STUDY OF HEALTH STATUS OF SUGARCANE FACTORY WORKERS OF VIJAYAPURA DISTRICT-LONGITUDINAL STUDY.

By

Dr. VIJAY SINGH

Dissertation submitted to

BLDE (Deemed to be University) Vijayapur, Karnataka

In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE IN

COMMUNITY MEDICINE

Under the guidance of

Dr.GUDADINNI .M.R.

PROFESSOR

DEPARTMENT OF COMMUNITY MEDICINE

BLDE (Deemed to be University)

SHRI B.M.PATIL MEDICAL COLLEGE

HOSPITAL & RESEARCH CENTRE, VIJAYAPUR

KARNATAKA

2020

Study of health status of sugarcane factory workers of Vijayapura district- Longitudinal study

DOCTOR OF MEDICINE

In

COMMUNITY MEDICINE

LIST OF ABBREVIATIONS USED

WHO	: World Health Organization
FVC	: Forced Vital Capacity
FEV	: Forced Expiratory Volume
VC	: Vital Capacity
BMI	: Body Mass Index
PEFR	: Peak Expiratory Flow Rate
SPSS	: Statistical Package for Social Science
FEF	; Forced Expiratory Flow
SD	:Standard Deviation.
BMI	:Body Mass Index

ABSTRACT

INTRODUCTION

Sugar industry is a growing sector to combat increasing demands of sweeteners throughout the world. Sugar industry is one of the important agro-based industries not only in India but also in the world as it directly contributes in creating employment, income and social developments in the rural areas of the country. Both skilled and unskilled workers from rural areas are engaged in this sector**.** Pulmonary dysfunction is one of the worldwide health burdens. According to WHO report it is estimated that 235 million people suffer from asthma (pulmonary problem). These pulmonary problems cause nearly 4 million deaths per year. Although, data are available across the country showing varied prevalence of pulmonary function in different studies due to type of study population, inclusion and exclusion criteria, study methods etc., no study has been performed earlier in population of this region. Hence, the present study was aimed to pulmonary functions of sugarcane factory workers.

OBJECTIVES

1. To study sociodemographic and work profile of sugar cane factory workers.
2. To study the morbidity pattern and assess the pulmonary functions of sugarcane factory workers
3. To assess and follow health status of sugar cane factory workers

MATERIALS AND METHODOLOGY

It is a Longitudinal study carried out in the sugarcane factory workers of the vijayapura district among the age group between 20-59. All who fulfilled the inclusion criteria were taken for the study. Face-to-face interviews were conducted using semi-structured questionnaires (regarding socio-demographic data, personal habits, family and environment). Lung function parameters were found using a spirometer. Those who are with lower pulmonary function were advised to use precautions during work and to consul specialty doctors.

STATISTICAL ANALYSIS

The data obtained will be entered in a Microsoft Excel sheet, and statistical analysis will be performed using statistical package for the social sciences (Verson 20). Results will be presented as Mean (Median) ±SD, counts and percentages and diagrams. For normally distributed continuous variables will be compared using paired t test. For not normally distributed variables Wilcoxon signed rank test will be used

RESULTS

Pulmonary function parameters of study participants during first visit shows that show that 182(81%)of the working population have normal FEV1/FVC% Ratio. 20(9%) of study population are having moderate restriction and 23(10%) of study participants are having severe restriction. 132(58%) of study participants had normal peak expiratory flow rate and 93(42%) of study participants have low PEFR suggestive of lung diseases (Asthma, COPD). 197(88%) of study participants had

normal FEF, and 28(12%) of study participants had low FEF suggestive of COPD, even in people with normal lung function.

CONTENTS

LIST OF GRAPHS

INTRODUCTION

India is the second largest agro-processing industry, next to Brazil. Sugar industry directly contributes in creating employment, income and social developments in the rural areas of the country[1]. Both skilled and unskilled workers from rural areas are engaged in this sector. The sugar industry accounts for about 20% of sugar mills and 15% of global production.[2,3]

Sugarcane industry workers are directly exposed to most of the linked risk factors for obesity, diabetes, cardiovascular disease and other health problems that can lead to premature death, according to the World Health Organization. Poor working conditions can result in musculoskeletal injuries and damage to joints and tendons, leading to joint pain and fatigue..[4]

. Occupation-related exposure is a risk factor for acute and chronic respiratory irritation and inflammation with the possibilities of development of atherosclerotic and coronary artery diseases.[5] Long living accompanied by health is not possible without the cooperation of different organs. The function of each part has some effect on others. organic dust bagasse is one of that[6]

A person's weight may also influence pulmonary function mechanically by changes in compliance, work of breathing, and elastic recoil, and the elastic recoil of their body. .[7,8]

After extraction of sugar cane juice, the residual fibre is known as bagasse. This material has found uses in insulation, as fuel, and in paper manufacture. During the de-stacking

process workers are exposed to dried, old bagasse fibres which may be heavily laden with fungal and bacterial organisms. Bagassosis is a respiratory disease caused by inhalation of bagasse dust[9]

The causative agent has been identified by Lacey[10] as being *Thermoactinomyces sacchari*.

. Bagassosis, or allergic alveolitis, may present insiduously with increasing dyspnoea and cough, or acutely after an unusually heavy exposure. On examination, there are usually basal crackles (generalized in severe cases). Chest X-ray may be normal in the early stages, followed by the appearance of fine micronodular shadowing (predominantly basal). After recovery, lung function tests show a decrease in FEV1, FVC, TLC, transfer factor and residual volume.[11,12]

Pulmonary dysfunction is one of the worldwide health burdens. According to WHO report it is estimated that 235 million people suffer from asthma (pulmonary problem) These pulmonary problems cause nearly 4 million deaths per year. Pulmonary impairment was found in 8.7% of the workers in a study in Karnataka.[13,14]

In one of the studies done in maharastra ,PFT parameters of workers working in sugarcane industry showed decreased values of FVC, FEF, VC, FEFR when compared with controls.[15]

The present study was aimed to examine pulmonary functions of sugarcane factory workers in the Indian state of Karnataka , Vijayapura district.

OBJECTIVES

1. To study sociodemographic and work profile of sugar cane factory workers.

2. To study the morbidity pattern and assess the pulmonary functions of sugarcane factory workers

3. To assess and follow health status of sugar cane factory workers

REVIEW OF LITERATURE

Global scenario

One of the major health problems in the globe is pulmonary dysfunction. A WHO research estimates that 235 million people worldwide have asthma (pulmonary problem). Expected death due to lung diseases is 4million per year. Sugarcane farming employs 30% of the population directly and indirectly. The respiratory condition known as "bagassosis" is one that is brought on by inhaling a substance called bagasse dust. It is frequently referred to as pneumonitis and is also referred

to as a farmer's lung variation. Sugar plant workers are exposed to bagasse, respirable dust with a particle size range of 0.5 to 3 microns, as a result of their line of work. This study's objective is to determine the overall prevalence of pulmonary impairment among workers in sugar factories[16]

Indian Scenario

Sugarcane was first used in India around the eighth century BC. About 50 million farmer families are supported by sugar and related sectors in India, which significantly advances the country's economy. India's sugarcane industry is a major player in the global sugar market. One of India's top states for producing sugar is Tamil Nadu. Furthermore, the globe has the potential for producing 105 watt of electricity per year from bagasse. In 1802, the island of Lanai saw the establishment of the first sugar factory. Agriculture began to take up in Hawaii in the 1840s, but plantation collapse began in the 1980s due to several dangers While sporadic observations were made in countries that produced sugar in the nineteenth century, concern for occupational health and safety in this industry just began to emerge in this century[17]

A study conducted by Patil S.N et al (2005) in Krishna sugar factory, Maharashtra in directly and indirectly exposed bagasse workers. As compared with indirect exposure group, the lung-function test results presented here indicate a significant decrease in values of all the parameters studied (FVC, FEV1, PEFR, and MVV) in the directly exposed group.[18]

Anand et al (1999) conducted a cross-sectional epidemiological study among agricultural industry workers in India justified that a respiratory problems were seen the highest in poultry farms (59%) than sugar refinery (42.5%) and granaries (40.5%). Smoking was found to have a definite impact on the incidence of cough and breathlessness. Higher incidence of respiratory disorders was recorded in workers with longer duration of employment.

A cross sectional study conducted by Bohadana A B et al, in 1995 in male employees comprising the workforce at a chalk powder factory and a sugar factory in France. This study revelaed that the small subgroups of chalk sacking and sugarcane manufacture workers had high prevalence (33%) of chronic cough. Prevalence of respiratory symptoms like asthma 12% and 5% , and cough 29% and 27% in chalk powder and sugar industry workers respectively were seen.[20]

An observational study by Nitin et al (2011) in Pravaranagar, revealed that the prevalence of pulmonary impairment was 31.97%.The highest prevalence of pulmonary impairment was seen in Bagasse workers (40.48%) followed by Manufacturing dept (38.24%) workers. FEV1/FVC was found significant in bagasse workers and manufacturing dept workers. Amongst the occupational exposure sub-groups, 31yrs exposed workers were maximally affected by obstructive type (21.43%) and restrictive type (14.29%) of pulmonary impairment..[21]

A study conducted by Dr S.A Nayakawadi in Dist.Sangli has revealed that the values of FVC FEV1 PEFR and MVV were significantly lowered in workers working in the bagasse baling section as compared to those of the control group.[22]

MVV and FEF showed a highly significant decrease in the age group of 15-25yea,26-35years and in >35years group. A study conducted by Sunita et al (2009-10), in Maharashtra, showed a reduction in FVC and PEFR when compared with controls.[23]

A study conducted by Saravanan et al(2020) in Villupuram district tamilnadu showed the prevalence of pulmonary impairments was found to be 31.06%. Among impairments, 58.3% were restrictive and 33,3% are obstructive. Among diseased 63% are nonsmokers and 37% are smokers.[24]

A study conducted by Prajakta pawar et al(2019) in karad taluka included 88sugar distillery industry workers. It showed that 34 workers had normal pulmonary function and 25 had the mild obstructive type of pulmonary impairments. The remaining three workers had mixed types of lung disease for PFT.[25]

PULMONARY FUNCTION TESTS

The pulmonary function tests provide an assessment of the respiratory system of its functions. The pulmonary function test is age-old but time-tested parameter for

assessing the respiratory health of a person. With increased urbanization, increased population and indiscriminate industrialization, the level of pollution is increasing day by day[26,27,28.]

There are various pulmonary function tests. These tests provide a quantitative and objective assessment of pulmonary diseases. They do not give a specific etiological or pathological diagnosis[29,30.] The tests can be divisible into categories which are as follows[31.]

A. Tests to assess the ventilatory function of lungs-

1. Measurements of various lung volumes and capacities
2. Measurements of dead space
3. Measurements of compliance
4. Measurements of airway resistance

B. Tests of diffusion

C. Tests of the ultimate purpose of respiration

D. Tests during exercise

Volumes and capacities. : Volumes are basic entities while Capacity is derived from Volumes. Each Capacity is the sum of two or more Volumes.

LUNG VOLUMES:

A. **Tidal Volume (TV):** It is the volume of air that is inspired or expired

during the normal respiratory cycle. Normal value 500ml

B. **Inspiratory Reserve Volume (IRV):** It is the maximum volume of air that can be inspired after complete normal tidal inspiration. Normal value 2000 to 3200ml

C. **Expiratory Reserve Volume (ERV):** It is the volume of air that can be expired after complete normal tidal expiration. Normal value 750 to 1000

D **Residual Volume (RV):** It is the volume of air that is remaining in the lungsat the end of maximum expiration. Normal value .1000 -1100ml

LUNG CAPACITIES:

A. **Inspiratory Capacity(IC):** It is the maximum volume of air which can beinspired after complete tidal expiration Normal value: 2500 to 3700ml. IC=TV+IRV

B. **Expiratory Capacity (EC):** It is the maximum volume of air which can beexpired after complete tidal inspiration Normal value: 1250 to 1500ml. EC=TV+ERV

C. **Functional Residual Capacity (FRC):** It is the volume of air that isremaining in the Lungs at resting expiratory level. It is about 2300ml. FRC=ERV+RV.

