FLOUR MILL WORKERS OCCUPATIONAL HEALTH IN CHANDRAPUR CITY, CENTRAL INDIA

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Abstracts: **Background:** Flour mill workers are at increased risk of developing respiratory symptoms and reduce lung capacity due to exposure to dust in their working environment. **Objective**: The objective of this study was to access occupational health status of flour mill workers in Chandrapur city. **Method:** For the study 65 flour mill workers from wheat flour and mix flour mills were selected as a subject group and 10 individual were as control group. Structured interview was carried out by questionnaire and lung capacity was measured by breath-o meter and inspection of work site was carried out for ambient temperature, humidity, light intensity and noise level. Respiratory symptoms were significantly higher in flour mill workers than control group and Peak Expiratory Flow Rate (PEFR) values were lower in exposed workers as in proportion with the exposure period. **Result:** The results showed a decrease in PEFR values as the duration of exposure increased and allergic problems were also increased in flour mill workers. **Conclusion:** The study recommends periodic medical examination and compulsory use of personal protective equipment's at the work site.

Key Words: Flour dust, Occupational health, Peak expiratory flow rate, Respiratory symptoms.

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Introduction:

The global burden of diseases related to occupational factors was estimated at 410 million cases per year, with approximately 3-9 million in developing countries per year. An estimated 12 percent of chronic obstructive airway diseases deaths are from occupational exposure to airborne particulates. Occupational diseases are caused by a pathogenic response of patients to their working environment and extended exposure to irritating or toxic substances that may cause acute or chronic respiratory ailments [1]. Occupational health hazards associated with flour mill workers are presented in Table 1.

Flour mill workers spend about 8 hours each day in workplace environment, where they are exposed to variety of dust, pollutants etc. thus they are spending 1/3 of their life in workplace environment. Subjects with workplace exposure to organic dust have high prevalence of respiratory diseases. There is a growing consensus on deleterious effects of organic dust on respiratory symptoms and functions of industrial workers. Industrial dust inhalation over a long period leads to proliferative and fibrotic changes in lungs. Flour dust is widely incriminated to cause such effects. Exposure to flour dust occurs across a range of food industries including grain mills, flour mills and bakeries[2].

The health and safety commission of United Kingdom has established an 8 hour maximum exposure limit of 10 mg/m^3 for flour dust as hazardous substance with respiratory sensitizing property with pre-existing disease and also cause chronic bronchitis [3].

Spice mill and pepper mill is a risk factor among workers who work in this environment. Spices are derived from taxonomically different species of plants that harbour allergic potency and can induce mild local to severe systematic reactions. Inhalation is the main route of exposure among workers in spice mill. Workers in these mills exposed to variety of different respiratory sensitizers and aerosolition of spice dust has been implicated in inhalant-related allergic manifestation of rhino conjunctivitis and allergic asthma. Chilli pepper sensitization being a major determinant of probable obstructive lung diseases and chronic airway inflammation [4].

This investigation was planned with an objective to ascertain occupational health hazards faced by flour mill workers in Chandrapur city, central India.

Study area:

The socio-culture atmosphere of the city is still traditional one. Inhabitants of the city prefer to get different types of flour prepared from flour mill rather than packed flour from market. In Chandrapur city about 350 flour mills exist. As number of flour mills are more and still they are using traditional age old machines in rather compact area this study becomes more significant one to ascertain the occupational health of flour mill workers.

Study population:

Study population was selected from study area comprising of 65 non-smoker flour mill workers in the age group of 25-70 years working in this job for more than 10 years with daily exposure of 8-10 hours and 10 healthy non-exposed subjects in the same age group, who were non-smoker and no history of respiratory disease. It was confirmed that none of the control subject had respiratory tract symptoms such as cold or cough during Breath-o metric testing. Out of these selected subjects, 26 percent were male (17) and 74 percent were female (48).

