

Original Research Article

Screening of flour mill workers for respiratory morbidities: a cross-sectional study in rural Bangalore

Seema P., Shashi Kumar M.*, Deepthi R.

Department of Community Medicine, ESIC Medical College and PGIMS, Rajajinagar, Bangalore, India

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*Correspondence:

Dr. Shashi Kumar M.,

E-mail: drshashi1982@gmail.com

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ABSTRACT

Background: Flour mill workers are highly exposed to organic wheat flour dust with a large diversity of antigenic/allergic component leading to respiratory morbidity and skin allergies. This work environment may affect workers health and safety if the effects are unchecked periodically.

Methods: A cross-sectional study was conducted among 194 workers of 4 flour mills in Bangalore Rural district. Prior permission (factory) and informed consent *(workers) were obtained. Pre-structured interview-schedule was administered. Peak expiratory flow rate (PEFR) readings were measured by using wrights flow meter and best of 3 readings recorded. Respiratory morbidity was assessed on PEFR classification - based on American lung association (ALA) colour coding - red, yellow and green zones. Respiratory morbidity was compared with years of experience, type of work, smoking habits and usage of appropriate PPEs. Data was analyzed using Epi-info 08.

Results: Among 194 workers studied, 188 were males, 6 were females. They were in the age group of 15-50 years. 143 (73.7%) were engaged in work with direct dust exposure. 84 (43%) were working for more than 3 years, 50 (25%) between 1-3 years and 60 (30%) for less than a year. 7.2% regularly smoked. According to ALA classification, PEFRs of 71 (36%) of the workers were classified into RED, 91 (46%) to yellow and 32 (16%) to green zones respectively. Usage of PPEs was only among 126 (64%).

Conclusions: Respiratory morbidity among flour mill workers was high. Adequate use of PPEs was low. Half of the workers fell into yellow zone that had a potential to fall into red zone if external factors were not considered.

Keywords: Flour mill, Respiratory morbidity, PEFR, Colour code

INTRODUCTION

Any person involved in any occupation is at risk of exposure to occupational hazards. When these hazards are not identified early and not controlled, they may cause occupational diseases.¹ Occupational diseases have been known for decades with worker being ceaselessly exposed to the raw material that his job deals with. Respiratory diseases are common in areas of work where the exposure to dust is high.² One such common Industry having abundant generation of dust at work places having abundant dust exposure is flour mill. Flour dust exposure

may induce acute or chronic respiratory ailments. Flour dust refers to particle coming from finely milled cereal or non-cereal grain. Wheat Flour contains at least 40 allergens which causes adverse health effect in exposed workers.³ Flour mill produce a large amount of flour dust. Poor ventilation may be basic problem in flour mill throughout the country that augments the exposure of dust. Long term continuous exposure of workers to fine dust leads to pulmonary and respiratory disease.⁴ Spirometry is regarded as an integral component of any respiratory medical surveillance program.

In light of the existing knowledge this study was conducted to know the effects of long-term exposure to flour dust on respiratory symptoms and lung functions.

METHODS

A cross-sectional study was conducted among 194 workers of 4 flour mills in Bangalore rural district in the period from 20 July 2018 to 20 August 2018. All the workers in the 4 flour mills were included in the study. Prior permission from factory owners and Informed consent from workers were obtained. Ethical clearance was obtained from the Institutional ethics committee. Pre-structured questionnaire was administered which included history taking, physical examination and laboratory investigations like Hb%, and fasting blood sugar.

Peak expiratory flow rate (PEFR) was done by using wrights flow meter. The method and steps of use of peak flow meter was systematically followed based on the recommendations by American lung association.⁵ Best of three readings was taken. Respiratory morbidity was assessed on PEFR classification which was based on American lung association (ALA) colour coding that is red, yellow and green zone. Respiratory morbidity was then assessed with years of experience, type of work, smoking history and usage of appropriate personal protective equipments (PPEs).

Data was entered in microsoft excel sheet and analyzed using Epi-info 8.

RESULTS

A total of 194 workers were assessed in 4 flour mills of Bangalore rural district - all four were involved in flouring the wheat and packing them into different products like broken wheat, Wheat flour, multigrain Atta and Maida. The demographic characteristics of workers are shown in (Table 1). Among 194 workers studied, 188 were males, 6 were females. They were in the age group of 18-50 years, where majority of them belonged to 18-45 years. More than 60% of the workers have studied less than 4th standard (Table 1).

The various categories of workers based on the activities they are involved in are shown in (Table 2). Most of them were involved in packing, loading and worked as cutting machine operators. Among these 194 workers 143 (73.7%) were engaged in work which was directly exposed to dust. 84 (43%) were working for more than 3 years among them 50 (25%) between 1-3 years and 60 (30%) for less than a year. 7.2% regularly smoked tobacco and all were males.