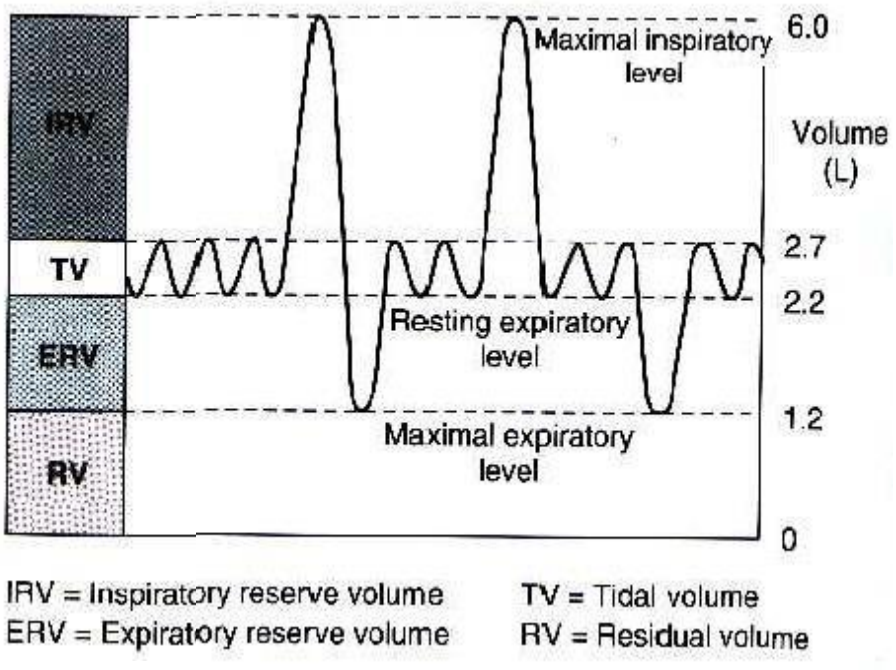
D. **Vital Capacity (VC):** It is the maximum volume of air which can be expired from lungs by forceful efforts followed by a maximal inspiration. Normal value: 4.8L in males and 3.2L in females. VC=TV+IRV+ERV

E. **Total Lung Capacity (TLC):** It is the amount air that can be present in the lungs at the end of maximum inspiration. It is about 5800ml.

TLC=VC+RV.

All these lung volumes and capacities can be measured by Spirometry. In the present study, by computerized Spirometer with the exception of Residual Volume and Functional Residual Capacity.

Fig. 1: Spirogram



DYNAMIC LUNG FUNCTION TESTS:

1. **Forced Vital Capacity(FVC) :**

Forced Vital Capacity is the volume of air which can be breathed out as forcefully and asrapidly as possible following a maximum inspiration. It is exactly similar to Vital Capacity except that there is a special stress on rapid forceful and complete exhalation.

2. **Forced Expiratory Volume or Timed Vital Capacity (FEV or TVC):**

If the vital capacity is recorded on a kymograph (Spirograph) at a

known speed, volume of air expired can be timed. This is TVC.

Components of TVC:

1. FEV_1: Forced Expiratory Volume at the end of 1^{st} second i.e., volume of FVC

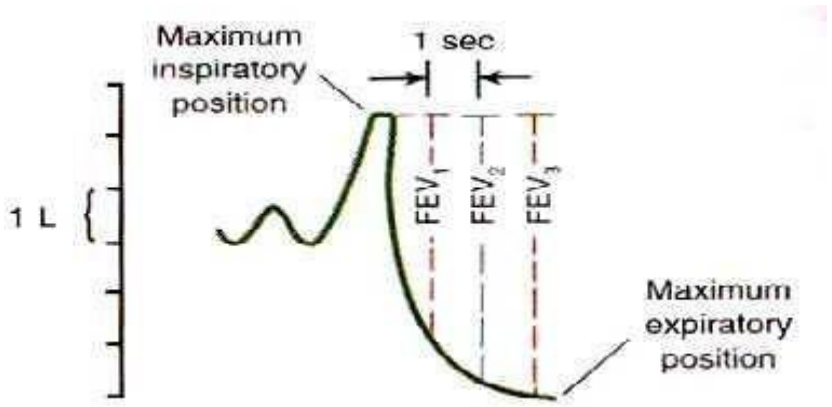
expired in first second of exhalation. Normally 80% of FVC.

2. FEV_2**:** Forced Expiratory Volume at the end of 2nd second i.e., volume of FVC

expired at the end of 2nd seconds of exhalation. Normally 95% of FVC.

1. FEV_3**:** Forced Expiratory Volume at the end of 3rd second i.e., volume of FVCexpired at the end of 3rd second of exhalation. Normally 98-100% of FVC.

Fig. 2: Record of Timed Vital Capacity



FEV1%=Volume of air exhaled in the first secondX10 0

Vital Capacity

1. **FEV1/FVC ratio (FEV1%):**

This ratio in healthy adults should be approximately 75-80%. FEV_1% is more sensitive indicator of airway obstruction than FVC or FEV_1 alone. FEV1/FVC decreases in obstructive diseases. But in the early phase of obstruction which originates in the small airways, this ratio may be normal.

2. Peak Expiratory Flow Rate (PEFR):

This is the expiratory flow rate during the peak of FVC. It is recorded with a mini Wright's Peak Flow Meter. PEFR measures efficiency of lungs by recording maximum flow of air. Peak Expiratory Flow Rate is dependent upon age, sex, build, etc. Normal value: 400- 450 liters per minute. In a young adult, it is about 400L/min. It falls dramatically in such as COPDs.

3 .Maximum Expiratory Pressure (MEP):

Respiratory symptoms are associated with respiratory muscle dysfunction. There are reports of progressive weakness in patients with multicore myopathy, multiple sclerosis, Motor Neuron disorder, Malnutrition and Congestive Heart Failure. MEP is useful in determining the ability of a person to cough effectively. But it is non specific and relatively insensitive measurement. However MEP alone can be used as an effective tool for measuring the strength of respiratory muscles.

MEP is reflecting the strength of the abdominal muscles and other expiratory muscles by using a modified Black's apparatus.

Pictures - mini Wright's Peak flow meter **Modified Black's apparatus**

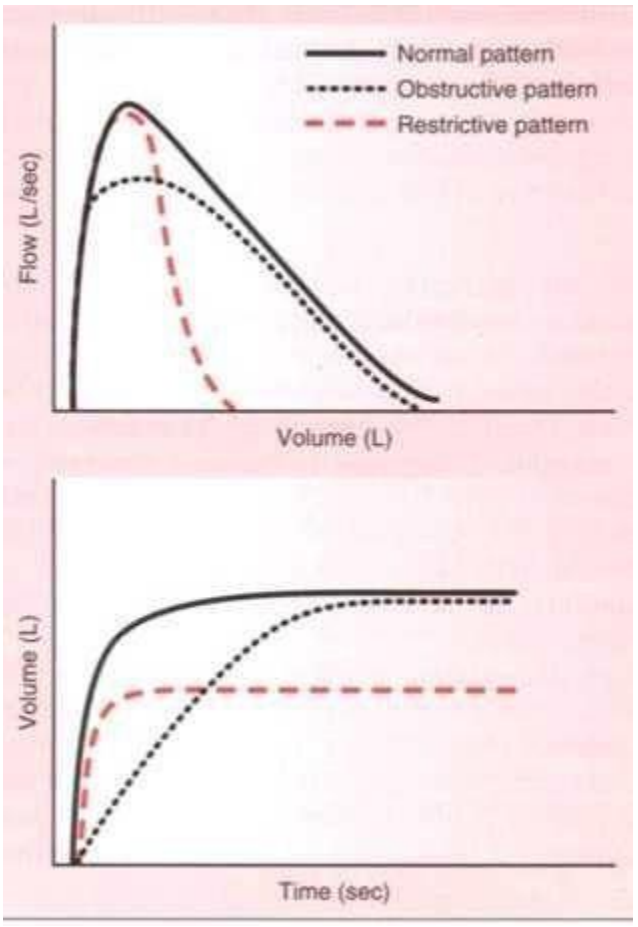
Spirometry:

ventilation, the movement of air into and out of the lungs can be measured by spirometry[32.]

Chronic bronchitis, emphysema and asthma result in dyspnea (difficulty breathing), a ventilatory deficiency a condition which is known as Chronic Obstructive Pulmonary Disease (COPD). COPD is the fourth leading cause of death among Americans. Common causes of an obstructive pattern are cystic fibrosis, asthma, bronchiectasis, respiratory infections and menopause.[33]

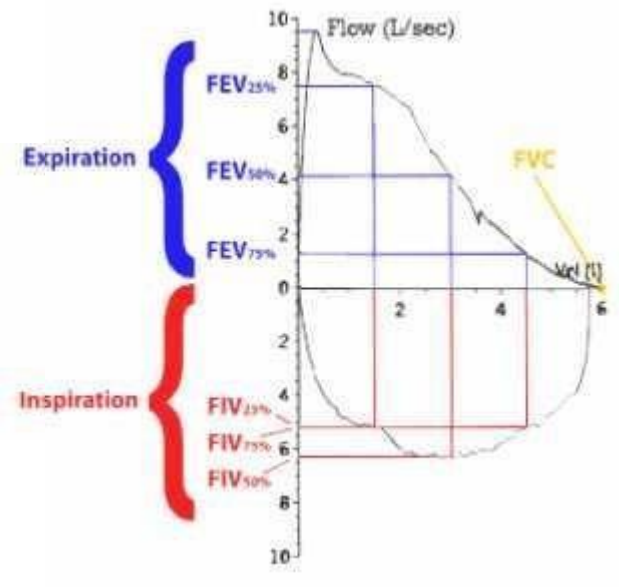
Some of the common patterns are pneumonia, heart disease, pregnancy, lung fibrosis, pneumothorax (collapsed lung) and pleural effusion (compression caused by chest fluid) [34.]

Figure 3: Spirograms showing obstructive & restrictive patterns.



Obstructive and restrictive patterns can be identified on Spirograms using both "y" and "x" axes. A restrictive pattern is characterized by a normal shape showing reduced volumes for all parameters. An obstructive pattern produces a Spirogram with an abnormal shape. The reduction in volumes indicates the severity of the disease

Figure 4: Flow Volume Spirogram



The flow-volume loop spirogram is helpful in diagnosing upper airway obstruction and can differentiate some types of restrictive patterns. The expiratory phase is shown on top and the inspiratory phase on the bottom. This requires the FVC manouvre followed by a Forced Inspiratory (FIV) [32.]

Spirometry is contraindicated in patients whose condition will be aggravated by forced breathing such as those who have had their airways damaged by smoking or drinking alcohol. [32.]

- ☐ hemoptysis (spitting up blood from the lungs or bronchial tubes)
- ☐ pneumothorax (free air or gas in the pleural cavity)
- ☐ recent heart attack
- ☐ unstable angina

- ☐ aneurysm (cranial, thoracic, or abdominal)
- ☐ thrombotic condition (such as clotting within a blood vessel)
- ☐ recent thoracic or abdominal surgery
- ☐ nausea or vomiting

.

The patient's emotional state must be considered when undergoing psychological tests, such as Spirometry, and should be considered before the procedure is carried out. The test should be terminated if the patient shows signs of significant head, chest or abdominal pain at any time during the procedure.[33]

Assessment of restrictive and obstructive ventilatory defects[33.]

Obstructive lung disease	**Restrictive lung disease**
High TLC	Decreased TLC
Low FEF_{25-75}	Normal FEF_{25-75}
VC normal/increased	Decreased VC
FEV_1 decreased	FEV_1 normal
FEV_1 /FVC decreased	FEV_1 / FVC normal
MVV decreased	MVV normal
Residual volume increased	Residual volume decreased

MATERIALS AND METHODS

STUDY AREA: sugar cane factories available in Vijayapura district

METHODS OF DATA COLLECTION

STUDY DESIGN: Longitudinal study

STUDY PERIOD: One and half year

STUDY TECHNIQUE: Interview technique

Sample size

With anticipated Proportion of Pulmonary impairments among Sugarcane Industry workers 31% [9], the study would require a sample size of 225 workers with 99**%** level of confidence and 8% absolute precision**.**

Formula used

- $\mathbf{n=\frac{z^2\ p*q}{d^2}}$

Where Z= Z statistic at α level of significance

d^2= Absolute error

P= Proportion rate

q= 100-p

METHODOLOGY:

After obtaining ethical clearance from ethical committee in institution and permission from the CEO of the sugar factory, study will be carried out in the selected factory

The following parameters will be studied :

The following Parameters were recorded in the subjects:

I. Record of Physical Anthropometry of subjects.

1. Height (in centimeters): This was measured with each subject standing without his/her footwear nearest to 0.1 centimeter.
2. Weight (in kilograms): The subjects were weighed in standardized machine with minimum clothing nearest to 0.1 kilogram.
3. Chest circumference (in cm): It was measured at deep inspiration position at the level of the nipple with minimum clothing with the help of standard tailor tape nearest to 0.1centimetre.
4. Body Mass Index (kilogram/meter^2): This was calculated for each subject from Weight in kgs and height in meters by using Quetlet index.

II. Record of Physiological Parameters [33,34,35,36.]

1. Pulse Rate (PR): It was expressed as beats per minute by

palpating right radialartery.

2. Blood Pressure (SBP and DBP): It was measured by mercuria l sphygmomanometer in mm of Hg.
3. Mean Arterial Pressure (MAP): It was measured in mm of Hg by usingfollowing formula DBP$\pm$1/3 pulse pressure (PP).
4. Respiratory Rate (RR): It was expressed as cycles per minute by manualmethod.

