparable to the findings of the study done by Bharati Gogoi.D and Hazarika.J in Assam in the year 2016 and Thomas BE et al in Tamil Nadu in the year 2014 which showed the illiteracy rate among the study participants to be 57.4% and 51.6% respectively^{31,42}.

STATUS OF USAGE OF PPE AMONG BRICK KILN WORKERS:

In the present study 30.3% of the study participants used face mask which is higher than the findings of the study done by Tusher TR et al in Bangladesh (year 2018) which showed only 15.70% of brick kiln workers used face mask²⁸. This observed difference could be due to the time period in which the present study was undertaken. The present study was done during the period of COVID-19 pandemic between January 2021 to June 2022 during which there is an increased usage of face mask as public health measures. But even then, 70% of the participants did not use proper protective equipment while working in the brick kiln industry. Similar findings were obtained in a study done by Zia-ur-Rahman NA et al in Pakistan, in which proper PPE was either not provided or not used by the workers properly significantly affecting their health and wellbeing.⁶⁵

TOBACCO AND ALCOHOL CONSUMPTION AMONG THE STUDY PARTICIPANTS:

In the present study 2 out of 10 study participants (19.4%) consume tobacco in one form or the other which is comparable to the findings of the study done by Thomas BE et al in Tamil Nadu in the year 2014 which showed the prevalence of tobacco consumption to be 24.4%⁴². The prevalence of tobacco consumption in the present study is similar to the findings of the National Family

Health Survey -5 Tamil Nadu data (year 2019-2021) which showed the prevalence of tobacco consumption among men aged 15 years and above to be 20.1% ⁴⁴

In the present study 4 out of 10 study participants (40%) consume alcohol which is similar to the findings of the study done by Thomas BE et al in Tamil Nadu in the year 2014 which showed the prevalence of alcohol consumption to be 32.6% ⁴². The prevalence of alcohol consumption in the present study (40%) is higher than the findings of the National Family Health Survey -5 Tamil Nadu data (year 2019-2021) which showed the prevalence of alcohol consumption among men aged 15 years and above to be 25.4% ⁴⁴

RESPIRATORY PROBLEMS AMONG THE STUDY PARTICIPANTS:

A study done by Thomas BE et al in Thiruvallur district, Tamil Nadu found that, respiratory symptoms among brick kiln workers were prevalent among those who consume tobacco and alcohol. ⁶² A study done by Lee SY et al in China and a systematic review by Frone MR found that work stress and working long hours in situations causing increased physical and mental stress could lead to the workers abusing alcohol and tobacco. This higher prevalence of alcohol and tobacco use in the present study could have been attributed to these factors. ^{63,64}

The present study found the prevalence of respiratory problems among the brick kiln workers to be 27%. Similar results were obtained in a study done by Raza et al in Pakistan in which brick kiln workers suffered from respiratory problems due to the pollution generated by the brick kiln industries ⁴⁸. Many studies have reiterated the fact that, brick kiln industries tend to have hazardous emissions in the form of Particulate Matter between 2.5 and 10 in hazardous category which could cause significant respiratory morbidity if not properly controlled by suitable measures ^{49,50,51}.

PREVALENCE OF NON-COMMUNICABLE DISEASES AMONG THE STUDY POPULATION:

The prevalence of hypertension among the study participants was 18.2% which is comparable to the findings of the National Family Health Survey -5 Tamil Nadu data (year 2019-2021) which showed the prevalence of hypertension among men and women to be 27% and 21% respectively⁴⁴. The prevalence of hypertension in a study done by Gogoi B et al among brick kiln workers in Assam was found to be 28%. Similar prevalence (28%) was found in a study conducted by Mohanraj S et al in Coimbatore Tamilnadu among brick kiln workers ⁴⁶. This comparatively higher prevalence of Hypertension among brick kiln workers compared to general population maybe attributed to the predominance of various work related factors like stress and long working hours which could have

played a role in increasing the blood pressure among the brick kiln workers. The prevalence of diabetes among the study participants was 20% which is higher than the findings of the study done by National Noncommunicable Disease Monitoring Survey (NNMS) (2017-2018) which showed the prevalence of diabetes to be 9.3% ⁴⁵. Similar higher prevalence of T2DM was found among brick kiln workers in Pakistan in a study done by Muhammed N et al ⁴⁷. The higher prevalence of diabetes in the present study could be due to the fact that two third of the present study population (66.7%) were above the age of 35 years. There was statistically significant association between T2DM, hypertension and musculoskeletal pain. A Systematic Review done by Louati K et al found that diabetes is associated with increased odds of developing osteoarthritis especially workers involved in brick kiln industries. ⁵⁹ A study done by Aldossari et al in Saudi Arabia found that musculoskeletal pain was found to be more prevalence among diabetic people when compared with non-diabetic people. ⁶⁰ A study done by Kakinana H et al in Japan found that hypertension leading to metabolic changes as one of the major factors predisposing to chronic low back pain. ⁶¹ These findings suggest that, brick kiln industry already posing a lot of physical stress on the individuals, coupled with T2DM and HTN among the workers could lead to significant musculoskeletal morbidity among them.

PREVALENCE OF SKIN DISEASES AMONG THE STUDY POPULATION:

The prevalence of skin disease in the present study population is 39% which is comparable to the findings of the study done by Kumar Parimal Shrestha in Uttar Pradesh (year 2021) and the findings of the study done by Tanmoy Roy Tusher et al in Bangladesh (year 2015) which showed the prevalence of skin diseases to be 31% and 32% respectively^{34,28}. The prevalence of skin disease in the present study (39%) is much lower when compared to the findings of the study done by Gogoi B et al in Assam (year 2016) which showed the prevalence of skin diseases to be 86%³¹. This observed difference in the prevalence of skin disease could be due to poor usage of personal protective equipment by the brick kiln workers.

