

Effects of Exposure to Flour Dust on Respiratory Symptoms of Flour Mill Workers in Ahmedabad City

Rajshree Bhatt¹, Jyotsna Tabiyar², Navin Raja Sekar³

¹ Assistant Professor, ²Tutor, ³ Resident, Community Medicine Department, B J Medical College, Ahmedabad

Correspondence : Dr. Rajshree Bhatt, Email: nitshi2815@gmail.com

Abstract:

Introduction : Flour milling is a rampant industry in India where the workers are continuously exposed to dust. Workers engaged in flour milling are at risk of developing respiratory health problems due to high level of dust exposure. Our aim was to correlate the respiratory problems arising among flour mill workers with their exposure and habits. **Objective**: To assess the effect of exposure to flour dust on respiratory symptoms and additive effects of smoking and years of exposure. **Method**: It's a cross-sectional study. All six zone of Ahmedabad municipality were covered. 29 flour mills were covered. Total study population was 62 which included both owners and workers. **Results**: Current study population consisted of 29(46.77%) mill owners & 33(53.23%) mill workers. Majority of them belonged to above 35 years of age 20 (32.26%), 50(80.65%) were males and 12(19.35%) were females. Among the study population, 55(88.71%) were smokers and 43(69.35%) were working in mills for more than 10 years. Our survey revealed that none of them used any protective device against flour dust. In the study group 60(96.77%) were suffering from prolonged dry cough and 22(35.48%) had complains of dyspnea on and off. **Conclusion**: Prolonged exposure to flour mill dust do cause various respiratory problem among the mill workers and smoking has a synergistic effect on them.

Key Words: Flour dust, Respiratory symptoms, Smoking

Flour dust is seen across a range of food industries; its exposure may induce acute or chronic respiratory ailments. The term 'flour dust' refers to particles coming from finely milled cereal or non-cereal grains. Wheat flour contains at least 40 allergens which can cause adverse health effects in exposed workers. Proteins with potential allergenic activities represent about 10–15% of wheat grain dry weight. The aerodynamic sizes of flour dust particles vary between ≤ 4 and $30 \mu\text{m}$.^[1]

Their kinetics in the lungs follows the pattern of other particulate aerosols of a similar type and their deposition within the respiratory tract is determined by the particle size, shape, density as well as by the respiration volume. Most particles greater than $10 \mu\text{m}$, and up to 80% of particles between 5 and $10 \mu\text{m}$, are trapped in the nasopharyngeal region due to inertial impaction and centrifugal condensation resulting from the anatomic formation of these parts of the respiratory tract. Particles trapped and

deposited in the upper parts of the respiratory tract are usually removed within a few hours by the mucociliary system or as a result of expectoration. Massive exposure may lower the ability of macrophages to eliminate particles, which may result in penetration of dust into the interstitium.

Inhaled particles with aerodynamic diameters equal or above $10 \mu\text{m}$ cause eye or nose irritations. Particles with sizes between 5 and $10 \mu\text{m}$ may provoke asthmatic reactions. Particles below $5 \mu\text{m}$ may evoke an allergic alveolitis type of reaction.^[1]

Three groups of workers have an increased risk of adverse health effect appearance when exposed to flour dust: (a) workers with a flour sensitization after repeated exposure to low levels of flour dust; (b) workers with an atopic status or an allergic constitution; and (c) workers with pre-existing asthma or those with more general respiratory symptoms. Epidemiological reports have

showed that asthma, conjunctivitis, rhinitis and dermal reactions are the major health effects of flour dust exposure.

Method:

Indian wheat flour is mostly ground in stone mills popularly called as chakkis. Chakkis is nothing but a pair of stones, of which, one is stationery and other is a rotating.

From all Ahmedabad Municipality Zone, Flour mills were selected randomly.

Sr.No	Zone	Flour milled surveyed	Person covered
1	North	5	13
2	East	5	7
3	West	5	12
4	South	5	11
5	Central	6	9
6	New West	3	10
	Total	29	62

All the workers were given pre designed questionnaires and data were analyzed using Microsoft excel. The co-authors assisted in designing the study, collecting data and analyzing the data.

Results & Discussion:

Table 1: Age and sex wise distribution of study population.

