

## Occupational and respiratory abnormalities among grain mill workers

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**ABSTRACT:** Wheat flour is a complex organic dust with a large multiplicity of allergic effects when encountered for a considerable time. There is a growing accord on the toxic effect of flour dust on respiratory functions of flour mill workers. Dust inhalation over a long period leads to proliferative and fibrotic changes in respiratory tract and lungs. Flour production is predominantly in the unorganized sector involves the milling process and milling is accomplished by grinding grain between stones and a steel wheel which leads to workers exposure to floor dust. Therefore, the present study was undertaken with the objective of assessment of the prevalence of occupational allergic disorders, skin problems, lower and upper respiratory tract problems among flour mill workers. The findings showed that the high prevalence of allergic disorders among flour mill workers were seen and approximate half of the respondents were in agreement that they have problems such as cough, eczema, wheezing, nasal congestion, poor sense of smell, hives/swelling, shortness of breath, itchy nose, headache and sneezing due to dust. Grain mill workers were also reported the skin problems such as skin rash, itching, dry skin, hives, swelling and blistery rashes. Respondents were reported about frequent or constant cough and wheezing while 19 per cent respondents were strongly agreed about chest tightness, problem of breathing and pneumonias as lower respiratory tract problems and frequent bronchitis. Majority of the respondents were suffering from upper respiratory tract problems such as nasal congestion, runny nose, postal nasal drip, itchy nose, red or itchy eyes, sinus pressure or pain, poor sense of smell, frequent ear infections, frequent sinus infections, frequent colds and hoarse voice.

**Key words:** Flour mill workers, occupational allergic disorders, respiratory abnormalities, skin problems

Wheat is the powdery substance created when a dry grain is pulverized. This is referred to as the milling process. During the milling process, different parts of the wheat grain are used to make different types of flour. The most common varieties of flour are made from wheat although any grain can be made into flour including rice, oats, corn or barley. In addition to the type of grain used, flour also varies depending on what part of the grain is retained during milling process. The flour milling process comprised of four main sections which are grain elevator, cleaning tower, mill tower, warehousing and shipping. These flour milling activities includes loading and lifting, carrying, lifting, packing etc. The workers performed and spend most of their time in mill work in these activities experiences the greatest amount of exposure and risk towards the respiratory and musculoskeletal problems. Therefore, flour mill workers are suffering from various types of problems which are physiological, physical and psychological. Workers in flour mill are also highly exposed to harmful factors in their work environment such as dust, excessive noise and insufficient light *etc.* Flour mills generate dust, which is released into the air and later inhaled during industrial processes, such as cleaning crumbling of the product, packaging and shipping (Bachanek *et al.*, 1999). Dust is treated as the most influential agent and perceived as a frequent cause of the respiratory system illnesses (Meo and Al-drees, 2005). The occupationally related lung diseases are most likely due to the deposition of dust in the lungs and are

influenced by the portal of the lungs and are influenced by the sort of dusts, the period of exposure, the concentration and size of airborne dust in the breathing zone (Mengesha and Bekele, 1998). Therefore, the present investigation entitled "Occupational Allergic disorders and respiratory Abnormalities among Grain Mill Workers" was taken with the objective of assessment of the prevalence of occupational allergic disorders, skin problems, lower and upper respiratory tract problems among flour mill workers.

### MATERIALS AND METHODS

The research area of the present investigation was Udham Singh Nagar in Uttarakhand, India. Two flour mills were selected with the purpose that only these selected flour mills were working in both shifts. A sample of 120 grain mill workers was selected through random sampling technique to assess the occupational allergic and lung function abnormalities among grain mill workers. Data collection consisted of individual interviews or naturalistic observation. In order to gain an in-depth understanding of primary information and people's experiences the descriptive data was collected from all 120 respondents personally using the precoded interview schedule. A five point scale was developed to know the level of allergic disorders, skin problems and respiratory tract problems. The responses were recorded in terms of strongly agreed, agreed, undecided, disagreed and

strongly disagreed. The responses on each item of the scale was quantified by ascribing scores on a five point scale, following weightage was given:

Strongly Agreed	-	5
Agreed	-	4
Undecided	-	3
Disagreed	-	2
Strongly Disagreed	-	1

For recording data regarding weight and height anthropometric rod and weighing balance were used. In the present study mean, standard deviations, frequency and percentage were computed.