Material and Methods:

Data pertaining to heath conditions of study population was collected by using structured questionnaire especially developed for this study and peak expiratory flow rate (PEFR) by Breath-o meter (Cipla, India, as per European Union scale) by comparing it with standard chart prepared by Chest Research Foundation (CRF), Pune, India according to age and height of an individual; background environment conditions by inspection of work environment for ambient temperature and humidity (Sling Psychrometer, Dimple, India), light intensity (TES Digital Illuminance meter, TES Electrical Electronic Corporation, Taiwan) and noise level (Sound Level meter, CENTER 325, Taiwan). The sampling was carried out in winter season of 2015-2016.

Result:

From the study it was observed that, out of 65 flour mill selected for the study, 40 (61.53%) flour mills grind only wheat and 25 (38.46%) grind different types of flours i.e. spices, red chillies, turmeric and wheat also. Of the 40 flour mill workers which grind only wheat, 28 (70%) were female and 12 (30%) were male workers. Whereas rest 25 workers from mix flour mill includes 20 (80%) female and 5 (20%) male workers (Tables 2 and 3). This indicates that more number of female workers work in flour mills than male workers.

Years of exposure:

From the results presented in Table 4 it was found that 17 flour mill workers were engaged in this job from 10 to 20 years, 30 from 21 to 25 years and 18 from 26 to 40 years.

Background work environment:

The background environment such as noise, humidity and work environment temperature were higher and light intensity was lower in flour mills as compared with ambient environment (Table 5). These work environment conditions in summer seasons when ambient temperature reaches upto 46 ^{o}C (May month) augment the problem of workers and affect health of exposed workers.

Peak Expiratory Flow Rate:

Tables 6-8 shows decline in PEFR values as compared with expected value with increase in duration of exposure to flour dust among flour mill workers. Figures I-XI depicts PEFR of female and male workers in wheat flour and mix flour mills with exposure period of 10-20 years, 21-25 years and 26-40 years. From the figures it is seen that, observed PEFR values were lower than expected as per standard chart prepared by Chest Research Foundation (CRF), Pune, India. These observations highlight that PEFR capacity of workers gets reduced as they exposed to dust. It is further observed that as exposure period increased to 26-40 years, observed PEFR decreased. Thus, it can be concluded that PEFR is directly proportional to exposure period to flour and spices dust.

Respiratory symptoms:

From subjects selected for the study, 35 workers had respiratory problems, 60 were suffering from cough, 40 from sneezing, 2 from runny nose, 10 facing shortness of breath, 52 had chest tightness and 18 reported problem of sputum in mouth while waking up in morning. Four subjects had reported asthma problem and this problem increased as the duration of exposure increases (Table 9).

Other health issues:

The results show that other health issues were predominant in workers (Table 10) which includes skin itching (15.38%), hearing problem (70.76%),

high blood pressure (23.07%), musculoskeletal problem (100%) and headache (61.53%). About 23 percent workers reported headache during work, out of which 8 percent stated that their headache remains after completion of work also. It was further observed that flour mills workers working in mix flour mills reported problem related with skin burning, severe itching, watery eyes, chest tightness, skin rashes, excessive cough, sneezing and these conditions continue to remain after work also.

Table 1: Occupational health issues in flour mill workers

Particulars	Occupational health issues
Respiratory symptoms	Shortness of breath, wheeze, chest tightness, cough, sputum
Nasal symptoms	Sneezing, runny nose
Allergies	Red eyes, itchiness, hives, asthma attack, eczema

Table 2: Gender distribution in wheat flour mills

Gender	Number (%)
Female	28 (70%)
Male	12 (30%)

Table 3: Gender distribution in mix flour mills

Gender	Number (%)
Female	20 (80%)
Male	5 (20%)

Table 4: Duration of exposure (for both types of flour mills)

Duration of exposure (Years)	Number (%)
10-20	17 (26.15%)
21-25	30 (46.15%)
26-40	18 (27.69%)

Table 5: Background work environment *vs*. ambient environment conditions

Parameters	Background work environment Range (Average)	Ambient environment (Average)
Noise	79.5-92.0 dB (A), (85.02 dB (A))	72.5 dB (A)
Humidity	46-60 %, (52.00 %)	63 %
Temperature	30-40 ^{o}C, (36 ^{o}C)	31 ^{o}C
Light intensity	14.0-19.5 Lux, (16.15 Lux)	125150 Lux