PREVALENCE OF MUSCULOSKELETAL DISEASES AMONG THE STUDY POPULATION:

It was found that, the most prevalent musculoskeletal problem among the brick kiln workers was lower back pain and knee pain which affected almost 93% and 69% of the study participants respectively. Similar results were obtained in a study done by Sain MK in Rajasthan in which, majority of the brick kiln workers suffered from musculoskeletal problems in the lower back region and knee joint.⁵⁵ In the present study 14.6% of the study participants with knee pain complained that their Activities of Daily

Living (ADL) were affected because of pain which is comparable to the findings of the study done by Inbaraj LR et al in Tamil Nadu in the year 2013 which showed the prevalence of limitation of Activities of Daily Living (ADL) due to knee pain to be 10% ⁴³. In the present study about 2 out of 10 study participants (18.7%) with lower back ache complained that their Activities of Daily Living (ADL) were affected because of pain which is comparable to the findings of the study done by Inbaraj LR et al in Tamil Nadu in the year 2013 which showed the prevalence of limitation of Activities of Daily Living (ADL) due to lower back ache to be 13% ⁴³.

In a study done by Das B et al in West Bengal, it was found that, gender as one of the most important predictors of low back pain, which is similar to findings of the present study. ⁵⁷ These may have attributed to the fact that, brick kiln industry, having more physically demanding nature of work, most of which will be given to the males when compared to females, as most of the female brick kiln workers were undernourished and stressed compared to females as reported in a study done by Sett M et al. in West Bengal. ⁵⁸ This results in the predominance of musculoskeletal problems to be more among males compared to females, as evident from the findings of the present study.

Around 62.9% of the study participants suffered from neck pain in the present study. Similar higher prevalence of neck pain (72%) were obtained in a study done by Ray CS et al done among Brick kiln workers in West Bengal.⁵² In a study done by Manoharan PK in Jharkhad, it was found that, brick kiln workers were exposed to significant physical stress manifesting as musculoskeletal pain predominantly in the neck.⁵³ Even in developing country like Nigeria, the situation remains grim as musculoskeletal problems were an important cause of concern in the brick kiln industry.⁵⁴

CONCLUSION

Indian clay brick manufacturing using traditional kilns is a high-risk occupation that causes frequent musculoskeletal disorders (MSDs) among workers. The study has analysed the various health problems faced by Brick kiln workers in Kancheepuram District. Most of the workers are belong to Scheduled Community. Majority of the workers are married in the Brick kiln fields. There is no difference between male and female in facing the illness and injuries. Workers in this occupation are predominantly of a middle aged and are migrated from other parts of India. Due to various musculoskeletal issues workers migrate to other sectors. Most of the brick kiln workers in this study suffered from musculoskeletal problems in the lower back, knee region, shoulder, neck, elbow region, upper back and hip regions due to prolonged working in a specific task under load, with high repetition and awkward postures (i.e. twisting, bending, kneeling, squatting, etc.). According to a postural analysis, actions including spading, mould filling, mould evacuation, and carrying tasks pose major risks to kiln workers.

Health care and welfare facilities were provided to the brick kiln workers. They were given benefits like leaves or holidays. The working environment has good ventilation and lighting, there was no overcrowding, but the workers were exposed to heavy heat of kilns and sunlight and also to dust and fumes.

Protective measures were used by most of the brick kiln workers, i.e., accidents were very minimal among brick kiln workers in last one year. There was specific time limit for working in brick kilns for each sectors and adequate training were given to the workers in their specific sector. The living condition of the brick kiln workers were very basic and shanty.

In this study, respiratory symptoms and illnesses was observed only in few brick kiln workers. Since most of the workers were using face masks to avoid exposure to SARS COV-19 virus. Age, nature of work, migration and socio-economic class were strong predictors of developing these symptoms and illnesses. Skin problems were also found to be less among the brick kiln workers, as protective measures were properly followed by most of the brick kiln workers during their working hours.

The evidence generated by this study needs to be further strengthened by conducting a more objective research on a large scale. Since majority of the workers working in brick kiln industries experiences commonly musculoskeletal problems, respiratory problems, and dermatological problems, the other health risks like injuries should also be studied. The working conditions and their impact on the quality of life of the workers should also be explored.

STRENGTHS AND LIMITATIONS

STRENGTHS:

- Separate literatures on the assessment of morbidity profile among Brickkiln workers are readily available. However, in this study, the overall musculoskeletal disorders (MSDs) among the brickkiln workers which comprises of aches and pain present all over the body along with respiratory problems and dermatological problems. Nature of work of the study participants showed a positive and significant association with musculoskeletal disorders (MSDs).
- Many studies have failed to address the morbidity pattern and its associated risk factors among the brickkiln workers. In the present study, have employed health education and awareness to the workers working in brickkiln industry.
- In this study, it is also assessed the prevalence of non-communicable diseases (NCDs) and its association with the musculoskeletal disorders among the brickkiln workers which is significantly correlated

LIMITATIONS

1. The study was limited only to Kancheepuram district.
2. The study was confined to small number of subjects and shorter period which limits generalization.
3. The study was limited only to Brick kiln workers of age group 18 to 60 years in the chamber working for minimum of one year.
4. Brick kiln workers previously diagnosed with other occupational disease and debilitating disease were excluded.
5. The study was conducted during COVID crisis which had imposed fear among the workers and no proper history was elicited.
6. Most of the brick kiln workers were migrated from other parts of India, the genetic cause, cultural cause and various other causes for the development of MSDs were not able to assess.

RECOMMENDATIONS

The brick kiln workers are employed in the unorganized/informal sector because of which they don't have fixed terms of payment and regular monthly income therefore by bringing them under organized sector their terms of employment and wages will be regulated.