III.Record of Pulmonary function Parameters[37,38,39.]

The following pulmonary function parameters were recorded using Spirometer

1. Forced Vital Capacity (FVC) in ml.

2. Forced Expiratory Volume at the end of first second (FEV1) in ml.

3. Percentage of Forced Expiratory Volume at the end of first second (FEV 1%).

FEV1% was calculated mathematically using following formula: FEV1%=FEV1/FVCX100.

4. Peak Expiratory Flow Rate (PEFR) in L/min by using mini Wright's peak flow meter.

Spirometry is the most widely used pulmonary function test. It records the amountof air breathed in and out and the rate at which this process takes place. The device used in this test is a spirometer, a long piece of tubing with a mouth piece at one end and a recording device at the other. Spirometry reveals degree of obstruction and restriction of the airway.

Figure 10: Spiroexel instrument

Procedure: A spirometer is a device that measures air flow by electronic or mechanical displacement principles and uses a microprocessor and recorder to plot air flow. Spirometry requires the subject's nose to be pinched off as the subject breathes through a mouthpiece attached to a spirometer. Three breathing manouvre are practiced before recording the procedure and the highest of

three trials is used for evaluation

.

Purpose: Spirometry is the most commonly performed pulmonary function test (PFT) The test can be performed at the bedside, in a physician's office or in a pulmonary laboratory. Spirometry may also be suggested by an abnormal x ray, arterial blood gas analysis or other diagnostic pulmonary test result. National Lung Health Education Program recommends regular spirometric tests for persons over 45 years old who have a history of smoking.

Precautions: The subject's smoking habits and history should be thoroughly documented. The subject must be able to understand and respond to instructions for the breathing manouvre. The test may not be appropriate for very young, unresponsive, or physically impaired persons. Subjects should inform the physician of any medications they are taking, or of any medical conditions that are present [23.]

Preparation: The subject's age, gender and race are recorded. Height and weight of each subject are measured before the procedure. The subject should not have eaten heavily within three hours of the test. He or she should be instructed to wear loose-fitting clothing over the chest and abdomen area. The respiratory

therapist or other testing personnel should explain and demonstrate the breathing manouvre to thepatient. The subject should practice breathing into the mouthpiece until he or she is able to duplicate the manouvre successfully on two consecutive attempts.

Sampling Technique:

Industries will be selected using Simple Random sampling by Lottery method.

- **Statistical Analysis**
- The data obtained will be entered in a Microsoft Excel sheet, and statistical analysis will be performed using statistical package for the social sciences (Verson 20).
- Results will be presented as Mean (Median) ±SD, counts and percentages and diagrams.
- For normally distributed continuous variables will be compared using paired t test

  For not normally distributed variables Wilcoxon signed rank test will used.
- Categorical variables will be compared using Chi square test.
- Paired categorical data will be compared using Mac Nemer's chi square test

$p<0.05$ will be considered statistically significant. All statistical tests will perform two tailed[42 43]

Results

TABLE 1 Sociodemographic details

VARIABLES		FREQUENCY	%
AGE GROUP (IN YEARS)	35-40	38	17%
	41-45	38	17%
	46-50	51	22.5%
	51-55	54	24%
	56-60	44	19.5%
GENDER	MALE	225	100%
EDUCATION	ILLITERATE	37	16.4%
	PRIMARY	77	34.2%
	SECONDARY	60	26.6%
	GRADUATE	32	14.2%
	PG	19	8.4%
SOCIO ECONOMIC STATUS	UPPER	49	21.7%
	UPPER MIDDLE	76	33.7%
	MIDDLE CLASS	48	21.3%
	LOWER MIDDLE	16	7.1%
	LOWER CLASS	36	16%
MARITAL STATUS	MARRIED	208	92.4%
	UNMARRIED	17	7.5%

Table 1 shows demographic status of study participants. Between 46-50yrs 51(22.5%), 51-55yrs 54(24%) constitutes almost 46.5% of working population.34% population falls in between 35-45yrs age group and remaining population 19.5% falls under 56-60 yrs. 85%(192) 0f population are males .26.6%(60) had completed secondary studies and 16.4% of working population are illiterate. Only 8.4% (19) of population had completed postgraduation.33.7% (76) belongs to upper middle class and 16%(36) belongs to lower

Figure 1 : Age distribution of study participants

Below graph shows that age group pf 51-55yrs (24%) are more in working population followed by age group 46-50yrs(22.5%)

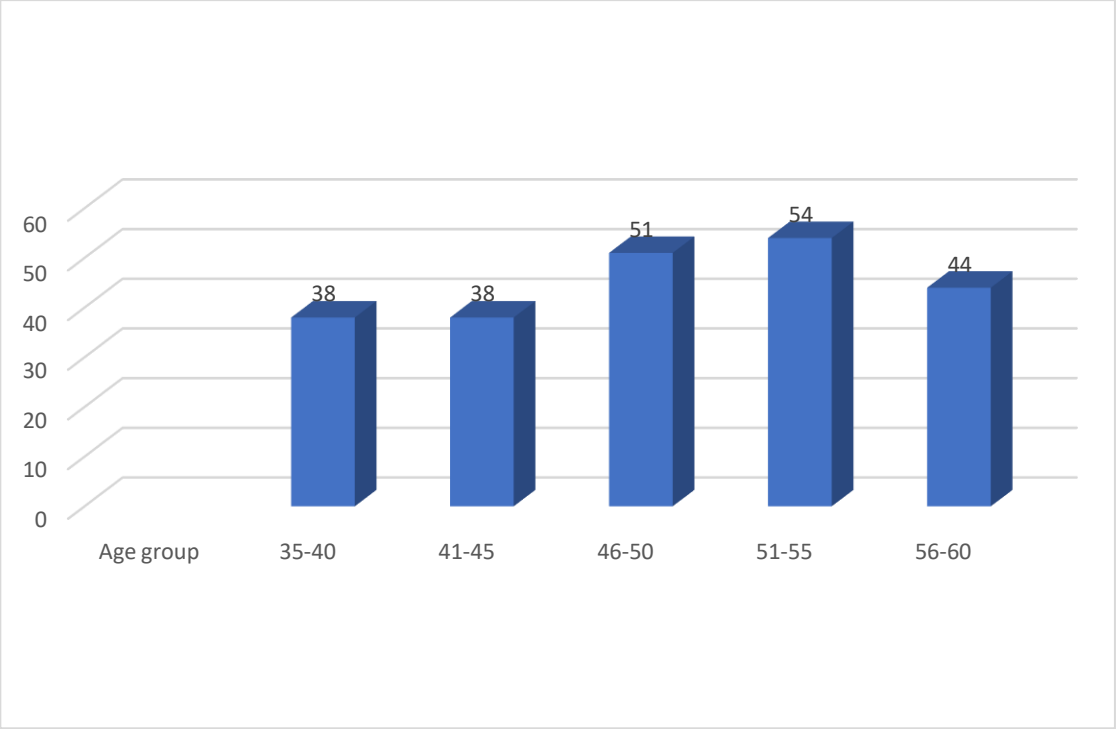


Figure 2: socioeconomic status of the workers

Below figure shows Sociodemographic details show that most of the working population is from the middle class 76(33.7%), followed by the lower middle class 49(21.3%).

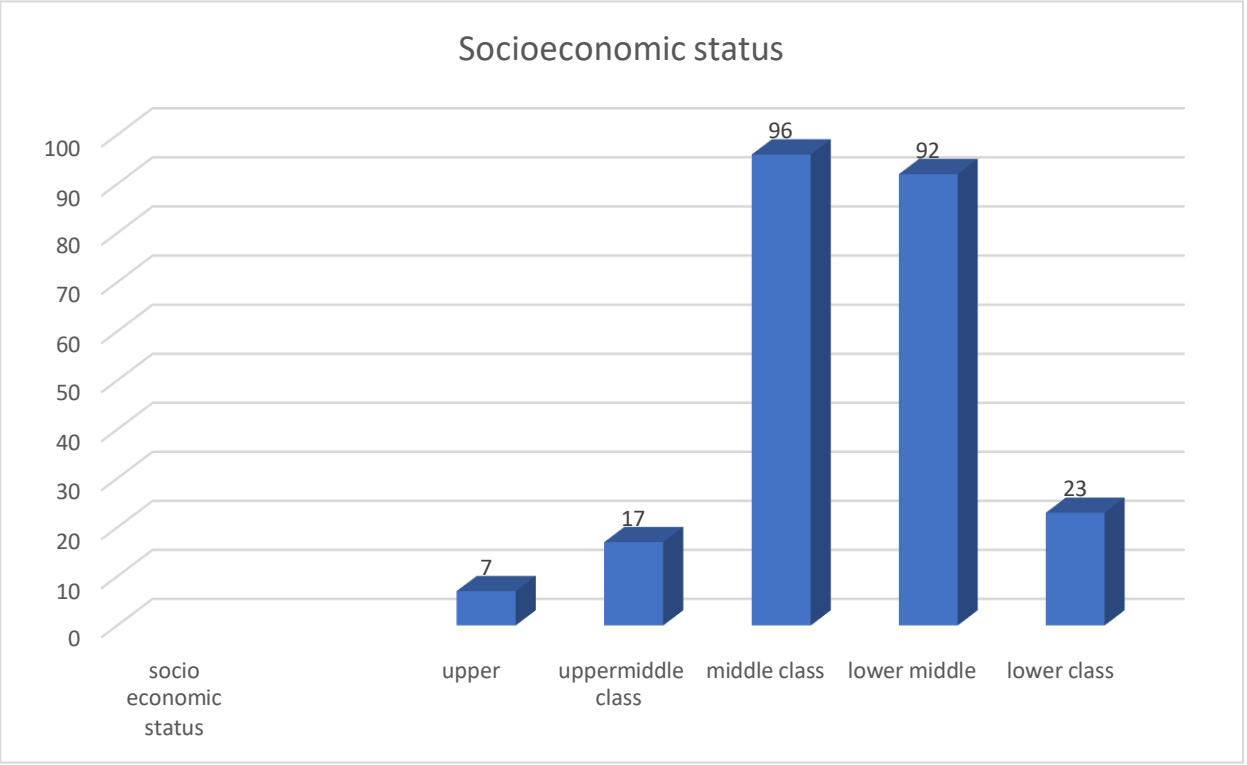


Figure 3: Distribution of study participants according to educational status

Below figure shows that most of the study participants had completed primary level of education 77(34.2%) followed by secondary level 60(26.6%)

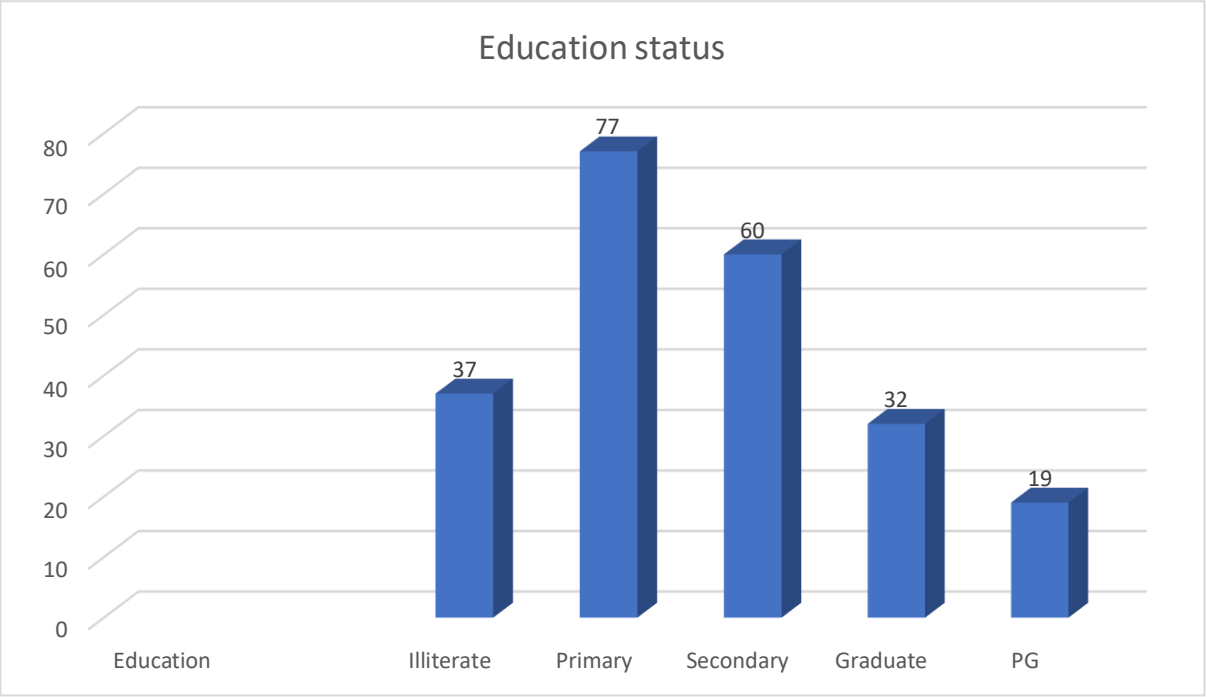


Figure 4: Distribution of study participants according to type of family

Below figure shows that most of the study participants are from Nuclear family 121(52%) followed by joint family 80(40%)