## RESULTS AND DISCUSSION

In the present study, data regarding selected respondent's age, weight and height were as 30.91 years, 159.83kgs and 52cms, respectively. The mean and S.D. of working years of respondents in the flour mills was  $5.75 \pm 2.63$  years. Saliu *et al.* (2015) found in their study that respondent's age was ranges from 30 to 40 years and respondents were spent above five years as a flour mill worker. Babel and Rajvanshi (2013) reported in their study that 40 per cent of the respondents had more than 20 years of experience in flour mill and 80 per cent were operating flour mill for 10 hours daily.

These findings showed that flour mill workers generally work over years simultaneously they also spend a considerable time in flour mill which enhances the health risks associated. Wagh *et al.* (2006) resulted in their study on flour mill workers that flour mill workers continuously exposed to flour mill dust over the 10-20 years.

### Assessment of the prevalence of occupational allergic disorders among flour mill workers

Dust allergies make difficult to breathe and may trigger asthma symptoms such as coughing, wheezing, tightness in the chest and shortness of breath. Dust also just makes some people's skin itchy. Common dust allergy symptoms are sneezing, funny or stuffy nose, red itchy or watery eyes, wheezing, coughing, tightness in the chest, shortness of breath and itching.

**Table 1: Distribution of respondents showing age, height, weight and duration of employment**

S.No.	Parameters	Mean $\pm$ S.D.
1	Age (in years)	30.91 $\pm$ 9.25
2	Weight (in kgs)	159.83 $\pm$ 7.01
3	Height (in cms)	52 $\pm$ 7.18
4	Years of Working	5.75 $\pm$ 2.63

In Table 2 data pertaining to symptoms and complaints of dust allergy were assessed in the present study and it was found that 17.5 per cent were strongly agreed of having cough due to dust, 47.5 per cent were agreed, 15.83 per cent were disagreed and 19.17 per cent of the respondents were strongly disagreed with the fact that cough is associated with the dust. When they reported about the problems of runny nose, nearly thirty per cent (30.83 per cent) were strongly agreed, 14.16 per cent were agreed, 9.17 per cent were undecided whereas 24.17 per cent were disagreed and 21.67 per cent were strongly disagreed with the fact that their problem of runny nose occurred due to dust.

It was also found that 34.17 per cent strongly agreed that they were suffering from nasal polyps due to dust, 23.33 per cent were agreed, 4.17 per cent were undecided about having nasal polyps due to dust, 32.5 per cent were disagreed and 5.83 per cent strongly disagreed. When workers were reported about eczema it was found that 22.5 per cent were strongly agreed, 53.33 per cent were agreed, 14.17 per cent were disagreed and ten per cent were strongly disagreed that there is any association with dust. Data pertaining to workers suffering from wheezing shows that 55 per cent were strongly agreed, 39.17 per cent were agreed, 2.5 per cent were undecided, 3.33 per cent were disagreed of there is any association with dust. More than thirty five (37.50%) per cent flour mill workers were strongly agreed, 49.17 per cent were agreed, 8.33 per cent were disagreed and five per cent respondents were strongly disagreed whereas none of the respondents were undecided about nasal congestion problem's association with dust. In terms of poor sense of smell, 27.5 per cent mill workers were strongly agreed, 50 per cent were agreed, 5.83 per cent were undecided and 16.67 per cent were strongly disagreed that they have poor sense of smell because of dust allergy. More than forty five per cent respondents were strongly agreed, 35.83 per cent were agreed and 18.33 per cent were reported that they were disagreed about their hives/swelling problems arouse due to flour mill dust. None of the respondents were being found under the category of undecided and strongly disagreed with this fact.

It was further revealed in Table 2 that 20 per cent respondents were strongly agreed the reason of shortness of breath was dust while 48.33 per cent were agreed and 31.67 per cent were found disagreed with this reason while none of the respondents were found to be undecided and strongly disagreed. Data regarding itchy nose revealed that 26.67 per cent were strongly agreed that due to dust they face problem of itchy nose also 51.67 per cent were agreed that they were being suffered from itchy nose due to dust flour and none of the respondents were undecided and strongly disagreed. Forty four per cent of respondents were strongly agreed that they have headache due to dust also 46.67 per cent were agreed but 18.33 per