To improve the musculoskeletal health of brick kiln workers the following measures are proposed:

- Work place efficiency of workers can be enhanced by giving proper acquaintance in occupational safety.
- Workers should be encouraged to practice stretching exercises and should change their posture on regular intervals in order to relieve excessive muscular stress.
- Usage of lumbar belts in persons with lower back issues could help to lessen the pain.
- Since majority of the brick kiln workers belong to lower socioeconomic status they should be brought under CHIEF MINISTER'S COMPREHENSIVE HEALTH INSURANCE SCHEME (CMCHIS) in order to provide for their medical expenses and to prevent tragic medical expenditure.
- By adopting better health and safety approaches like wearing mask while molding and by avoid/reduce smoking will be beneficial to improve the worker health condition.

- Promoting the usage of trolleys in brick and mold carrying will enhance the working condition.
- Job rotation among both sexes, different age groups & according to their BMI will help in preventing lower back issues.
- Health education among workers in the kilns regarding personal & industrial hygiene should be encouraged.
- Periodical medical examination should be done.
- Occupational health disorders can be prevented by regular monitoring of pollution control via devices and installation of proper chimneys which will be helpful in lower the exposure to fumes and gases.
- Usage of hand tools such as spade and trowel etc along with other hand tools should be redesigned in order to enhance the work place efficiency and to bring down injuries & medical issues of the workers.
- Dereliction of duty of the company in any circumstances should be subjected to penalization.
- Referral of the employees to nearby primary health centers can substantially cut down out-of-pocket medical expenses. Since majority of workers suffer from musculoskeletal disorders it would be wise to utilize the services of Orthopedicians and physiotherapists from the nearby Government or private medical colleges/Hospitals.

- Brick kilns industry should periodically revamp the fuel quality and newer technologies should be promptly accepted .
- Medical assessment for workers should be done in regular intervals which an intention to elevate the quality of life of the workers.
- As the brick kiln industry is rising rapidly it is mandatory to enforce strict laws to mitigate unauthorized kilns at work place.
- Charitable organizations and NGOs should carry out health education programmes to spread awareness and educate the employees & employers of the brick kiln industry and the general public on the importance of industrial hygiene practices.
- Brick kiln workers are continuously been subjected to dust particles which in turns leads to multiple pulmonary complications; for which chest x-rays and spirometry has to be done on regular intervals for early diagnosis of lung diseases. Usage of masks should be made mandatory.
- Due to constant exposure to high heat during manual coal feeding and prolonged exposure to sun, brick kiln workers suffer from many skin disorders hence preventive measures such as use of personal protective equipment's should be encouraged .
- Safety equipment and safety awareness are the key goals to elevate quality of life of kiln workers.

EXECUTIVE SUMMARY

Indian brick kiln industry still predominantly uses traditional methods of manufacturing and is reluctant to adapt newer technologies owing to high input cost. This has led the workers to do all the work in the process of manufacturing brick manually. Clay brick manufacturing is a labour intensive, strenuous job with workers being made to work throughout the week many a times. They are exposed to extreme heat and harmful gases. Brick kiln workers suffer from a variety of diseases owing to their adverse working conditions. They suffer from musculoskeletal disorders due to prolonged hours of standing, improper posture, carrying of heavy loads of weight, poor ergonomics and repetitive movements. It is important to note that the prevalence of musculoskeletal disorders increases with increase in the number of years of working. In addition to musculoskeletal disorders they also suffer from respiratory tract disorders like Chronic Obstructive Pulmonary Disorders, Bronchial Asthma and chronic cough due to inhalation of obnoxious gases like carbon monoxide , sulphur dioxide, nitrous oxide and inhalation of suspended particulate matter and skin diseases due to not wearing personal protective equipment's.

This study summarizes the common morbidities and its associated risk factors among the brickkiln workers. This study was conducted with the objective to estimate the prevalence of

musculoskeletal problems, respiratory problems and occupational dermatitis among the brickkiln workers, to assess the association between the risk factors and common morbidities among the brickkiln workers, and to assess the practice of protective measures among the brick kiln workers.

Review of literature brought out many facts about the morbidity pattern among the workers working in brickkiln industry. This study was conducted at Brickkiln industries located in Kancheepuram district. The sampling method applied to choose the required study population was Stratified Random Sampling. A total of 12 brick kiln industries situated in Kancheepuram district and 1 brick kiln industry was selected randomly using simple random sampling among the brick kilns situated in Kancheepuram district. Around 586 labourers were working currently in the selected brick kiln industry and the labours were divided into 2 strata based on gender.

Among the 586 laborers, males and females were distributed in the ratio of 40 females: 60 males. Based on this ratio, 62 females and 103 males were selected randomly using lottery method. If a worker from the list was not able to be contacted due to any illness or absence were excluded and the study was carried out till the required sample size was reached. Chi square test was used to

identify the association between risk factors and the outcome and unadjusted odd's ratio were calculated.

The total number of participants were 165. Among them 103 were males (62.4%) and 62 were females (37.6%). Majority of the participants belongs to the age group above 35years (66.7%) and rest of the participants were less than 35years of age (33.3%), 99(60%) of them were Illiterate, and 66(40%) participants were Literate. Those who are married and living with their partner were 106(64.2%) and 59 (35.8%) of them were unmarried. As per modified B.G. Prasad socio economic status scale, 109 participants (66.1%) belong to middle class / lower middle class / lower class, followed by 56 (33.9%) participants in upper class / upper middle class. The migrants comprises of 120 (72.7%) study participants from other states in India, whereas the remaining participants (45) lived in the same state (27.3%). Majority (142) of them were brick workers (86.1%) includes brick making, brick cutting, brick loading, brick unloading and brick heating, while other participants (23) of them belong to different working sections i.e., driver, cashier, motorman, farmer (13.9%). 106 were working with protective measures like wearing face mask, hand gloves, goggles and safety boots (64.2%), remaining workers (59) were working without any protective measures (35.8%).