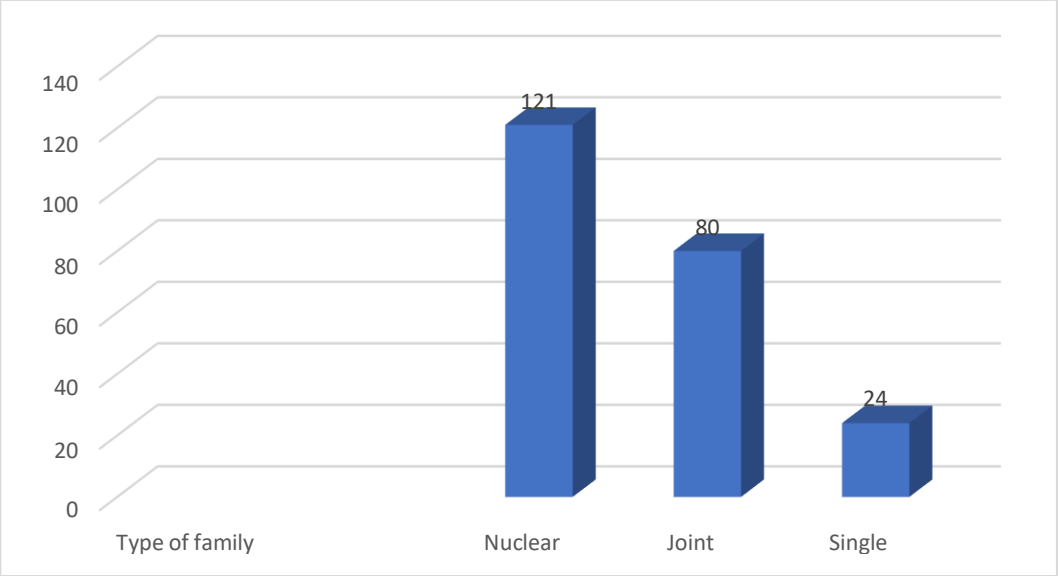


Figure 5: Distribution of study participants according to their marital status

Below figure shows that most of the study participants 208(92.4%) are married

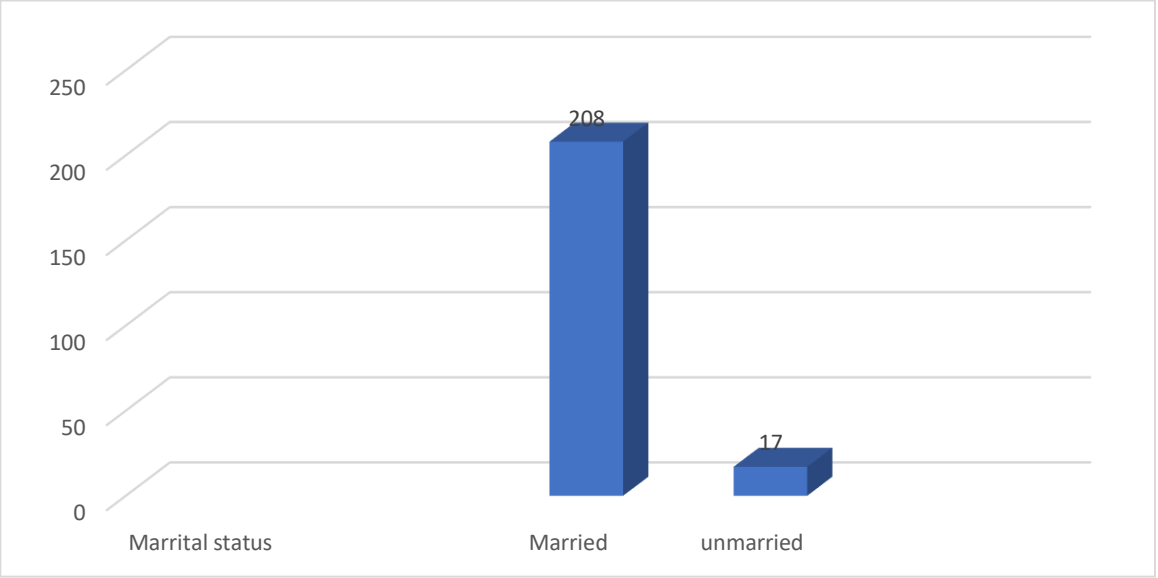


TABLE 2: HISTORY OF VARIOUS HABITS

AGE	ALCOHOL		SMOKING		TOBACCO		DRUG HABIT	
	YES	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
35-40	30	8	6	32	23	15	2	15
41-45	35	3	9	29	30	8	2	17
46-50	25	26	20	31	30	21	5	26
51-55	46	8	15	39	39	15	6	18
56-60	24	20	9	35	19	25	1	34
TOTAL (%)	160(71%)	65(29%)	59(26%)	166(74%)	141(63%)	84(37%)	16(8%)	209(92%)

Table 2 shows the distribution of participants involved in various habits. 160(71%) of study population were involved in alcohol followed by 141(63%) tobacco. Age group inbetween 51-55yrs are involved more in alcohol smoking and tobacco

Figure 6: Distribution of study participants according to various personal habits

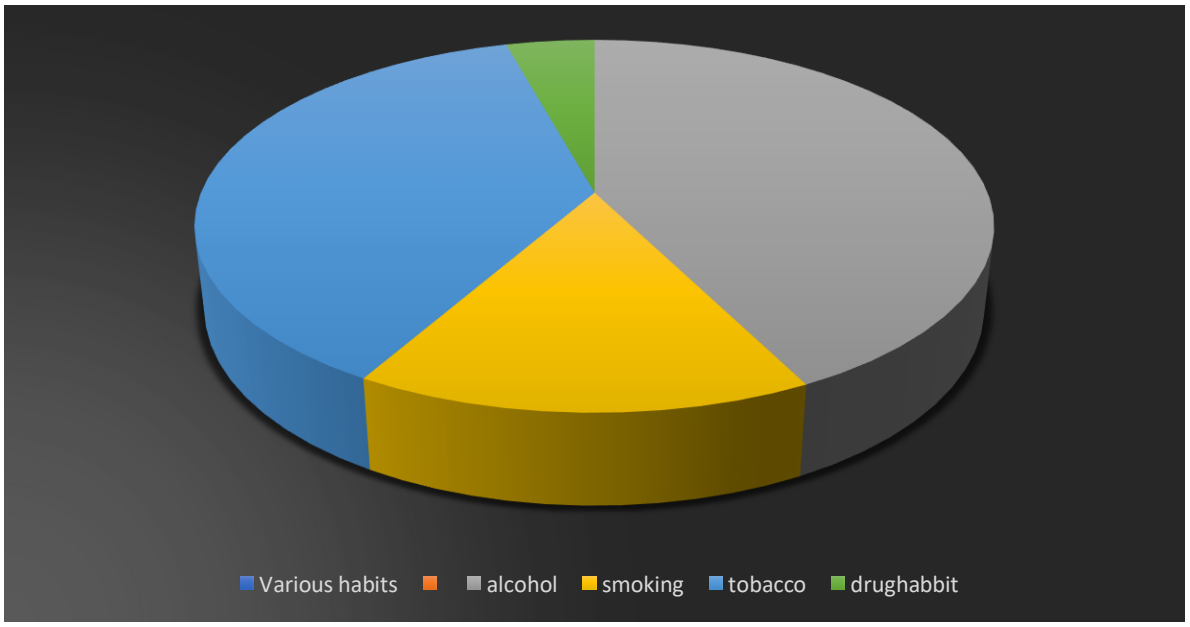


Figure 6 shows majority of study participants were involved in alcoholism(71%)160 followed by tobacco 141(63%)

TABLE 3: PHYSICAL ACTIVITY

AGE	PHYSICAL ACTIVITY		WALKING		RUNNING		EXERCISE		YOGA		SPORTS		OTHERS	
	YES	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
35-40	30	8	7	31	21	17	6	32	22	16	8	30	16	22
41-45	36	2	14	24	7	31	18	20	29	9	24	14	16	22
46-50	34	17	18	33	13	38	13	38	10	41	30	21	16	35
51-55	24	30	20	34	18	36	15	39	9	45	19	35	10	44
56-60	25	19	10	34	9	35	21	23	19	25	17	27	15	29
TOTAL (%)	149(66%)	76(34%)	69(31%)	156(69%)	68(30%)	157(70%)	73(32%)	152(68%)	89(40%)	136(60%)	98(44%)	127(56%)	73(32%)	152(68%)

Table 3 shows distribution study population doing physical activity. 66%(149) were involved in physical activity and 34% were not involved in any physical activity

Figure 7: Distribution of study population involved in various physical activity

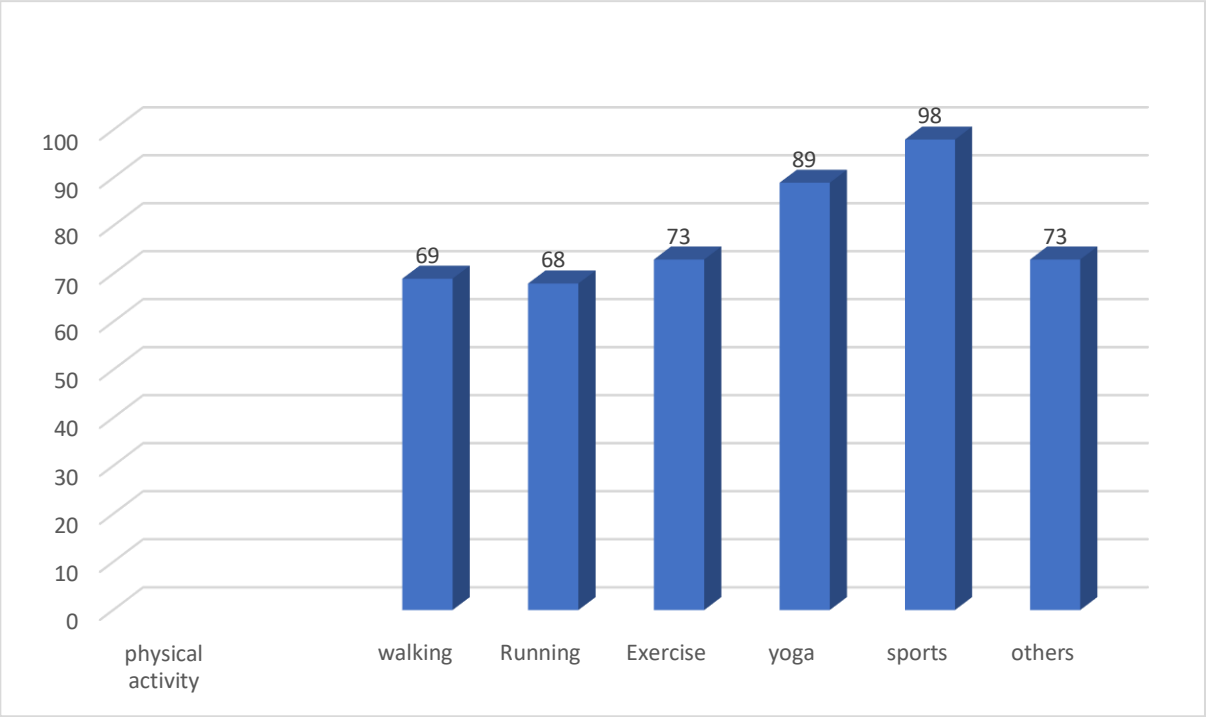


Figure 7 shows that most of the study population were involved in sports 98(44%) followed 5by yoga 89(40%). Participants involved in running and walking are 68 (30%) and 69(31%) respectively

Table 4: Family History of study participants

AGE	HYPERTENSION		DIABETES	
	YES	NO	YES	NO
35-40	11	27	12	26
41-45	18	20	23	15
46-50	17	34	28	23
51-55	26	28	21	33
56-60	26	18	28	16
TOTAL (%)	98(46%)	127(56%)	112(50%)	113(50%)

Table 4 shows the study participants having family history of diabetes and hypertension. 46%(98) of study particiapnts have hypertension and 112(50%) have diabetes in their family history

Table 5: Systemic Examination of study participants

AGE	RS		CVS		GIT		GENITOURINARY		CNS	
	N	A	N	A	N	A	N	A	N	A
35-40	31	7	32	6	32	6	31	7	27	11
41-45	30	8	34	4	30	8	27	11	34	4
46-50	45	6	42	9	47	4	43	10	40	11
51-55	46	8	44	10	48	6	45	9	46	8
56-60	34	10	40	4	35	9	33	11	37	7
TOTAL (%)	186(83%)	39(17%)	192(85%)	33(15%)	192(85%)	33(15%)	179(80%)	48(20%)	184(82%)	41(18%)

Table 5 shows study participants systemic examination. 39(17%) of study participants had abnormal Respiratory system and 33(15%) of study participants had

abnormal Cardiovascular system. 33(15%) of study participants had abnormal gastrointestinal tract and 20% had abnormal genitourinart tract and 18% had abnormal central nervous system

Table 6: General Examination of study participants

AGE	HEIGHT				WEIGHT			
	150-160		**161-170**	**>171**	**45-55**		**56-65**	**>66**
35-40	25	9		4	2		9	27
41-45	29	7		2	11		4	23
46-50	16	22		13	2		4	45
51-55	18	21		15	26		7	21
56-60	29	13		2	2		16	26
TOTAL (%)	117(52%)		72(32%)	36(16%)	43(19%)		40(18%)	142(63%)

Table 6 shows 52%(117) participants are having height in between 150-160cm follows by 32%(72) in between 161-170cm and remaining 16%(36) are having height greater than 171cm. Also 63%(142) was having weight more than 66 , 18%(40) was having weight in between 56-65 and 19%(43) was having weight in between 45-55

Table 7: BMI of study participants (First Visit)

AGE	**BMI**		
	16-20	**21-25**	**26-30**
35-40	22	14	2
41-45	8	29	1
46-50	19	27	5
51-55	30	18	6
56-60	**18**	**25**	**1**
TOTAL	**97(43%)**	**113(50%)**	**15(7%)**

Table 7 shows only 15(7%) of study participants having BMI more than 26-30.