Table 6: PEFR Values according to duration of exposure (Exposure to wheat flour only)

PEFR (L/ min)	Duration of exposure (Years)					
	10-20		21-25		26-40	
	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.
Female	294	250	295	200	256	100
	293	290	242	180	292	100
	289	260	191	150	230	150
	269	250	274	220	310	250
	210	230	242	210	300	150
	257	195	284	250	265	250
	195	250	290	276	272	240
	230	190	295	275	278	270
	309	220	278	240	266	190
	303	300	-	-	-	-
Total	n = 10		n = 9		n = 9	
Male	429	410	325	255	400	100
	430	420	440	400	380	250
	470	390	455	430	437	420
	428	350	390	350	426	200
Total	n = 4		n = 4		n = 4	

Exp. = Expected values, Obs. = Observed values

Table 7: PEFR Values according to duration of exposure (Exposure to mix flour)

PEFR (L/min)	Duration of exposure (Years)					
	10-20		21-25		26-40	
	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.
Female	281	270	295	230	291	220
	274	255	288	250	298	200
	266	260	278	240	272	235
	300	280	286	260	284	240
	293	290	277	230	295	255
	264	200	280	275	280	210
	290	270	285	210	-	-
Total	n = 7		n = 7		n = 6	
Male	420	380	414	375	407	350

	375	330	423	365	-	-
Total	n = 2		n = 2		n = 1	

Exp. = Expected values, Obs. = Observed values

Table 8: PEFR Values control group

PEFR (L/min)	Control group	
	Expected	Observed
Female	296	210
	312	300
	330	275
	295	280
	305	290
Total	n = 5	
Male	449	440
	457	390
	461	460
	443	430
	414	390
Total	n = 5	

Table 9: Respiratory symptoms in flour mill workers

Symptoms	Number (%)
Cough	60 (92.30%)
Sneezing	40 (61.53%)
Runny nose	2 (3.07%)
Shortness of breathe	10 (15.38%)
Chest tightness	52 (80.00%)
Sputum in mouth	18 (27.69%)
Asthma	4 (6.15%)

Table 10: Other health problems

Health problems	Percentage
Skin itching	15.38%
Hearing problem	70.76%
High blood pressure	23.07%
Musculoskeletal problem	100%
Headache	61.53%

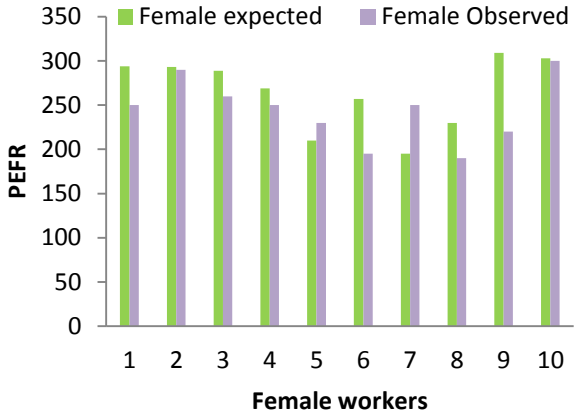

Figure I: PEFR of female workers (Exposed period 10-20 years, Wheat flour)

Figure II: PEFR of male workers (Exposed period 10-20 years, Wheat flour)

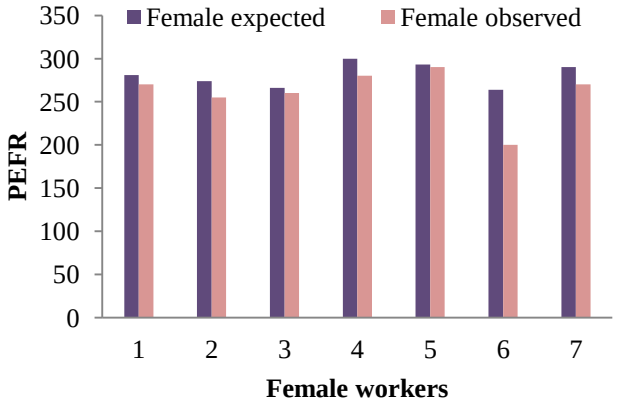

Figure III: PEFR of female workers (Exposed period 10-20 years, Mix flour)