During last 12 months on assessing the pain distribution of the study participants, majority (71%) of the workers had lower back pain (males (38.7%), females (32.3%)), followed by shoulder pain (58.1%) (males (35.5%), females (22.6%)), knee pain (51%) (males (20.4%), females (30.6%)), and 42% of them had neck pain (males (19.4%), females (22.6%)), while few experienced pain in other regions of the body. When assessing the pain distribution of study participants in the past 7days, the majority (93.4%) of workers had low back pain (men (51.5%), women (41.9%)), followed by knee pain (69.4%) (men (38.8%), women (30.6%)), neck pain (62.9%) (men (35.5%), women (27.4%)), and 58.1% had upper back pain (men (35.5%), women (22.6%)), while rest of the workers had pain in the other body regions. About 61.2% of men had difficulty going to work and about 38.6% of women had activity limitations in the past year.

Most of the brick kiln workers in this study suffered from musculoskeletal problems in the lower back, knee region, shoulder, neck, elbow region, upper back and hip regions due to prolonged working in a specific task under load, with high repetition and awkward postures (i.e. twisting, bending, kneeling, squatting, etc.). According to a postural analysis, actions including spading, mould filling, mould evacuation, and carrying tasks pose major risks to kiln workers. Health care and welfare facilities were provided to the brick kiln workers. They were given benefits like leaves or

holidays. The working environment has good ventilation and lighting, there was no overcrowding, but the workers were exposed to heavy heat of kilns and sunlight and also to dust and fumes. Age, nature of work, migration and socio-economic status of the workers were strong predictors of developing these symptoms and illnesses. Skin problems were also found to be less among the brick kiln workers, as protective measures were properly followed by most of the brick kiln workers during their working hours. In this study we also assessed the prevalence of non-communicable diseases (NCDs) and its association with the musculoskeletal disorders among the brickkiln workers which is significantly correlated.

The evidence generated by this study needs to be further strengthened by conducting more objective research on a large scale. The working conditions and their impact on the quality of life of the workers should also be explored.

REFERENCES

1. National Commission for Enterprises in the Un-organised Sector(NCEUS). Report on Conditions of Work and Promotion of Livelihoods in the Unorganised Sector. Available at https://msme.gov.in/sites/default/files/Condition_of_workers_sep_2007.pdf. Accessed on 26.8.2022.
2. Welfare of the unorganised sector workers. About the Ministry. The Ministry of Labour and Environment, Government of India. Available at <https://labour.gov.in/about-ministry>. Accessed on 26.8.2022.
3. McKinsey & Company, 2009. Environmental and Energy Sustainability: An Approach for India. McKinsey & Company, Mumbai, India.
4. Maithel, Sameer, 2003. Energy Utilization in Brick Kilns. PhD Thesis. Energy Systems Engineering, Indian Institute of Technology, Bombay.
5. Eil, A., Li, J., Baral, P. and Saikawa, E., 2020. Dirty Stacks, High Stakes.
6. Sharma DK, Varun A, Patel M. Qualitative study on clinico-social problems of brick-kiln workers: a study from Anand, Gujarat. National Journal of Community Medicine. 2013 Sep 30;4(03):503-6.

7. Brick Kilns Performance Assessment. A Roadmap for Cleaner Brick Production in India. Available at https://www.ccacoalition.org/sites/default/files/resources/Brick_Kilns_Performance_Assessment.pdf . Accessed on 26.8.2022.
8. Sain MK, Meena M. Identifying musculoskeletal issues and associated risk factors among clay brick kiln workers. *Industrial health*. 2019;57(3):381-91.
9. Pre Legislative Research. Impact of COVID-19 on rising unemployment and loss of jobs/livelihoods in organised and unorganised sectors. Available at <https://prsindia.org/policy/report-summaries/impact-of-covid-19-on-rising-unemployment-and-loss-of-jobs-livelihoods-in-organised-and-unorganised-sectors>. Accessed on 26.8.2022.
10. Bhat MS, Afeefa QS, Ashok KP, Bashir AG. Brick kiln emissions and its environmental impact: A Review. *Journal of Ecology and the Natural Environment*. 2014 Jan 31;6(1):1-1.
11. Vaidya VG, Mamulwar MS, Ray SB, Beena R, Bhatlawande PV, Ubale S. Occupational Health Hazards of Women Working in Brick Kiln and Construction Industry. *Journal of Krishna Institute of Medical Sciences (JKIMSU)*. 2015 Jan 1;4(1).
12. *World Health Organization. Occupational health. Available at <https://www.who.int/health-topics/occupational-health>. Accessed on 19.9.2022.*

13. World Health Organization. India. Available at <https://www.who.int/india/health-topics/occupational-health>. Accessed on 19.9.2022.
14. World Health Organization. Protecting workers' health. Available at <https://www.who.int/news-room/fact-sheets/detail/protecting-workers'-health>. Accessed on 19.9.22.
15. GBD 2016 Occupational Chronic Respiratory Risk Factors Collaborators. Global and regional burden of chronic respiratory disease in 2016 arising from non-infectious airborne occupational exposures: a systematic analysis for the Global Burden of Disease Study 2016. *Occupational and environmental medicine*. 2020 Mar 1;77(3):142-50.
16. Li N, Zhai Z, Zheng Y, Lin S, Deng Y, Xiang G, Yao J, Xiang D, Wang S, Yang P, Yang S. Association of 13 Occupational Carcinogens in Patients With Cancer, Individually and Collectively, 1990-2017. *JAMA network open*. 2021 Feb 1;4(2):e2037530-.
17. ILO (International Labour Organization). 2013a. "ILO Calls for Urgent Global Action to Fight Occupational Diseases." ILO, Geneva
18. Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M. The global burden of occupational noise-induced hearing loss. *American journal of industrial medicine*. 2005 Dec;48(6):446-58.