Table 3, shows the distribution of the symptoms the workers presented during the history taking. The common symptoms were musculoskeletal pain and cough. Table 4, shows the distribution of the workers based on the peak expiratory flow rate and distribution based on ALA

classification into red, green and yellow zones. 71 (36%) fell into red zone, 91 (46%) into yellow zone and 32 (16%) into green zone. Usage of personal protective devices was recorded, which showed only 126 (64%) used PPE while working (Table 5). The reasons given by workers for consistent use of PPEs and non-use of PPEs are shown in (Table 6 and 7) respectively. The common reasons said by the workers on consistent use of PPEs include that the PPEs provide safety to the workers and it protects from inhalation to dust. However, among the reasons said by the workers on not using PPEs consistently includes few felt it is not necessary and causes difficulty in breathing especially during hard work.

Table 1: Distribution of workers based on sociodemographic factors.

| Variables | Frequency | Percentage |
|-------------------------|-----------|------------|
| Gender | | |
| Male | 188 | 97 |
| Female | 6 | 3 |
| Age in years | | |
| 18-24 | 90 | 46.4 |
| 25-34 | 54 | 27.8 |
| 35-44 | 33 | 17.0 |
| ≥45 | 17 | 8.8 |
| Education status | | |
| Illiterate | 60 | 30.9 |
| Primary | 61 | 31.4 |
| High | 51 | 26.3 |
| PUC | 8 | 4.1 |
| Degree | 4 | 2.1 |
| Masters | 10 | 5.2 |

Table 2: Work related information of the workers.

| Variables | Frequency | Percentage |
|----------------------------|-----------|------------|
| Years of experience | | |
| Up to 1 | 60 | 30.9 |
| 1-3 | 50 | 25.8 |
| > 3 | 84 | 43.3 |
| Nature of work | | |
| Packing machine operator | 58 | 29.9 |
| Cutting machine operator | 18 | 9.3 |
| Loader | 67 | 34.5 |
| Security | 7 | 3.6 |
| Mason | 32 | 16.5 |
| Accountant | 5 | 2.6 |
| Cook | 3 | 1.5 |
| Driver | 4 | 2.1 |

When the ALA classification of the PEFR were assessed against the type of appointment, exposure to dust, work experience, age, history of smoking and use of appropriate PPEs it was seen that even though there was difference among the different groups none of the factors were found to be statistically significant (Table 8). The

workers were classified in to three categories based on their experience (up to 1 year, 1-3 years and >3 years), there was no significant difference with respect to proportion of workers in red, yellow and green zones in all three categories.

Table 3: Presenting complaints of the workers.

| Health problems | Frequency | Percentage |
|-----------------------|-----------|------------|
| Musculo skeletal pain | 45 | 23.2 |
| Cough | 32 | 16.5 |
| Dyspnoea | 8 | 4.1 |
| Skin problems | 7 | 3.6 |
| Ear problems | 7 | 3.6 |
| Chest pain | 6 | 3.1 |
| Wheeze | 3 | 1.5 |
| Eye problems | 3 | 1.5 |
| Habits | | |
| | 14 | 7.2 |
| | 38 | 19.6 |
| | 21 | 10.8 |

Table 4: PEFR related information.

| PEFR grades | Frequency | Percent |
|--|-----------|---------|
| ≤ 250 | 27 | 13.9 |
| 251-300 | 71 | 36.6 |
| 301-350 | 20 | 10.4 |
| 351-400 | 35 | 18.0 |
| ≥ 401 | 41 | 21.1 |
| PEFR coding based on ALA classification | | |
| Green (80-100%) | 32 | 16.5 |
| Yellow (50-80%) | 91 | 46.9 |
| Red (<50%) | 71 | 36.6 |
| Total | 194 | 100 |

Table 5: Distribution of workers based on use of PPEs and reasons for using and not using them.

| Use of PPEs | Frequency | Percentage |
|-------------|-----------|------------|
| Yes | 126 | 64.9 |
| No | 68 | 35.1 |
| Total | 194 | 100 |

Table 6: Reasons given by workers for consistently using PPEs.

| Reasons for using PPEs | Frequency | Percentage |
|---|-----------|------------|
| Safety of the worker | 81 | 64.3 |
| Protection from dust | 37 | 29.3 |
| To prevent hair, fall due to exposure to dust | 6 | 4.8 |
| Because it is made compulsory to wear it | 2 | 1.6 |

Multiple responses were given and the percentages are not mutually exclusive.