Figure IV: PEFR of male workers (Exposed period 10-20 years, Mix flour)

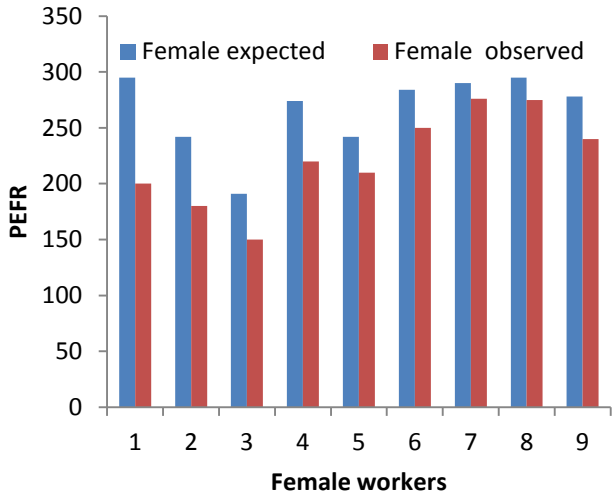

Figure V: PEFR of female workers (Exposure period 21-25 years, Wheat flour)

Figure VI: PEFR of male workers (Exposure period 21-25 years, Wheat flour)

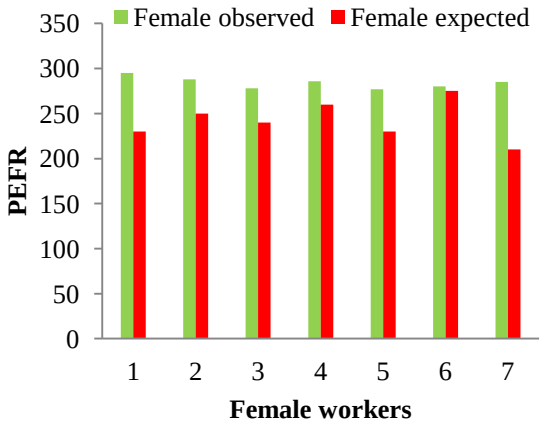

Figure VII: PEFR of female workers (Exposed period 21-25 years, Mix flour)

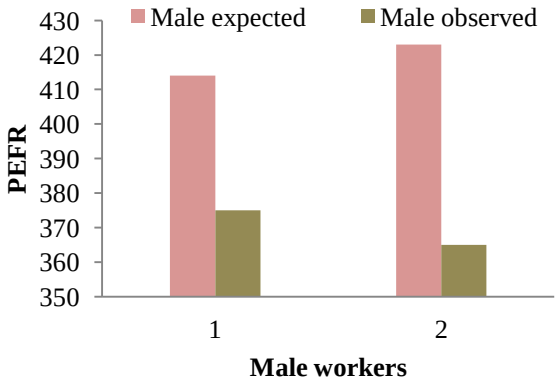

Figure VIII: PEFR of male workers (Exposed period 21-25 years, Mix flour)

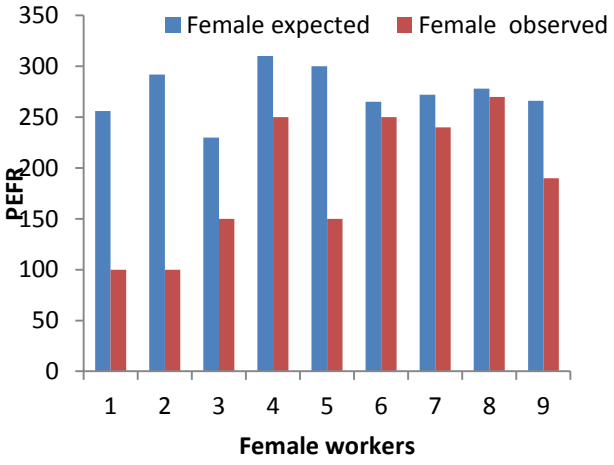

Figure IX: PEFR of female workers (Exposure period 26-40 years, Wheat flour)