19. Govaerts R, Tassignon B, Ghillebert J, Serrien B, De Bock S, Ampe T, El Makrini I, Vanderborgh B, Meeusen R, De Pauw K. Prevalence and incidence of work-related musculoskeletal disorders in secondary industries of 21st century Europe: a systematic review and meta-analysis. *BMC musculoskeletal disorders*. 2021 Dec;22(1):1-30.
20. National Programme For Control & Treatment Of Occupational Diseases. National Institute of Health and Family Welfare. Available at <http://www.nihfw.org/NationalHealthProgramme/NATIONALPROGRAMMEFORCONTROL.html>. Accessed on 5.10.2022.
21. Saha RK. Occupational health in India. *Annals of global health*. 2018;84(3):330.
22. Brick Making in India. Available at <http://www.ecobrick.in/brickmakinginindia.aspx>. Accessed on 5.10.2022.
23. Fernando WI, De Silva PV, Sundarapperuma SM. Prevalence of work related musculoskeletal disorders in brick industry workers in Chilaw Sri Lanka. *Journal of the Ruhunu Clinical Society*. 2016 Dec 21;21(1).
24. Shaikh S, Nafees AA, Khetpal V, Jamali AA, Arain AM, Yousuf A. Respiratory symptoms and illnesses among brick kiln workers: a cross sectional study from rural districts of Pakistan. *BMC Public Health*. 2012 Dec;12(1):1-6.

25. Rehman A, Saeed AK, Ali MA. Prevalence of chronic obstructive pulmonary disease as occupational lung disease among brick kiln workers. *Pak J Med Health Sci.* 2013;7(3):618-21.
26. Sanjel S, Khanal SN, Thygerson SM, Carter WS, Johnston JD, Joshi SK. Respiratory symptoms and illnesses related to the concentration of airborne particulate matter among brick kiln workers in Kathmandu valley, Nepal. *Annals of occupational and environmental medicine.* 2017 Dec;29(1):1-2.
27. Sajjan D, Md SQ, Rumana A, Sumaiya H, Sumana K, Md ZH, Mohammad S. Socioeconomic conditions and health hazards of brick field workers: A case study of Mymensingh brick industrial area of Bangladesh. *Journal of Public Health and Epidemiology.* 2017 Jul 31;9(7):198-205.
28. Tusher TR, Ashraf Z, Akter S. Health effects of brick kiln operations: a study on largest brick kiln cluster in Bangladesh. *South East Asia Journal of Public Health.* 2018;8(1):32-6.
29. Sain MK, Meena ML, Dangayach GS. Musculoskeletal health problems and relationship of risk factors among manual clay brick sector workers. *International Journal of Business and Systems Research.* 2021;15(1):112-23.
30. Sain MK, Meena M. Identifying musculoskeletal issues and associated risk factors among clay brick kiln workers. *Industrial health.* 2019;57(3):381-91.

31. Bharati Gogoi D, Hazarika J. An Assessment of Health Status of Seasonal Migrant Brick Kiln Workers of Jorhat District of Assam. *Digestion.*;76(22.9):0-5.
32. Vaidya VG, Mamulwar MS, Ray SB, Beena R, Bathlawande PV, Ubale S. Occupational Health Hazards of Women Working in Brick Kiln and Construction Industry. *Journal of Krishna Institute of Medical Sciences (JKIMSU)*. 2015 Jan 1;4(1).
33. Das B. Assessment of occupational health problems and physiological stress among the brick field workers of West Bengal, India. *International journal of occupational medicine and environmental health*. 2014 Jun;27(3):413-25.
34. Shrestha KP, Sahoo H, Bharadwaz MP. Treatment seeking behavior and level of treatment among brick kiln workers: A Study in Azamgarh District, Uttar Pradesh. *Clinical Epidemiology and Global Health*. 2021 Oct 1;12:100861.
35. Monga V, Singh LP, Bhardwaj A, Singh H. Respiratory health in brick kiln workers. *Int J Phys Soc Sci*. 2012 Apr;2(4):226-44.
36. Tandon S, Gupta S, Singh S, Kumar A. Respiratory abnormalities among occupationally exposed, non-smoking brick kiln workers from Punjab, India. *The International Journal of Occupational and Environmental Medicine*. 2017 Jul;8(3):166.

37. Maity P, Pal A, Dhara PC. Evaluation of work related musculoskeletal disorder and postural stress of brick kiln workers during performing different brick making tasks.
38. Bijetri B, Sen D. Occupational stress among women moulders: A study in manual brick manufacturing industry of West Bengal. *Age (yrs)*. 2014;24:4-16.
39. Patil DS, Durgawale P, Gordhanbhal SR. A cross sectional study of socio-demographic and morbidity profile of brick kiln workers in rural area of Karad, in Satara District. *J. Med. Sci. Clin. Res.*. 2017.
40. Bharatiya M, Rode M, Phatak M. Study of work related respiratory symptoms and pulmonary functional tests in brick kiln workers. *J Med Sci Clin Res*. 2017;5(1):17179-84.
41. Pandian SH, Duraisingh V. A Study on Occupational Health Hazards of Brick Workers in Eral Block, Thoothukudi District. *International Journal of Grid and Distributed Computing*. 2021;14(1):1343-9.
42. Thomas BE, Charles N, Watson B, Chandrasekaran V, Senthil Kumar R, Dhanalakshmi A, Wares F, Swaminathan S. Prevalence of chest symptoms amongst brick kiln migrant workers and care seeking behaviour: a study from South India. *Journal of Public Health*. 2015 Dec 1;37(4):590-6.
43. Inbaraj LR, Haebar OJ, Saj F, Dawson S, Paul P, Prabhakar AK, Mohan VR, Alex RG. Prevalence of musculoskeletal disorders among brick kiln workers in rural Southern India.