Table 7: Reasons given by workers for not using PPEs consistently.

| Reasons for not using PPEs | Frequency | Percentage |
|----------------------------|-----------|------------|
| Not necessary | 48 | 72.6 |
| Difficulty in breathing | 13 | 20.1 |
| Not provided | 6 | 15.2 |
| Uncomfortable | 11 | 7.4 |
| Allergic to mask | 2 | 2.9 |
| Total | 68 | |

Multiple responses were given and the percentages are not mutually exclusive.

When the workers were classified into those who are and who are not exposed to dust during their work activities there were not much significant difference.

Table 8: Comparison of the experience, smoking history, dust exposure with ALA classification of PEFR values.

| Particulars | | Green N (%) | Yellow N (%) | Red N (%) | Total | Values |
|----------------------------------|---------------------|----------------|-----------------|--------------|-------|---|
| Experience (in years) | Up to 1 | 10 (16.7) | 26 (43.3) | 24 (40.0) | 60 | X ² =1.43 df=4 p=0.838 |
| | 1-3 | 7 (14.0) | 23 (46) | 20 (40.0) | 50 | |
| | > 3 | 15 (17.9) | 42 (50) | 27 (32.1) | 84 | |
| Smoking history | Smoker | 2 (14.3) | 9 (64.3) | 3 (21.4) | 14 | X ² =1.96 df=2 p=0.374 |
| | Non smoker | 30 (16.7) | 82 (45.6) | 68 (37.8) | 180 | |
| Work | Exposed to dust | 22 (15.4) | 65 (45.5) | 56 (39.2) | 143 | X ² =1.63 df=2 p=0.443 |
| | Not exposed to dust | 10 (19.6) | 26 (51.0) | 15 (29.4) | 51 | |

DISCUSSION

Among the 194 workers studied most of them were in the age group of 18 to 35 years. This may be due to need for younger people with more physical strength. The other

similar studies done by Bhatt et al, Ahire and Meo et al, showed that similar age distribution of workers in age group of 18-45 years and all were males.^{3,6,7}

Flour mill industry has male preponderance as for as the gender of workers are concerned. In this study, among

them 188 were males and 6 were females, it was also seen in the other similar studies done in various parts of India.^{3,6-9} This is due to requirement of more physical strength in activities like lifting weights, pushing the carts, operating machines and also may be due to the timing of work.

Among 194 workers studied 84 (43%) were working for more than 3 years, 50 (25%) worked between 1-3 years and 60 (30%) worked less than a year. Anju et al in their study found longer duration of employment was associated with higher prevalence of allergic symptoms.²

Bhatt et al in their study found workers were working for more than 10 years in nearly all 60 (96.77%) of the workers complained of constant dry cough during working hours and 12 (19.35%) did complain of productive cough.³ Zodpey and Tiwari in their study found 174 workers worked more than 5 years, 69 workers worked between 5-10 years, 29 workers 10-15 years and 14 of the workers more than 15 years and found that PEFR values decrease with increasing exposure (no of years of work) and the difference was statistically significant.⁸ Another study conducted by Madhavilatha found changes in forced expiratory volume was higher among the workers who worked for more than 15 years which also lead to chronic bronchitis.⁹

In our study among 194 workers 30% were engaged in packing, 16% loading, 36% worked as helpers and 16% engaged in cutting and they were directly exposed to dust. Among them workers engaged in cleaning complained of eye irritation and loading complained of backache, similarly work done by Ahire et al found 60% engaged in cleaning and packing who complained of eye irritation and itching and 100% of the workers were engaged in loading who complained of back ache.

Among the 194 workers, we found 64% of the workers used PPEs, whereas study conducted by Anju et al in their study found none of the workers used any protective device.² Another study by Ahire showed none of the workers used any PPE's while working and study done by Wagh et al found no usage of any PPE's and exhaust (dust) system.^{4,7} The common reasons for not using PPEs were that most of the workers felt that it was not necessary; it caused difficulty in breathing, and uncomfortable to work while working. 36% of the workers practiced consistent.

According to ALA classification in our study showed 71 (36%) fell into red zone, 91 (46%) into yellow zone and 32 (16%) into green zone. Even after extensive search of literature on using of ALA classification in flour mill industry, there were no studies found.

CONCLUSION

Respiratory morbidity among flour mill workers was high. Prevalence of adequate use of PPE was low. Half of

the workers fell into yellow zone that had a potential to fall into red zone.

Recommendations

We recommend the engineering method of enclosure of the machine especially at the packing to prevent exposure to dust. Consistent usage of PPEs at the workplace helps workers to protect their health from flour dust. A regular periodic examination is necessary to measure the impact of particulate matter on the health of flour mill workers.

Flour mill workers must undergo a pre-employment and periodic medical surveillance test, these will identify susceptible worker preventing further significant deterioration and aid in improvement of present condition.

Very few studies have been conducted in India among this group of workers to assess lung function and respiratory morbidity. Thus, there is a need to undertake more elaborate research among these workers.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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