Table8; BMI of study participants second visit

AGE	**BMI**		
	16-20	**21-25**	**26-30**
35-40	20	16	2
41-45	7	29	2
46-50	19	26	6
51-55	30	19	7
56-60	**18**	**24**	**2**
TOTAL	**94(41%)**	**114(50%)**	**19(9%)**

Table 8 shows 2% (4)increase of study participants BMI from 21-25 to 26-30 in the second visit

Table 9 Diseases present at the time of first visit

	Diabetes		**Hypertension**		**TB**		**Asthma**		**Others**	
	YES	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
35-40	18	20	24	14	26	12	22	16	10	28
41-45	24	14	24	14	12	26	16	22	6	32
46-50	27	24	27	24	12	39	30	21	29	22
51-55	34	20	44	10	25	29	9	45	33	21
56-60	**14**	**30**	**22**	**22**	**21**	**23**	**4**	**40**	**20**	**24**
TOTAL	**117(52%)**	**108(48%)**	**141(63%)**	**84(37%)**	**96(43%)**	**129(57%)**	**81(36%)**	**144(64%)**	**98(46%)**	**127(56%)**

Table 9 shows 117(52%) of study participants are having diabetes , 141(63%) of them having hypertension, 96(43%) of participants are having TB. 81(36%) of particiapnts are having asthma and 98(46%) of participants having other diseases.

Table 10: Disease Present at the time of second visit

	Diabetes		**Hypertension**		**TB**		**Asthma**		**Others**	
	YES	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
35-40	18	20	24	14	26	12	22	16	10	28
41-45	24	14	24	14	12	26	16	22	6	32
46-50	27	24	27	24	12	39	30	21	29	32
51-55	34	20	44	10	25	49	9	45	33	21
56-60	**14**	**30**	**22**	**22**	**21**	**23**	**4**	**40**	**20**	**24**
TOTAL	**120(53%)**	**105(49%)**	**147(65%)**	**78(35%)**	**96(43%)**	**129(57%)**	**81(36%)**	**144(64%)**	**98(46%)**	**127(56%)**

Table 10 shows that 3(1%) of developed diabetes in this six months period and 6(2%) of study participants developed hypertention in second visit. Asthma TB and other diseases remained same in this six months period.

Table 11: Pulmonary function test parameters of study participants(First visit)

AGE							
	FEVI/FVC% RATIO			**PEFR-IN-L-MIN**		**FEF 25-75%**	
	<70%	**70-80%**	**>80%**	**Normal**	**low**	**Normal**	**Low**
35-40	3	7	28	29	9	34	4
41-45	4	5	29	25	13	32	6
46-50	4	2	46	26	25	46	5
51-55	3	2	49	30	24	49	5
56-60	**9**	**4**	**31**	**22**	**22**	**36**	**8**
TOTAL	**23(10%)**	**20(9%)**	**182(81%)**	**132(58%)**	**93(42%)**	**197(88%)**	**28(12%)**

Table 11 shows that 182(81%)of working population are having normal FEV1/FVC% Ratio. 20(9%) of study population are having moderate restriction and 23(10%) of study participants are having severe restriction. 132(58%) of study participants had normal peak expiratory flow rate and 93(42%) of study participants have low PEFR suggestive of lung diseases(Asthma, COPD). 197(88%) of study participants had normal FEF and 28(12%) of study participants had low FEF suggestive of COPD even in people with normal lung function.

Table 12: Pulmonary function test parameters of study participants(second visit)

AGE	PFT PARAMETERS						
	FEVI/FVC% RATIO			**PEFR-IN-L-MIN**		**FEF 25-75%**	
	<70%	**70-80%**	**>80%**	**Normal**	**low**	**Normal**	**Low**
35-40	5	5	28	29	9	34	4
41-45	5	4	29	25	13	32	6
46-50	4	2	46	26	25	45	6
51-55	3	2	49	30	24	47	7
56-60	**11**	**2**	**31**	**16**	**26**	**35**	**9**
TOTAL	**28(12%)**	**15(7%)**	**182(81%)**	**128(57%)**	**97(43%)**	**197(88%)**	**31(13%)**

Table 12 shows 182(81%) had normal FEV1/FVC% ratio and 43(19%) had restrictive lung disease which was the same during first visit but (5)2% of study participants developed severe restriction from mild restriction in six months study period. PEFR and FEF values of second visit had very minor changes. Participants having low PEFR increased from 93(42%) to 97(43%) in six months study period. Participants having low FEF increased from 28(12%) to 31(13%). This table shows participants developed only minor changes in the six months period.

TABLE 13 Association between lung parameters from first visit to second visit

		MEAN	SD	P value
FVC	FIRST VISIT	2.861	0.211	0.596
	SECOND VISIT	2.853	0.206	
FEV1	FIRST VISIT	2.437	0.166	0.690
	SECOND VISIT	2.433	0.16	
FEV1/FVC% RATIO	FIRST VISIT	79.117	3.87	0.815
	SECOND VISIT	79.099	3.7	
PEFR IN L/MIN	FIRST VISIT	5.984	0.734	0.621
	SECOND VISIT	5.89	0.71	
FEF	FIRST VISIT	2.961	0.23	0.461
	SECOND VISIT	5.537	27.665	

Wilcoxon rank test applied

Table 13 shows lung parameters association between first visit and second visit.

P value of lung parameters between first visit and second visit shows no significance. It shows there is no significant changes in the lung function parameters between six months time period

DISCUSSION

The present study was undertaken on sugarcane factory workers of North Karnataka who were exposed to sugarcane dust applying necessary inclusion and exclusion criteria as mentioned earlier. The subjects of study group (sugarcane factoryworkers with minimum of 5years exposure) were screened with proper history. They were subjected to detailed clinical examination.

Anthropometric Parameters

No significant changes were observed in Anthropometric parameters among participants compared to that of second visit

Physiological Parameters

No significant changes were observed in Physiological parameters amongstudy participants compared to that of second visit

Respiratory Parameters:

RR:

No significant changes were observed in respiratory rate among participants during first and second visit.

FVC

There is a significant decrease in the forced vital capacity in the first visit among

workers who are directly exposed to bagasse indicating obstructive lung disease.

Reduced FVC was showed in the study done by S N. Patil et al where he showed

workers who were directly exposed to sugarcane had reduced FVC [44]

study done by sunita bhist et al also showed workers in sugarcane industry are having

reduced FVC[45]

FEV1:

Workers exposed to sugar dust in the sugar cube manufacture workstation had significantly lower FEV1 than the non-exposed ones, according to a study published in the British Journal of Sports Medicine[46]

Goyal R.C. et al[47] also observed a decrease in FEV1 in workers actively involved in various plant operations of sugar factory.

A possible mechanism could be mobilization of Neutrophils into the airways and the subsequent release of tissue irritating substances either directly from Neutrophils via Platelets or by secretion of Prostaglandins from macrophages[48]

.

FEV1%:

We did not find any significant reduction of FEV_1% in study group as compared to that of control group.

Insignificant change in FEV_1% among sugarcane factory workers exposed to sugarcane dust may be due to the fact that FEV_1% is more sensitive indicator of airway obstruction than FVC or FEV_1 alone in the later part of chronic obstructive lung diseases. Perhaps, our results of FEV_1% among sugarcane factory workers exposed to sugarcane dust indicate the early part of small airway diseases[49]

PEFR:

The remarkable change was decrease in the values of PEFR in study group as compared to control group.

PEFR is one of the important and simple respiratory function tests. It is frequently used for the recognition of asthma, assessment of severity of airway obstruction in bronchial asthma and other obstructive airway diseases, in monitoring the response to the treatment of patients with airway obstruction as well as in the early diagnosis of occupational lung diseases [50.]

Inflammatory changes in the respiratory tract might happen due to the reduction of PEFR. This might lead to increased airway resistance and disturb normal lung function due to increased airway resistance.

As PEFR is more effort dependent and an index of expiratory airway resistance, it reflects the caliber of the bronchi and large bronchioles. Hence, the reduction in PEFR may be due to obstructive lesion.

A highly significant decrease in PEFR observed in our study. Is in agreement with observations made by Patil S.N, Fatusi and Erhabor (1996), Okwari et al (2005) and Ugheoke et al (2006)[51,52.]

Our results are similar to the findings of Mohammad Shadab et al[63] where a decrease in PEFR, decrease in FEV_1 with normal FVC were observed. Results of our study clearly indicate an obstructive pattern of impaired lung functions possibly at smaller airways among the sugarcane factory workers exposed to sugarcane dust working for more than five years.

.A study conducted in the year 2013 shows a significant reduction in percent predicted values and mean values of PEFR between sweepers and their matched controls. Pulmonary function tests after sweeping showed a significant decrease. On comparing the pulmonary functions of sweepers before and after sweeping, it was concluded that inhalation of dust acutely affected lung functions

In a study conducted in the year 2011, it was noticed that there was a significant reduction in the mean values of PEFR in demolition workers as compared with their matched controls. An impairment in lung function parameters was in proportion to the duration of exposure was observed in study group.

According to a study in 2007, a significant gradual reduction of lung volumes and PEFR was observed as duration of exposure was increased in manufacturing workers. Among office workers, working experience did not significantly alter pulmonary functions and PEFR.

Dust particle:

Non skilled sugarcane factory workers were exposed to dust. Hence, dust particle size was evaluated using optical microscope. On an average, sizes of 50 dust particles were measured (Average size: 0.1mm, Thickness: 0.3-0.1mm and Length: 1- 10mm

Dusts are finely divided solid particles with size ranging from 0.1 to 150 \r microns. They are produced in number of industries like- mines, foundry, quarry, pottery, sugarcane, textile, wood or stone working. Dust particles larger than 10 microns settle down from air rapidly, while the smaller ones remain suspended indefinitely. Particles smaller than 5microns are directly inhaled into the lungs are retained there. This fraction of the dust is called 'respirable dust' and is mainly responsible for pneumoconiosis.

According to Harrison[53] (2005), occupational asthma is a significant health problem. The agents responsible are classified into:

1) High molecular weight compounds: They induce asthma through the immunological mechanisms.

For example:

a) Stone and vegetable dust.

b) Pharmaceutical agents [Ex: Antibiotic]

c) Biological enzymes [Ex: Laundry detergents].

d) Animal and insect dusts [Ex: Sera and secretions].

2) Plastic and western red cedar: They serve as haptens or release bronco constrictorsubstance. The particles are classified two groups:

A. More than 10-15 micrometers: They do not penetrate beyond the upper air waysdue to setting velocities in the air [Ex-Pollens, stone and blown dusts].

B. Less than 10 micrometers: They are subdivided into three groups:

a. 2.5 to 10 micrometers: They are coarse. Ex: Silica, Aluminum and Iron .Theydeposit in tracheo bronchial tree.

b. 0.1 to 2.5 micrometers : They are fine mode fraction or accumulation mode. Theyare carried to lower air ways.

c. Less than 0.1 micrometers: They are ultra fine fraction. They tend to remain in air stream and deposit in lungs only on a random basis as they come in contact with alveolar walls.