- Indian journal of occupational and environmental medicine. 2013 May 1;17(2):71.
44. State Fact Sheet Tamil Nadu. National Family Health Survey - 5 2019-21. Ministry of Health and Family Welfare. Government of India. Available at http://rchiips.org/nfhs/NFHS-5_FCTS/Tamil_Nadu.pdf. Accessed on 17.1.2023.
45. Mathur P, Leburu S, Kulothungan V. Prevalence, awareness, treatment and control of diabetes in India from the countrywide National NCD Monitoring Survey (NNMS). *Frontiers in public health*. 2022 Mar 14:205.
46. Mohanraj S, Swaminathan K, Velmurugan G, Alexander T, Palaniswami NG. Prevalence of hypertension and associated risk factors in Suburban Tamil Nadu. *Apollo Medicine*. 2019 Oct 1;16(4):216.
47. Muhammad N, Shah M, Alam I, Askar A. Poverty Alleviation Course_Reading 4_Debt Bondage: A Sociological Study of Brick kiln Workers in Badhabar, Peshawar, Pakistan.
48. Raza A, Ali Z. Impact of Air Pollution Generated by Brick Kilns on the Pulmonary Health of Workers. *Journal of Health Pollution*. 2021 Sep;11(31):210906.
49. Rafiq M, Khan M. The health costs of the brick kilns emissions in Peshawar: A policy analysis. *Global J Adv Pure Appl Sci*. 2014;3:158–170.

50. Alam K, Rahman N, Khan HU, Haq BS, Rahman S. Particulate matter and its source apportionment in Peshawar, Northern Pakistan. *Aerosol Air Qual Res.* 2015;15:634–647.
51. Monga V, Singh LP, Bhardwaj A, Singh H. Respiratory health in brick kiln workers. *Int J Phys Soc Sci.* 2012;2:226–244.
52. Ray CS, Biswas C, Roy K. A subjective and objective analysis of pain in female brick kiln workers of West Bengal, India. *Int J Occup Saf Health.* 2012;2:38–43.
53. Manoharan PK, Singh BK, Jha SK. Ergonomics investigation using psycho-physiological study for brick kilns' in Jharkhand. *Int J Environ Sci.* 2012;3:1484–91.
54. Imaekhai L. Musculoskeletal problems among brick packers: A Nigeria perspective. *Adv Life Sci Technol.* 2012;4:17–8.
55. Sain MK, Meena M. Identifying musculoskeletal issues and associated risk factors among clay brick kiln workers. *Industrial health.* 2019;57(3):381-91.
56. Das B. Assessment of occupational health problems and physiological stress among the brick field workers of West Bengal, India. *International journal of occupational medicine and environmental health.* 2014 Jun;27(3):413-25.
57. Das B. An evaluation of low back pain among female brick field workers of West Bengal, India. *Environmental health and preventive medicine.* 2015 Sep;20(5):360-8.
58. Sett M, Sahu S. Anthropometric characteristics and evaluation of nutritional status amongst female brick field workers of the

- unorganized sectors of West Bengal, India. *Homo*. 2016 Jun 1;67(3):235-44.
59. Louati K., Vidal C., Berenbaum F., Sellam J. Association between diabetes mellitus and osteoarthritis: systematic literature review and meta-analysis. *RMD Open*. 2015;1(1):p. e000077.
60. Aldossari KK, Shubair MM, Al-Zahrani J, Alduraywish AA, AlAhmary K, Bahkali S, et al. Association between chronic pain and diabetes/prediabetes: a population-based cross-sectional survey in Saudi Arabia. *Pain Research and Management*. 2020 Oct;2020.
61. Kakihana H, Jinnouchi H, Kitamura A, Matsudaira K, Kiyama M, Hayama-Terada M, et al. Overweight and hypertension in relation to chronic musculoskeletal pain among community-dwelling adults: The circulatory risk in communities study (CIRCS). *Journal of Epidemiology*. 2021 Nov 5;31(11):566-72.
62. Thomas BE, Charles N, Watson B, Chandrasekaran V, Senthil Kumar R, Dhanalakshmi A, Wares F, Swaminathan S. Prevalence of chest symptoms amongst brick kiln migrant workers and care seeking behaviour: a study from South India. *Journal of Public Health*. 2015 Dec 1;37(4):590-6.
63. Lee SY, Lee J, Kwon M. Impacts of heavy smoking and alcohol consumption on workplace presenteeism: A cross-sectional study. *Medicine*. 2021 Nov 11;100(47).

64. Frone MR. Work stress and alcohol use. *Alcohol Research & Health*. 1999;23(4):284.
65. Zia-ur-Rahman NA, Khan T, Khan A. Status of occupational health and safety in brick kiln industries at hatter industrial estate Haripur, Pakistan. *Occupational Health & Safety*. 1923;1(1).

ANNEXURES
QUESTIONNAIRE

1. AGE:
2. GENDER:
3. EDUCATION: Illiterate/Primary/Middle/Secondary/Higher secondary/Graduate or post graduate
4. MARITAL STATUS: Married/Unmarried/Divorced/Separated/Widower/Living together
5. DIET: Vegetarian/ Mixed
6. SOCIO-ECONOMIC CLASS:

WORK RELATED DETAILS

7. DESIGNATION:
8. YEARS OF WORKING:
9. WORK TIMING:
10. MIGRATED: Yes/No

PERSONAL HISTORY

1. SMOKING / ALCOHOL / ANY SUBSTANCE ABUSE:
2. MEDICAL / SURGICAL HISTORY:
3. FAMILY H/O MEDICAL ILLNESS:
SHT/DM/CAD/OA/BA/PTB/Skin disease
4. PROTECTIVE MEASURES ANY: Eye goggle/Face mask/Hand gloves/Apron/Safety boot

GENERAL EXAMINATION:

5. BUILT:

6. NOURISHMENT:
7. PALLOR:
8. ICTERIC:
9. CLUBBING:
10. CYANOSIS:
11. LYMPHADENOPATHY:

Measurements:

1. BLOOD PRESSURE:
2. PULSE RATE:
3. RESPIRATORY RATE:

MUSCULOSKELETAL ILLNESS

Have you at any time during the last 12 months had trouble (such as ache, pain discomfort, numbness)		Have you had trouble during the last 7 days:		During the last 12 months have you been prevented from carrying out normal activities (eg., job, housework, hobbies) because of this trouble:	
1. Neck:	NO/YES	2. Neck:	NO/YES	3. Neck:	NO/ YES
4. Shoulders:	NO/YES (R/L/BOTH)	5. Shoulders:	NO/YES (R/L/BOTH)	6. Shoulders (BOTH/EITHER):	NO/ YES
7. Elbows:	NO/YES (R/L/BOTH)	8. Elbows:	NO/YES (R/L/BOTH)	9. Elbows (BOTH/EITHER):	NO/ YES
10. Wrists/Hands:	NO/YES (R/L/BOTH)	11. Wrists/Hands:	NO/YES (R/L/BOTH)	12. Wrists/Hands (BOTH/EITHER):	NO/ YES

13.Upper back:	NO/YES	14.Upper back:	NO/YES	15.Upper back:	NO/ YES
16.Lower back(Small of the back):	NO/YES	17.Lower back:	NO/YES	18.Lower back:	NO/ YES
19.One or both hips/thighs/buttocks	NO/YES	20.Hips/thighs/buttocks:	NO/YES	21.Hips/thighs/buttocks:	NO/ YES
22.One or both knees:	NO/YES	23.Knees:	NO/YES	24.Knees:	NO/ YES
25.One or both ankles/feet:	NO/YES	26.Ankles/feet:	NO/YES	27.Ankles/feet:	NO/ YES

UPPER RESPIRATORY SYMPTOMS (ATS-DLD 78)

Cough:

1. Do you usually cough first thing in the morning in the winter-	YES / NO
2. Do you usually cough during the day or night in the winter-	YES / NO
3. Do you cough like this on most days for as much as three months each year-	YES / NO

Phlegm:

4. Do you usually bring up any phlegm from your chest first thing in the morning in the winter-	YES / NO
5. Do you usually bring up any phlegm from your chest during the day or night in the winter-	YES / NO

6. Do you bring up phlegm like this on most days for as much as three months each year-	YES / NO
7. In the past three years have you had a period of (increased) cough and phlegm lasting for three weeks or more-	YES / NO
8. Have you had more then one each period-	YES / NO

Breathlessness:

If the subject is disabled from walking by any condition other than heart or lung disease, Omit question 8 and enter 1 here

8a. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill-	YES / NO
8b. Do you get short of breath walking with other people of your own age on level ground.-	YES / NO
8c. Do you have to stop for breath when walking at your own pace on level ground.-	YES / NO

DERMATOLOGICAL PROBLEMS

SKIN PROBLEMS: Itching/Pigmented patches/Frictional callosities/Dry or fissured skin/Ulcer/Others_____

1.Contact dermatitis

2.Skin ulcers

DERMATOLOGY LIFE QUALITY INDEX (DLQI)

1. Over the last week, how itchy, sore, painful or stinging has your skin been.-	Very much A lot A little Not at all
2. Over the last week, how embarrassed or self conscious have you been because of your skin.-	Very much A lot A little Not at all
3. Over the last week, how much has your skin interfered with you going shopping or looking after your home or garden.-	Very much A lot A little Not at all
4. Over the last week, how much has your skin influenced the clothes you wear.-	Very much A lot A little Not at all
5. Over the last week, how much has your skin affected any social or leisure activities.-	Very much A lot A little Not at all
6. Over the last week, how much has your skin made it difficult for you to do any sport.-	Very much A lot A little Not at all

7. Over the last week, has your skin prevented you from working.-	YES / NO
7b. If No, Over the last week, how much has your skin been a problem at work.-	A lot A little Not at all
8. Over the last week, how much has your skin created problems with your partner or any of your close friends or relatives.-	Very much A lot A little Not at all
9. Over the last week, how much has your skin created any sexual difficulties.-	Very much A lot A little Not at all
10.Over the last week, how much of a problem has the treatment for your skin been, for example by making your home messy, or by taking up time.-	Very much A lot A little Not at all

PARTICIPANT INFORMATION SHEET

You are being invited to participate in a study on Prevalence of common morbidities and their associated risk factors among brick kiln workers in Kancheepuram district, Tamil Nadu. Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Musculoskeletal Disorder among brick kiln workers, where the joints and muscles are held in unconducive physiological positions for more periods of time, in suboptimal working conditions. Emission from brick kilns comprises of fine dust particles, hydrocarbons and Clay dust contains a mixture of free silica, iron oxide, lime, magnesium carbonate. There is also the risk of exposure to dust (from bottom ash spread on the kiln). Inhalation of even relatively low concentrations of fine particles could affect lung function and lead to increases in cardiovascular and respiratory diseases. Higher amount of CO, which is produced in these kilns due to poor kiln design that results in incomplete combustion of coal, could also increase incidence of heart disease. Lack of health education and inadequate personal protection can lead to several health and socioeconomic related consequences, such as musculoskeletal problems, respiratory problems, occupational dermatitis, cardiovascular problems and increased morbidity rate. We will ask few questions about your social background, occupational history, musculoskeletal illness, respiratory illness and dermatological illness; Data collection is done using a structured questionnaire on the day of

visit to the brickkiln industry. Participation is completely voluntary and you are free to withdraw from the survey any time. Data collected are stored and analyzed using study ID numbers. No personal identifiers are revealed during data analysis and publication of findings. If you would like to participate in this survey, please give your consent in the form given below.

CERTIFICATE OF CONSENT

I have read the participant information sheet of the study titled, “Prevalence of common morbidities and their associated risk factors among brick kiln workers in Kancheepuram district, Tamil Nadu” conducting from Sree Balaji Medical College and Hospital have discussed with the study investigators about the purpose of the study.

I have been given the opportunity to ask questions, which have been answered to my satisfaction. I understand that my participation in this study is voluntary.

I understand that as a participant in their study, my identity and data relating to this research will be kept confidential. I wish to participate in this study of my consent to participate in this study.