Age in years	Total	Male	Female
15 to 20	7(11.29%)	7	0
20 to 25	11(17.74%)	11	1
25 to 30	13(20.97%)	12	1
30 to 35	10(16.13%)	8	2
Above 35	20(32.26%)	12	8
Total	62	50(80.65%)	12(19.35%)

Table 1 shows age wise distribution of surveyed population with maximum 20(32.26%) of them lying above 35 years of age, followed by age group of 25 to 30 years 13(20.97%) and 20 to 25 years 11(17.74%). There were only 12(19.35%) female and they were nearly above 35 years of age group. In a study done by Meo SA all 46 workers were in age group of 18 to 65 years of age and all were males.^[2]

Table 2: Educational status of flour mill workers

Education	Frequency	Percentage
Primary	17	27.42
Secondary	24	38.71
Higher secondary	20	32.26
Graduates and above	1	1.61

Table 2 shows that a total of 24 (38.71%) flour mill worker were educated till secondary schooling followed by 20 (32.26%) completed higher secondary schooling. Only one of the flour mill owner was graduate.

Table 3: Years of exposure to flour dust on flour mill workers

Years	Frequency	Percentage
< 10	19	30.65
≥ 10	43	69.35

As per table 3, 43(69.35%) mill workers were working in this occupation for more than 10 years. In Trithankar study the years of experience of workers were nearly 15.9 years^[3] while in Mohammadien study group 104(48%) workers were with 10 years of experience.^[4]

Table 4: Working hours of flour mill workers in a day

Hours	Frequency	Percentage
< 8 hours	5	8.06
≥ 8 hours	57	91.94

Table 4 says that 57 (91.94%) of mill workers work for more than 8 hours per day in the same exposed premises. None of the flour mill worker used any protective devices to protect them from flour dust. In the study conducted by Ghosh et al, workers work for 7 days a week with average duration of work per day is 12 hours.^[3]

Table 5: Smoking and tobacco chewing habits among the mill workers

Habit	Male	Female	Total
Smoking	50(90.9%)	5(9.09%)	55(88.7%)
Chewing tobacco	36(75%)	12(25%)	48(77.41%)
Both	27(43.55%)	5(8.06%)	32(51.61%)

*Multiple answers were accepted

(Table 5) Among flour mill workers 50(90.9%) were smokers & 36(75%) were having habit of chewing tobacco (guthka). In females 5(9.09%) had habit of smoking & 12(25%) had habit of chewing tobacco. 27(43.55%) male & 5(8.06%) females means total 32 (51.61%) had both habit of smoking & chewing tobacco. While in a study done in Egypt by Hamdy.A. Mahammadien 75% of their study population was smoker.^[4]

There was statistically significant association between symptoms presentation & smoking & tobacco chewing in both the sexes with chi square 4.202, degree of freedom 1 p value 0.04404 which is significant. Similar findings were seen by Hamdy.A. Mahammadien in Egypt.^[4]

In male there was association between any habit (smoking or chewing tobacco) and getting symptoms with chi square 9.3808, degree of freedom 1 p value is 0.002193 which is highly significant. No association was found between smoking and respiratory symptoms by Tirthankar Ghosh.^[3]

Nearly all 60 (96.77%) of them complain of constant dry cough on working hours and 12(19.35%) do complain of productive cough. Dyspnea was another major complain of 22(35.48%) of those workers. In other studies similar respiratory symptoms cough (30%), phlegm (25%), dyspnea (21

Table 6: Respiratory symptoms amongst flour mill workers (n=62*)

Symptoms	Frequency	Percentage
Dry cough	60	96.77
Productive cough	12	19.35
Dyspnea	22	35.48
Wheezing	8	12.90
Others	3	4.84

* Multiple Responses

) were reported among workers at a cement factory in a rapidly developing country.^[5]

Wagh ND found that in their study population, 42% of flour mill workers were having shortness of breath, 34% have increased frequency of coughing and 19% shows respiratory tract irritation.^[6]

A significantly higher prevalence of respiratory symptoms in flour mill workers was related to the shortness of breath, wheezes, productive cough ($p < 0.0001$), also there are highly statistically significant differences for wheezes, crackles, hyperinflation and radiological finding.^[4]

Table 7: Non-respiratory diseases or symptoms among flour mill workers (n=62*)

Symptoms	Frequency	Percentage
Diabetes Mellitus	13	20.96
Hypertension	26	41.94
Asthma	7	11.29
Itching eyes	38	61.29
Skin allergy	24	38.71

*Multiple Responses

Table 7 shows that 26(41.94%) of workers were suffering from hypertension & 13 (20.96%) were suffering from diabetes mellitus. 7 (11.29%) among them had history of asthma. Association of respiratory symptoms and diabetes & hypertension was not statistically significant. Itching of eyes 38(61.29%) and skin allergy 24 (38.71%) were other two common complain given by flour mill workers.

Recommendation:

We recommend the compulsory use of personal protective equipment (nose mask) by flour mill workers during working hours. This would help to protect the workers health from the flour dust prevalent in the workplace environment. A regular periodic examination is necessary to measure the impact of particulate matter on the health of the flour mill workers.

Declaration:

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Conflict of Interest: Nil

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