In addition to the size of the particles, other factors that play a role in nature of diseases are as follows:

1 .Solubility of gases

2. Actual chemical composition

3. Mechanical property

4. Immuno density

5. Infectivity.

SUMMARY

- Age distribution of the study population shows age group of 51-55yrs (24%) is more in the working population, followed by the age group 46-50yrs(22.5%)

- Sociodemographic details show that most of the working population is from the middle class 76(33.7%), followed by the lower middle class 49(21.3%).

- Education level of the study population shows that most of the study participants had completed the primary level of education 77(34.2%), followed by the secondary level 60(26.6%)

- Type of family of study population shows that most of the study participants are from Nuclear families 121(52%) followed by joint families 80(40%)

- Distribution of study participants according to their marital status shows that most of the study participants, 208(92.4%), are married

- Distribution of participants involved in various habits shows that 160(71%) of the study population were involved in alcohol, followed by 141(63%) in tobacco. Age groups between 51-55yrs are involved more in alcohol smoking and tobacco

- Distribution study population doing physical activity shows that 66%(149) were involved in physical activity, and 34% were not involved in any physical activity

- Family history of study participants shows that 46%(98) of study participants have hypertension and 112(50%) have diabetes in their family history

- Systemic examination of study participants shows that 39(17%) of study participants had abnormal Respiratory system and 33(15%) of study participants had abnormal Cardiovascular system. 33(15%) of study participants had abnormal gastrointestinal tract, 20% had abnormal genitourinary tract, and 18% had abnormal central nervous system

- General examination of study participants showed that shows 52%(117) of participants have a height between 150-160cm, followed by 32%(72) between 161-170cm, and the remaining 16%(36) have a height greater than 171cm. Also 63%(142) was having weight more than 66 , 18%(40) was having weight in between 56-65 and 19%(43) was having weight in between 45-55

- BMI of study participants showed only 15(7%) of study participants had BMI more than 26-30 and, during the second visit, showed 2% (4) increase in study participants' BMI from 21-25 to 26-30 in the second visit

- Diseases present at the time of the first visit show that 117(52%) of study participants have diabetes, 141(63%) of them have hypertension, and 96(43%) of participants have TB. 81(36%) of the participants had asthma, and 98(46%) of the participants had other diseases during the second visit it shows 117(52%) of the study participants have diabetes, 141(63%) of them had hypertension, 96(43%) of participants are having TB. 81(36%) of participants are having asthma and 98(46%) of participants having other diseases

- Pulmonary function parameters of study participants during first visit shows that show that 182(81%)of the working population have normal FEV1/FVC% Ratio. 20(9%) of study population are having moderate restriction and 23(10%) of study participants are having severe restriction. 132(58%) of study participants had normal peak expiratory flow rate and 93(42%) of study participants have low PEFR suggestive of lung diseases (Asthma, COPD). 197(88%) of study participants had normal FEF, and 28(12%) of study participants had low FEF suggestive of COPD, even in people with normal lung function.

- Pulmonary function parameters of study participants during the second visit show 182(81%) had normal FEV1/FVC% ratio, and 43(19%) had restrictive lung disease, which was the same during the first visit but (5)2% of study participants developed severe restriction from mild restriction in six months

study period. PEFR and FEF values of the second visit had very minor changes. Participants having low PEFR increased from 93(42%) to 97(43%) in six months study period. Participants having low FEF increased from 28(12%) to 31(13%). This table shows participants developed only minor changes in the six months period.

- Association between first visit and second visit shows no significance. P value of lung parameters shows no significance seen between 6months time period between lung parameters

CONCLUSION

The decline in FEV1 and PEFR in the present study is suggestive of obstructive changes in lungs. Decrease in these parameters were in linear relation to duration of exposure

The study demonstrated significant pulmonary dysfunction in the sugar factory workers, thereby suggesting that occupational exposure to Bagasse led to pulmonary impairment. Longer the duration of occupational exposure to the organic dust (Bagasse) more is the pulmonary impairment in sugar factory workers.

Based on the present study, we conclude that airborne particulate materials like Bagasse, asbestos, lead, silica dust, concrete, cement, stone, sand and other dusts adversely affect the pulmonary function parameters such as FVC, FEV1, FEV1/FVC%, PEFR and FEF25-75% and cause an obstructive pattern of lung diseases [56.] Values of PEFR were significantly reduced as compared to that of control group. We attribute this reduction in lung function test to respiratory muscle weakness.

Hence, we propose repeated recording of simple, non invasive and dynamic lung function test like PEFR in subjects who are exposed to dust may help to assess the prognosis in clinical practice.

Breathing exercises may help in strengthening the respiratory muscles and will improve the lung functions.

RECOMMENDATION

1. The workers should wear masks during processing & crushing of sugarcane.
2. Suppression of dust by technical control measures such as pre wetting & watersprinkling.
3. Pre employment medical examination & yearly medical checkup of workers.
4. Pulmonary function tests & X –ray chest should be done once in a year afterone year of exposure. Mobile x ray in the industry is suggested.
5. Sputum examinations should be done from time to time to make certain aboutother Lung infection

REFERENCES

1. Singh K, Pandita V, Patthi B, Singla A, Jain S, Kundu H, et al. Is Oral Health of the Sugar Mill Workers Being Compromised? J Clin Diagn Res. 2015;9:ZC07-10.

2. Biswas G, Bhattacharya A, Bhattacharya R. A review on the occupational health of sugar cane workers. International Journal of Biomedical Research. 2016;7:568–70.

3. Rossi Rocha FL, Palucci Marziale MH, Cruz Robazzi ML do C. Poverty as a predisposing factor of illness tendencies in sugar cane workers. Rev Lat Am Enfermagem. 2007;15 Spec No:736–41.

4. Walker-Bone K, Palmer KT. Musculoskeletal disorders in farmers and farm workers. Occup Med (Lond). 2002;52:441–50.

5. akrad Z, Momen-Beitollahi J, Khajetorab A. DMFT (Decayed, Missing, Filled, Teeth) Oral Health Index in Sweets and Cable Industry Workers. Iran J Public Health. 2006;35.

6. Koskela RS, Mutanen P, Sorsa JA, Klockars M. Respiratory disease and cardiovascular morbidity. Occup Environ Med. 2005;62:650–5.

7. Biring MS, Lewis MI, Liu JT, Mohsenifar Z. Pulmonary physiologic changes of morbid obesity. Am J Med Sci. 1999;318:293–7.

8. Luce JM. Respiratory complications of obesity. Chest. 1980;78:626–31.

9. Hur T, Cheng KC, Yang GY. Hypersensitivity pneumonitis: bagassosis. Gaoxiong Yi Xue Ke Xue Za Zhi. 1994;10:558–64.

10. Lacey J. Thermoactinomyces sacchari sp. nov., a thermophilic actinomycete causing bagassosis. J Gen Microbiol. 1971;66:327–38.

11. Weill H, Buechner HA, Gonzalez E, Herbert SJ, Aucion E, Ziskind MM. Bagassosis: a study of pulmonary function in 20 cases. Ann Intern Med. 1966;64:737–47.

12. Buechner HA, Aucoin E, Vignes AJ, Weill H. The Resurgence of Bagassosis in Louisiana. Journal of Occupational Medicine. 1964;6:437–42.

13. A Study on Pulmonary Function among Workers of Sugar Factory in Villupuram District- A Cross-Sectional Study. 2020;3.

14. Masthi NRR, R MA, J M, G PS, Dhruva. A cross sectional study on morbidities among sugar cane factory workers in Mandya district, Karnataka, India. rjms [Internet]. 2018 [cited 2022 Nov 4];8. Available from: https://journalgrid.com/view/article/rjms/216

15. Nayakawadi . a study of lung function test ofworkers in sugar industry during work

16 Saravanan C, Suhanya G, Sophia C. A study on pulmonary function among workers of sugar factory in Villupuram district- a cross-sectional study. International Journal of Science & Healthcare Research. 2020; 5(3): 22-24

17 Gourab Biswas et al/ International Journal of Biomedical Research 2016; 7(8): 568-570.

18 .Nene SB,Shete SS. Dynamic lung profile in sugarcane industry workers. International Journal of Basic Medical Science. 2011; 2(5): 118-23.

19. Singh AB, Singh A, Pandit T. Respiratory diseases among agricultural industry workers in India: A cross sectional epidemiological study. Ann Agric Environ Med. 1999; 6, 115–126.

20. Bohadana AB, Massin N, Wild P, Berthiot G. Airflow obstruction in chalkpowder and sugar workers . Int Arch Occup Environ Health. 1996; 68: 243-248.

21. Nikhade N , Sharma P. A study of pulmonary function test in workers of sugar factory, Pravaranagar, Maharashtra. Int J Med Res Health Sci. 2012; 2(1): 52-58.

22. Nayakawadi SA. A study of lung function tests of workers in sugar industry during working period. American J of Sustainable Cities and Society. 2014; 1(3): 345-34

23 Dhule SS, Sunita BN, Gawali SR. Pulmonary function tests in wind instrument players. Int J Sci Res. 2013;2(5):384-6.

24 Saravanan C, Suhanya G, Sophia C. A Study on Pulmonary Function among Workers of Sugar Factory in Villupuram District-A Cross-Sectional Study.2020;22

25 pawar, prajakta & Shinde, Sandeep. (2019). prevalence of impairment in pulmonary function test in sugar distillery industry workers in karad taluka. Asian Journal of Pharmaceutical and Clinical Research. 428-431.

26)E.F Spizer, BG Fernnis. Changes in diffusing Capacity of Lung on function of smoking &exposure to automobile.exhaust.AM Rev Resp Dis 1976:113:96.

27)Kamat S R et al.The health effects of automobile exhaust & total ambient air pollution in Bombay Lung india 1989:7(1):15-22.

28) Rastogi S K, Gupta B N, Hussain Tanveer, Srivastava Seema. Pulmonary function evaluation in traffic policemen exposed to automobile exhaust ind jour occ Health 1991:34(2):67-74

29)Bijlani R L understanding of Medical Physiology Jaypee Publication, 3rd edition p 258—6**1**

30)Guyton & Hall Text book of Medical Physiology, Saunders publishers 11th Ed.2006.37:475-77&42:524-26.

31)Jain A K, Text book of Medical Physiology, Avicahal publishers.3rd Ed 2006; I (6.2)435-40.

32)http://www.surgeryencyclopedia.com/Pa-St/Spirometry-Tests.html)

33) Jain A. K. Manual of practical physiology Arya publication 1st Ed 2003; 151-55.

34) Pal G K. Text book of practical Physiology Orient longmann Publications 1st Ed 2002:p 178.210&221.

35) Choudhry A R. Text book of practical Physiology Paras Publisher 1st Ed 2000.p 200-07.

36) Wanger J pulmonary function test A practical approache Williams & Wiilkins Baltimore 1st Ed 1992

37)Udwadia F E Sunawala J.D Lung function studies in health Indian subject, J Ass of Physcian of Indian 1987.36:7:491-96.

38) Omprakash et al Spirometric norms. A study from Karnataka. Lung India 8th Ed 1990; 123-27.

39)Mahajan K.K .A mahajan N Mishra in pulmonary functions in health females of Haryana ind j chest Dis All Sci 39:1997.p.163-71.

40)Omprakash et al Spirometric norms. A study from Karnataka. Lung India 8th Ed 1990; 123-27.

41)Mahajan K.K .A mahajan N Mishra in pulmonary functions in health females of Haryana ind j chest Dis All Sci 39:1997.p.163-71.

42)Mahajan B K, Methods in Biostatistics, Jaypee Publication 5th Ed 1991:p114.

43)Steele RGD & Torne JH. Principles &Procedure of statistics with Special reference to the biological Science Mc Graw Hill Book co ink 4th edition 1980.p.183-93.

45) Patil, Shrirang & Somade, P.M. & Joshi, Anand. (2008). Pulmonary function tests in sugar factory workers of Western Maharashtra (India). Journal of basic and clinical physiology and pharmacology. 19. 159-66. 10.1515/JBCPP.2008.19.2.159.

46) Nene, S.B., & Shete, S.S. (2011). dynamic lung profile in sugarcane industry workers.

47) Bohadana AB and Massin N. Airflow obstruction in sugar refinery workers. International Arch. of Occup. And Environ. Health. 1996;68(4): 131-34

48)Goyal RC, Adiya AN, Jejurikar ND and Chavan UA. Study of health profile of industrial workers at Pravaranagar comlex. Ind. Jr. of Occup. Health. 1994; 36 (1): 11-13

49) Gokani VN, Rao NM, Ghosh SK. Panchal GM, Bhatt HV, Parikh JR & Kashyap SK. Bronchoconstriction in cotton dust exposed workers. Role of bacterial endotoxins. Ind. Jr. of Industrial Med.1993;39:79-84.

50) Pal GK. Textbook of practical Physiology. University press, Hyderabad. 2010;3:153.