Participant’s Name Participant’s signature/Thumb impression

Date

Witness Name Witness Signature Date

Investigator’s Name Investigator’s signature Date

பங்கேற்பாளர் தகவல் தாள்

தமிழ்நாட்டின் காஞ்சீபுரம் மாவட்டத்தில் செங்கல் சூளைத் தொழிலாளர்களிடையே பொதுவான நோய்கள் மற்றும் அவற்றுடன் தொடர்புடைய ஆபத்து காரணிகள் குறித்த ஆய்வில் பங்கேற்க அழைக்கப்படுகிறீர்கள். பங்கேற்க வேண்டுமா என்பதை நீங்கள் தீர்மானிப்பதற்கு முன், ஆராய்ச்சி ஏன் செய்யப்படுகிறது, அதில் என்ன ஈடுபடும் என்பதை நீங்கள் புரிந்துகொள்வது அவசியம். செங்கல் சூளைத் தொழிலாளர்களிடையே தசைக் கோளாறு, மூட்டுகள் மற்றும் தசைகள் நிபந்தனையற்ற உடலியல் நிலைகளில் அதிக காலத்திற்கு, துணை உகந்த வேலை நிலைமைகளில் வைக்கப்படுகின்றன. செங்கல் சூளைகளில் இருந்து உமிழ்வது சிறந்த தூசி துகள்கள், ஹைட்ரோகார்பன்கள் மற்றும் களிமண் தூசு ஆகியவை இலவச சிலிக்கா, இரும்பு ஆக்சைடு, சுண்ணாம்பு, மெக்னீசியம் கார்பனேட் ஆகியவற்றைக் கொண்டுள்ளது. தூசிக்கு வெளிப்படும் அபாயமும் உள்ளது (சூளையில் கீழே சாம்பல் பரவுகிறது). ஒப்பீட்டளவில் குறைந்த செறிவுகளைக் கூட உள்ளிழுப்பது நுரையீரல் செயல்பாட்டை பாதிக்கும் மற்றும் இருதய மற்றும் சுவாச நோய்களின் அதிகரிப்புக்கு வழிவகுக்கும். நிலக்கரி முழுமையடையாமல் எரியும் விளைவாக மோசமான சூளை வடிவமைப்பு காரணமாக இந்த சூளைகளில் உற்பத்தி செய்யப்படும் அதிக அளவு CO, இதய நோய்களின் நிகழ்வுகளையும் அதிகரிக்கக்கூடும். சுகாதாரக் கல்வியின் பற்றாக்குறை மற்றும் தனிப்பட்ட பாதுகாப்பின்மை ஆகியவை தசைகள், சுவாசப் பிரச்சினைகள், தொழில்சார் தோல் அழற்சி, கார்டியோ வாஸ்குலர் பிரச்சினைகள் மற்றும் அதிகரித்த நோயுற்ற வீதம் போன்ற பல உடல்நலம் மற்றும் சமூக பொருளாதார தொடர்பான விளைவுகளுக்கு வழிவகுக்கும். உங்கள் சமூக பின்னணி, தொழில் வரலாறு, தசைக்கூட்டு நோய், சுவாச நோய் மற்றும் தோல் நோய் பற்றி சில கேள்விகளை நாங்கள்

கேட்போம்; செங்கல் தொழிலுக்கு வருகை தரும் நாளில் கட்டமைக்கப்பட்ட கேள்வித்தாளைப் பயன்படுத்தி தரவு சேகரிப்பு செய்யப்படுகிறது. பங்கேற்பு முற்றிலும் தன்னார்வமானது மற்றும் நீங்கள் எந்த நேரத்திலும் கணக்கெடுப்பிலிருந்து விலகிக்கொள்ளலாம். சேகரிக்கப்பட்ட தரவு ஆய்வு ஐடி என்களைப் பயன்படுத்தி சேமிக்கப்பட்டு பகுப்பாய்வு செய்யப்படுகிறது. தரவு பகுப்பாய்வு மற்றும் கண்டுபிடிப்புகளின் வெளியீட்டின் போது தனிப்பட்ட அடையாளங்காட்டிகள் எதுவும் வெளிப்படுத்தப்படவில்லை. இந்த கணக்கெடுப்பில் நீங்கள் பங்கேற்க விரும்பினால், தயவுசெய்து கீழே கொடுக்கப்பட்டுள்ள படிவத்தில் உங்கள் ஒப்புதலை வழங்கவும்.

ஒப்புதல் சான்றிதழ்

ஸ்ரீ பாலாஜி மருத்துவக் கல்லூரி மற்றும் மருத்துவமனையிலிருந்து நடத்தப்படும் காஞ்சிபுரம் மாவட்டம், தமிழ்நாடு, செங்கல் சூளைத் தொழிலாளர்களிடையே பொதுவான நோய்கள் மற்றும் அவற்றுடன் தொடர்புடைய ஆபத்து காரணிகள் ” என்ற தலைப்பில் ஆய்வின் பங்கேற்பாளர் தகவல் தாளைப் படித்தேன். ஆய்வின்.

என் திருப்திக்கு பதிலளிக்கப்பட்ட கேள்விகளைக் கேட்க எனக்கு வாய்ப்பு வழங்கப்பட்டுள்ளது. இந்த ஆய்வில் எனது பங்கேற்பு தன்னார்வமானது என்பதை நான் புரிந்துகொள்கிறேன்.

அவர்களின் ஆய்வில் பங்கேற்பாளராக, எனது ஆராய்ச்சி மற்றும் இந்த ஆராய்ச்சி தொடர்பான தரவு இரகசியமாக வைக்கப்படும் என்பதை நான் புரிந்துகொள்கிறேன். இந்த ஆய்வில் பங்கேற்க எனது சம்மதத்தின் இந்த ஆய்வில் பங்கேற்க விரும்புகிறேன்.

பங்கேற்பாளரின் பெயர் பங்கேற்பாளரின் கையொப்பம் / கட்டைவிரல்
தேதி எண்ணம்

சாட்சி பெயர் சாட்சி கையொப்பம் தேதி

புலனாய்வாளரின் பெயர் புலனாய்வாளரின் கையொப்பம் தேதி