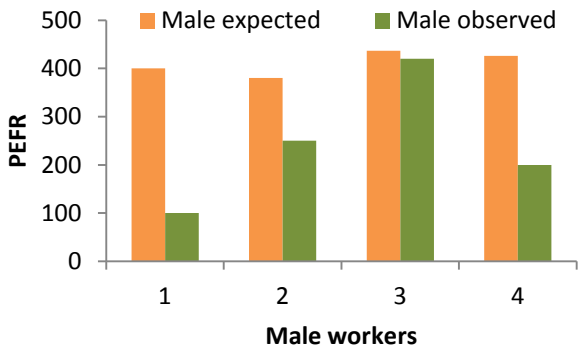

Figure X: PEFR of male workers (Exposed period 26-40 years, Wheat flour)

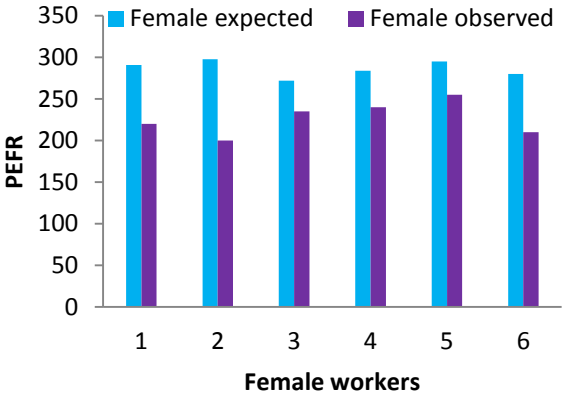

Figure XI: PEFR of female workers (Exposed period 26-40 years, Mix flour)

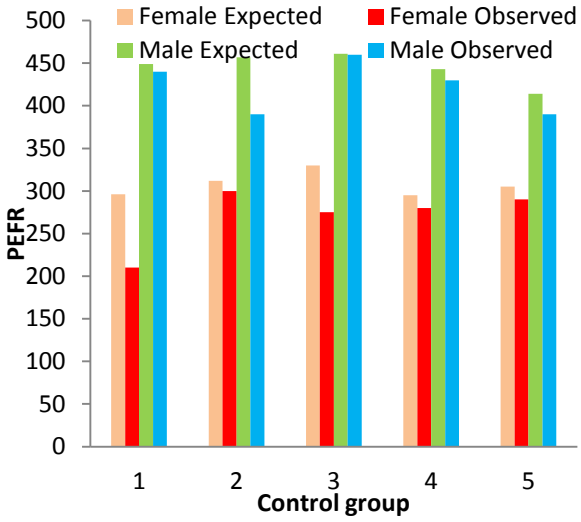

Figure XII: PEFR of control group

Conclusion:

The results of the study showed that most flour mill workers were unaware of effects of exposure to flour dust. Unhealthy conditions at workplace environment were observed in flour mill during study. Reduction in PEFR showed reduction of lung capacity with increased exposure period. From the literature survey it is found that this is the first study pertaining to flour mill workers PEFR values.

Workers of mix flour mills come across with additional health problems than wheat flour mill workers, like extensive cough during work, skin burning, itching and watery eyes and allergic problem. Asthma problem increases as worker exposure in flour mill increases.

From the study it can be concluded that flour mill workers in Chandrapur city exposed to health problems and there is an urgent need of awareness about occupational health of workers and need of compulsory use of protective equipments among flour mill workers.

Recommendations:

From the results of the study it is recommended that, while working in flour mills personal protective equipments such as special mask, cap, ear plugs and ear muffs should be used. Whereas, in case of spice flour mills in addition to these personal protective equipments hand gloves should also be used to protect them from spices.

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