51) Ihekwaba AE, Nwafor A, Adienbo OM. Lung function indices in primary and secondary sawmill workers in Port Harcourt, Nigeria. African J of Applied Zoology & Environmental Biology. 2009; (11):101 – 105

52) Okwari OO, Antai AB, Owu DU, Peters EJ, Osim EE. Lung function status of workers exposed to wood dust in timber markets in Calabar, Nigeria. Afr. J. Med. Med. Sc. 2005; 34: 141 – 145.

53) Ugheoke AJ, Ebomoyi MI, Iyawe VI. Influence of smoking on respiratory symptoms and lung function indices in sawmill workers in Benin City, Nigeria. Nig. J. of Phys. Sciences.2006; 21: 49-54.

54) Harrison's principles of Internal Medicine Mc Graw Hill publishers 16thEd; 2.238.1521&1524, 2005.

55) Park K. In: Park's Textbook of preventive and social Medicine. 26th ed.

56) Jabalpur: M/s Banarsidas Bhanot; 2007. Occupational health; pp. 608–10.

ANNEXURE –I

QUESTIONNAIRE

Performa for Study of Health Status of sugar cane factory workers in sugar cane factory

BASELINE STUDY (FIRST VISIT)

I) Personal Information

Socio-demographic Profile:

i) Name Date

ii) Age

iii) Gender

iv) Religion

v) Married: Yes/No

vi) Address

vii) Family: Single/Nuclear/Joint/Others

No. of members in the family

viii) Socio-economic status

1) Income:

Individual Income Rs._____/ Month (Pensioner/ None / Earning / Dependent)

Total income of the family Rs._____/ Month

Per Capita Income Rs._____/ Month

2) Occupation:

3) Education:

Illiterate / Primary / Secondary / College / Graduations / PG

4) Socio-economic class : Modified B.G. Prasad Classification

II) Personal History:

1) Present history of habits:

Yes/No

If Yes,

Habits	Type	Amount	Frequency	Duration	If Stopped, Since when
a) Alcohol	Arrack, Beer, Wine, Whisky, Rum				
b) Smoking	Cigarettes, Beedis,Chilum(pipes)				
c) Tobacco Chewing	Paan, Gutka, Betel nut				
d) Any other (drugs etc.)					

2) Past History of habits:

Yes/No

If yes,

Habits	Type	Amount	Frequency	Duration	If Stopped, Since when
a) Alcohol	Arrack, Beer, Wine, Whisky, Rum				
b) Smoking	Cigarettes, Beedis, Chilum(pipes)				
c) Tobacco Chewing	Paan, Gutka, Betel nut				
d) Any other (drugs etc.)					

3) Taking any long term medications:

Yes/No

If yes what?

4) Physical activity:yes or no

If Yes,

Type	Duration of Activity/Day	No. of Days/Week

Walking		
Running		
Exercise		
Yoga		
Sports		
Others		

III) Family History:

1) History of Hypertension in the Family : Yes/No

Relative	Y/N	Duration
Father		
Mother		
Others		

2) Any history of Diabetes present in the Family : Yes/No

Relative	Y/N	Duration
Father		
Mother		
Others		

i) Is any other family member smoking at home? Yes/No

IV) Dietary History:

1) Food habits:

Vegetarian/Non-Vegetarian

2) Amount of salt intake/day in grams

3) Extra Salt intake

i) Do you regularly consume pickle/papad/cheese/sauce or any item containing high salt content? Yes/No

4) Per day consumption of

i) Oil:

Type : Refined/ Non refined

ii) Ghee

5) Extra fat intake

i) Do you regularly add visible fat like ghee/butter to chappati and/or other food? Yes/No

Systemic Examination

1. RS (Involves inspection, palpation , percussion and auscultation)
2. CVS
3. GIT
4. Genitourinary
5. CNS

II. Occupational history:-

1. Present occupation
2. Type of work being done(engineering dept,manufacturing dept,godown dept,bagass dept)

(a) In the present occupation (duration)

(b) In the previous occupation (duration)

3. Years of Service: ……
4. Any illness before joining present occupation
5. Any illness after joining occupation

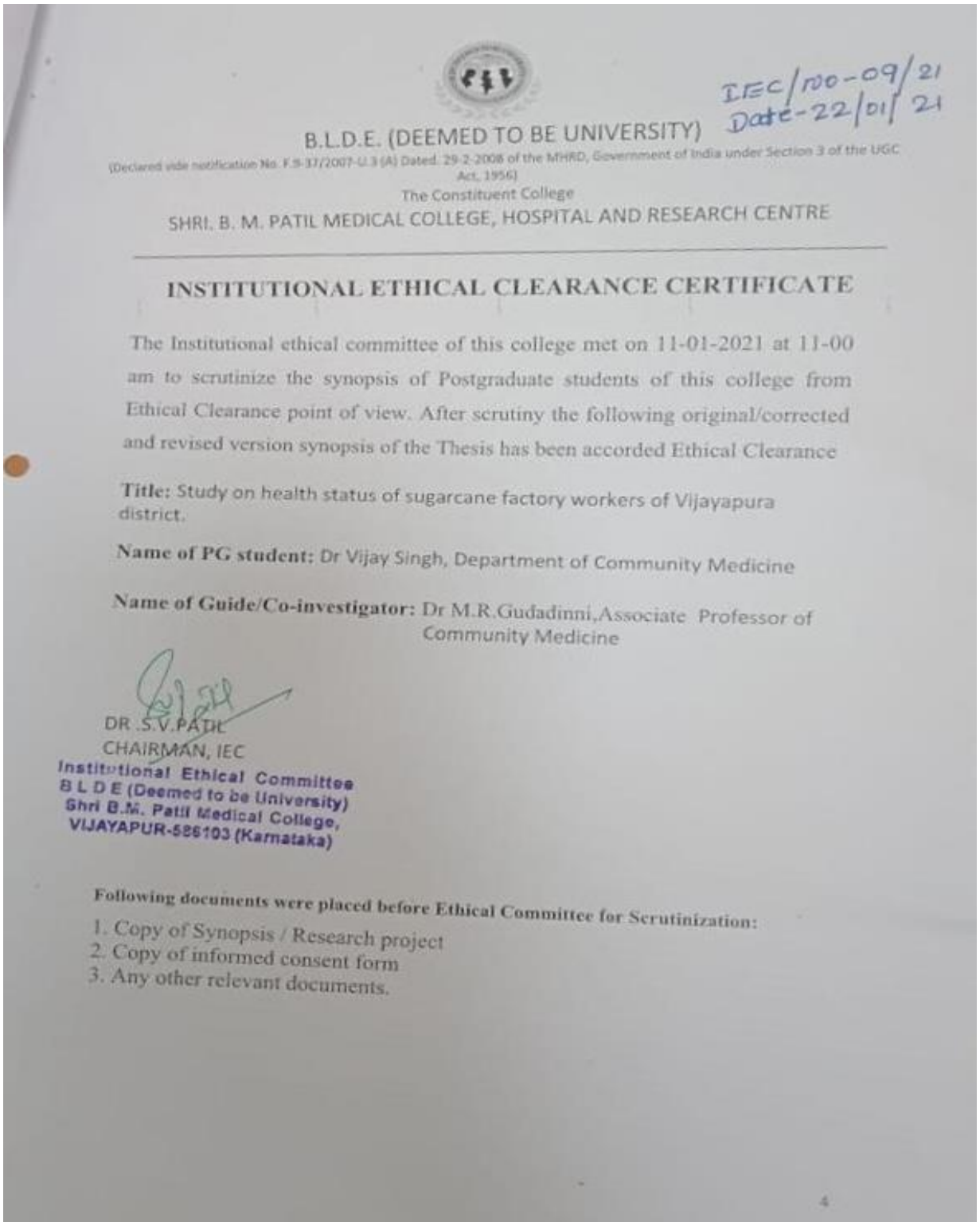
GENERAL EXAMINATION		
VITALS	**FIRST VISIT(MAY2021)**	**SECOND VISIT(MAY 2022)**
HEIGHT(CMS)		
WEIGHT(KG)		
BP		
BMI		
PR-/MIN		
RR- /MIN		

DISEASES PRESENT DURING FIRST AND SECOND VISIT		
DISEASES(PRESENT/ABS)	**FIRST VISIT(MAY2021)**	**SECOND VISIT(MAY 2022)**
DIABETUS		
HYPERTENSION		
TB		
ASTHMA		
OTHERS		

PFT PARAMETERS DURING FIRST AND SECOND VISIT		
PFT PARAMETERS	**FIRST VISIT(MAY2021)**	**SECOND VISIT(MAY 2022)**
FVC		
FEV1		
FEV1/FVC% RATIO		
PEFR IN L/MIN		
FEF		

ANNEXURE –II

ETHICAL CLEARANCE CERTIFICATE



IEC/100-09/21
Date-22/01/21

B.L.D.E. (DEEMED TO BE UNIVERSITY)

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated: 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: Study on health status of sugarcane factory workers of Vijayapura district.

Name of PG student: Dr Vijay Singh, Department of Community Medicine

Name of Guide/Co-investigator: Dr M.R.Gudadinni,Associate Professor of Community Medicine

DR .S.V.PATIL
CHAIRMAN, IEC
Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

4

ANNEXURE – III

B.L.D.E. (DEEMED TO BE UNIVERSITY) SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER, VIJAYAPURA-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

TITLE OF TOPIC : Study on health status of sugar cane factory workers in Vijayapura district - A Longitudinal study

GUIDE : Dr. M.R.Gudadinni

PG STUDENT : Dr. Vijay singh

PURPOSE OF RESEARCH

I have been informed this study will help to assess the Socio demographic and morbidity patterns in workers of sugarcane factory and enable them to seek appropriate medical care in Community Medicine Department of Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura. The study is intended to interview workers of sugarcane factory residing in Vijayapura.

PROCEDURE

I understand that this is a field based programme. In this procedure I will be asked a series of questions by the researcher regarding the topic.

RISK AND DISCOMFORTS:

I understand that I may experience some difficulty during this procedure. This is mainly result of conditions. The procedures of study are not expected to exaggerate these feelings which are associated with the usual course of study.

BENEFITS:

I understand my participation in the study as one of the study subjects will help the researcher to assess Socio demographic and morbidity patterns of sugar cane factory workers

CONFIDENTIALITY:

Your answers are kept secret. Your name and contact information will never be identified to anyone outside of the study.

REQUEST FOR MORE INFORMATION:

I understand I may ask more questions about the study at any time to Dr. Vijay singh at the department of community medicine to answer my questions . I understand , I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate, or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that Dr. Vijay singh may terminate my participation in the study at any time after he has explained the reasons for doing so.

(Guide / Principle Investigator) (Date)

(Investigator) (Date)

INFORMED CONSENT FOR PARTICIPATION IN

DISSERTATION/RESEARCH

I, the undersigned,_____, S/O D/O W/O_____, aged ____years, ordinarily resident of_____do hereby state/declare that Dr. Vijay singh of Shri. B. M. Patil Medical College Hospital and Research Centre has examined me thoroughly on_____at_____(place) and it has been explained to me in my own language that I am suffering from _____disease (condition) and this disease/condition mimic following diseases_____. Further Doctor Dr. Vijay singh informed me that he is conducting dissertation/research titled "study on health status of sugarcane factory workers in Vijayapura district- longitudinal study" under the guidance of Dr. M.R.Gudadinni requesting my participation in the study. Apart from routine treatment procedure, follow-up observations will be utilized for the study as reference data. Further Doctor has informed me that my participation in this study help in evaluation of the results of the study which is useful reference to treatment of other similar cases in near future.

The Doctor has also informed me that information given by me, observations made photographs video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on information given by me, I can ask any clarification during the course of treatment / study related to diagnosis, procedure of treatment, result of treatment or prognosis.

At the same time I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time from the study but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned Shri/Smt_____under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Witness: 1.

Date:

Place

ANNEXURE – IV

INFORMED CONSENT FORM FROM HEAD OF THE FACTORY

Title of Topic:. study on health status of sugarcane factory workers of vijayapura district- longitudinal study

Guide: Dr. Gudadinni

PG Student: Dr. Vijay Singh

Purpose of Research: I have been informed that this study will help to assess the General wellbeing and prevalence of Lung diseases among sugarcane factory workers in Vijayapura. The study is intended to interview sugarcane factory workers and assess lung function using spirometer

Procedure: I understand that this is a Factory based study. In this procedure, the workers will be asked a series of questions by the researcher regarding the topic.

Benefits: I understand that my workers participation in the study as one of the study subjects will help the researcher to assess the general wellbeing and prevalence of Lung disease in the Vijayapura district.

Confidentiality: I have been told that my workers Name, contact information, and the answers to the questions are kept secret and will never be identified to anyone outside of the study.

Request For More Information: I understand that I may ask more questions about the study at any time to Dr. Vijay Singh, PG at the department of community medicine to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my workers's continued participation. A copy of this consent form will be given to me for careful reading.

Refusal or Withdrawal of Participation: I understand that my workers's participation is voluntary and that he/ she may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that Dr. Vijay Singh may terminate his/ her participation in the study at any time after she has explained the reasons for doing so.

CONSENT STATEMENT:

I confirm that Dr. Vijay Singh has explained the research's purpose, the study procedure that the students will undergo & benefits that he/she may experience. I have been explained all the above in detail in my language and understand the same. Therefore, I agree to give consent for my workers's participation as a subject in this research project.

Date:

_____

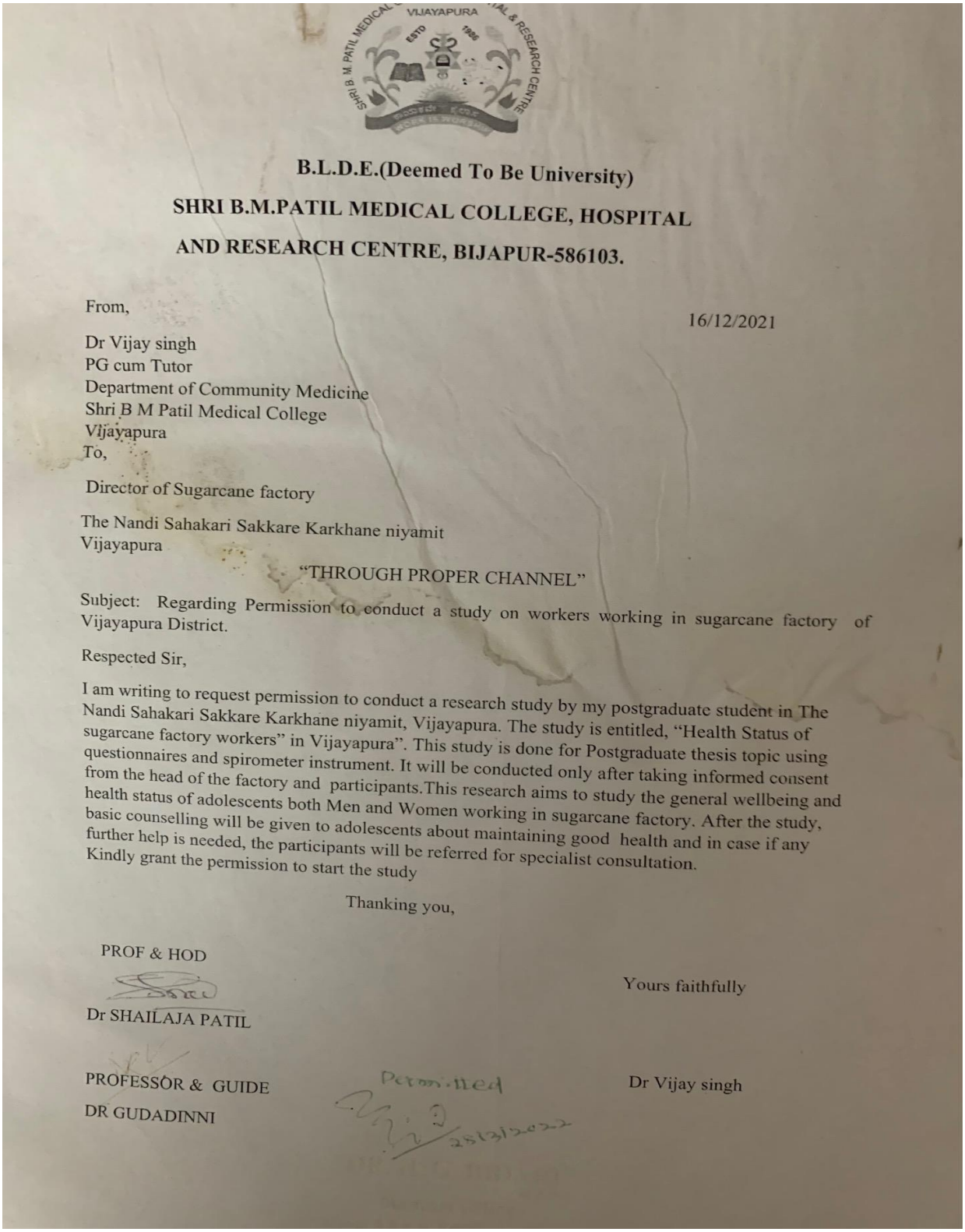
(Name of Head of the Institution)

_____

(Signature of Head of the Institution

ANNEXURE V

Permission letter from head of the factory in our study.



B.L.D.E.(Deemed To Be University)

SHRI B.M.PATIL MEDICAL COLLEGE, HOSPITAL

AND RESEARCH CENTRE, BIJAPUR-586103.

From,

16/12/2021

Dr Vijay singh
PG cum Tutor
Department of Community Medicine
Shri B M Patil Medical College
Vijayapura

To,

Director of Sugarcane factory

The Nandi Sahakari Sakkare Karkhane niyamit
Vijayapura

"THROUGH PROPER CHANNEL"

Subject: Regarding Permission to conduct a study on workers working in sugarcane factory of Vijayapura District.

Respected Sir,

I am writing to request permission to conduct a research study by my postgraduate student in The Nandi Sahakari Sakkare Karkhane niyamit, Vijayapura. The study is entitled, "Health Status of sugarcane factory workers" in Vijayapura". This study is done for Postgraduate thesis topic using questionnaires and spirometer instrument. It will be conducted only after taking informed consent from the head of the factory and participants.This research aims to study the general wellbeing and health status of adolescents both Men and Women working in sugarcane factory. After the study, basic counselling will be given to adolescents about maintaining good health and in case if any further help is needed, the participants will be referred for specialist consultation.
Kindly grant the permission to start the study

Thanking you,

PROF & HOD

Yours faithfully

Dr SHAILAJA PATIL

PROFESSOR & GUIDE

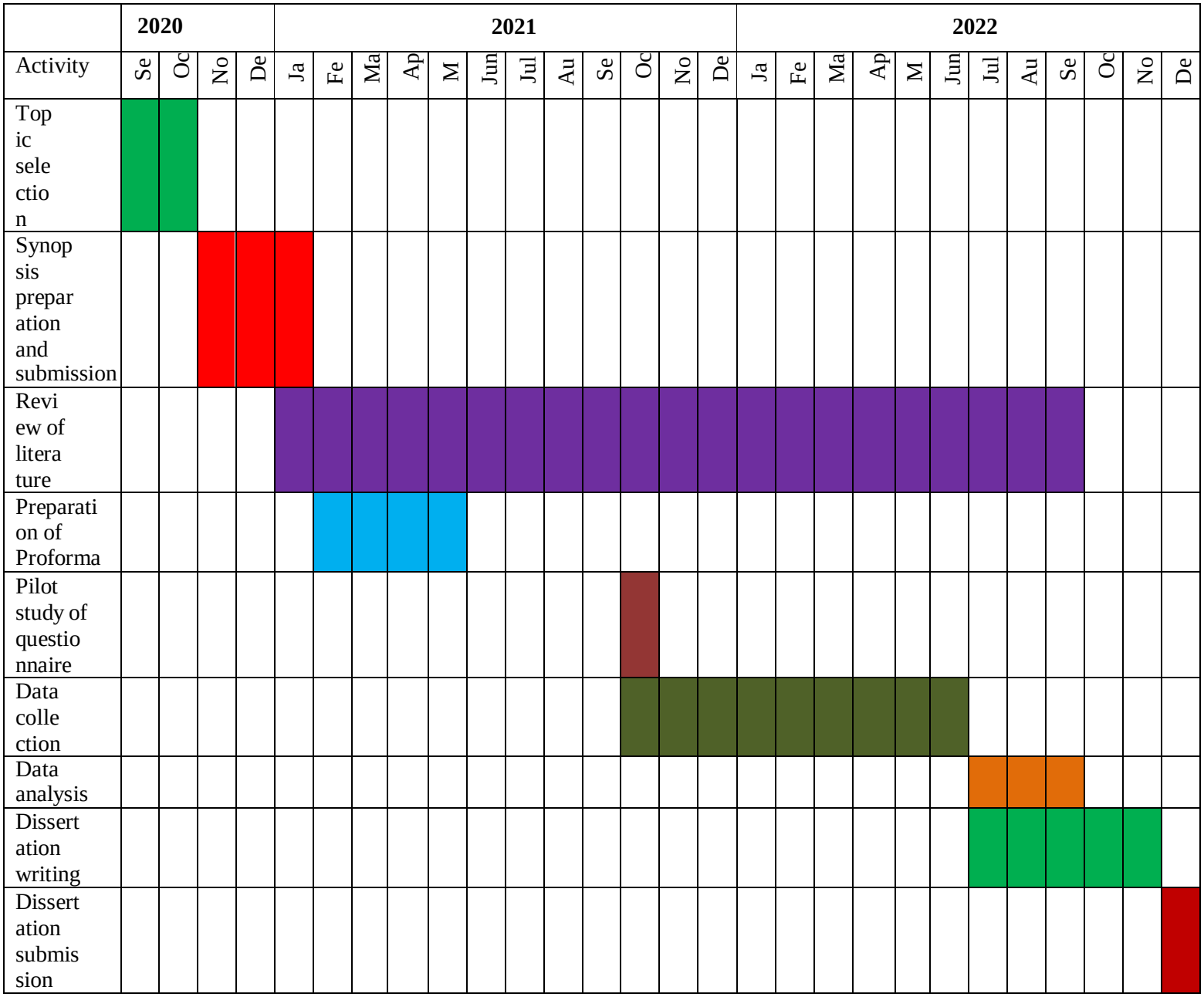
DR GUDADINNI

Permitted

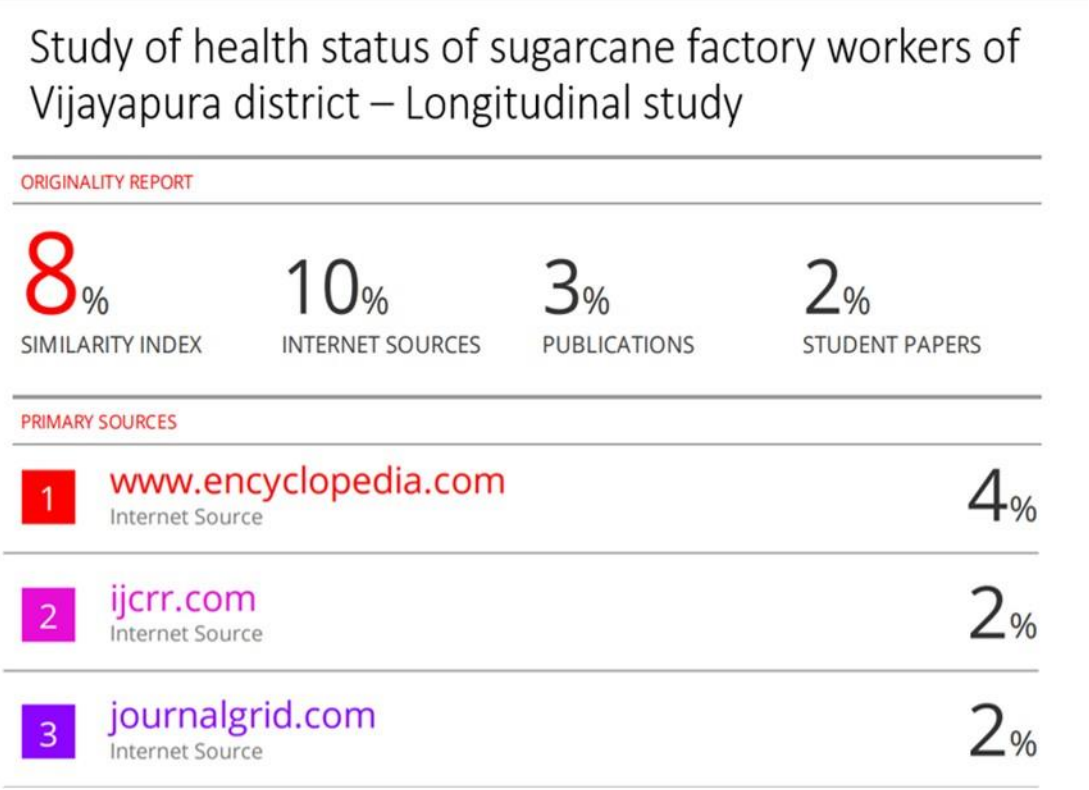
25/12/2021

Dr Vijay singh

ANNEXURE VI: Gantt chart



ANNEXURE VII



Study of health status of sugarcane factory workers of Vijayapura district – Longitudinal study

ORIGINALITY REPORT

8%	10%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.encyclopedia.com Internet Source	4%
2	ijcrr.com Internet Source	2%
3	journalgrid.com Internet Source	2%

ANNEXURE VIII

PHOTOGRAPHS