cent were disagreed while none of the respondents was found under the category of undecided and strongly disagreed. Majority of respondents (29.17%) were agreed for chest tightness due to dust followed by 23.33 per cent who were strongly agreed, 20.83 per cent workers were disagreed. More than half (56.67 per cent) of the respondents strongly disagreed and ten per cent of the respondents were undecided about watery/itchy eyes that they have this problem due to dust. Forty nine per cent of the respondents were strongly agreed and 20.00 per cent were strongly disagreed that they have sneezing due to dust whereas none of the respondents were under the category of undecided and disagreed but 30.83 per cent were agreed that their sneezing problem was due to flour mill dust. Asthma arising from the flour mill dust exposure is one of the commonest cause of occupational asthma simultaneously within the flour mill settings other allergies due to flour mill dust arises, which may be dangerous to workers health. Smith *et al.* (2000) were also identified the symptoms in wheat flour mill workers that were the result of wheat flour dust exposure. Flour dust is a hazardous substance and known cause to allergic and occupational asthma (Ajeel and Al-Yasin, 2007).

#### Assessment of the prevalence of skin problems among flour mill workers

Table 3 revealed the data regarding skin problems and showed that 37.5 per cent were strongly agreed, 30 per cent were agreed where 10 per cent were undecided and 2.5 per cent were strongly disagreed for having skin rashes. Forty five per cent were agreed that they were having itching, 28.33 per cent were strong agreed, 17.5 per cent were strongly disagreed and 9.17 per cent were disagreed of having itching due to dust of flour and none of the respondents came under the category of undecided. In terms of dry skin 42.5 per cent were strongly agreed,

39.17 per cent were agreed and 5.83 per cent were undecided about dry skin problem due to dust produced in flour mill.

Nearly thirty six per cent (35.83 per cent) workers were strongly agreed, 29.17 per cent were agreed, 22.5 per cent were disagreed and 12.5 per cent were strongly disagreed about having hives due to dust, and none was reported to be undecided for having hives. More than half of the respondents were strongly agreed for having swelling, 34.17 per cent were agreed, 5.83 per cent were strongly disagreed and 4.17 per cent were unable to decide the reason of swelling due to dust of flour. In terms of having problem of blistery rashes of workers, majority (47.50 per cent) of them agreed and strongly agreed (40.83 per cent) of having problems due to flour. Respondents with workplace exposure to organic dust over a longer period of time have high prevalence of skin problems. Nimgade and Kamble (2016) also find in their study that the skin itching was one of the predominant problem among flour mill workers and problems such as skin burning, severe itching, watery eyes and skin rashes were also reported by the flour mill workers. Ghosh *et al.* (2014) conducted a study on rice mill workers and a significantly greater proportion of the rice mill workers complained of eye burning (65.00%) and nose irritation (27.5%).

#### Assessment of the prevalence of lower respiratory tract problems among flour mill workers

Dust is treated as the most influential agent and perceived as a frequent cause of the respiratory system illness. In the present study the respondents were reported many lower respiratory tract problems such as frequent or constant cough as the 12.5 per cent respondents were strongly agreed, 22.5 per cent were agreed, 8.33 per cent were undecided, 26.67 per cent were disagreed and 30.00 per

**Table 2: Distribution of respondents as per reported allergies due to dust (N=120)**

S.No.	Symptoms and complaints	StronglyAgreed	Agreed	Undecided	Disagreed	Strongly Disagreed
1	Cough	21 (17.50)	57 (47.50)	-	19 (15.83)	23 (19.17)
2	Runny nose	37 (30.83)	17 (14.16)	11 (9.17)	29 (24.17)	26 (21.67)
3	Nasal polyps	41 (34.17)	28 (23.33)	5 (4.17)	39 (32.50)	7 (5.83)
4	Eczema	27 (22.50)	64 (53.33)	-	17 (14.16)	12 (10.00)
5	Wheezing	66 (55.00)	47 (39.17)	3 (2.50)	4 (3.33)	-
6	Nasal congestion	45 (37.50)	59 (49.17)	-	10 (8.33)	6 (5.00)
7	Poor sense of smell	33 (27.50)	60 (50.00)	7 (5.83)	20 (16.67)	-
8	Hives/swelling	55 (45.83)	43 (35.83)	-	22 (18.33)	-
9	Shortness of breath	24 (20.00)	58 (48.33)	-	38 (31.67)	-
10	Itchy nose	32 (26.67)	62 (51.67)	-	26 (21.67)	-
11	Ear infections	53 (44.17)	31 (25.83)	4 (3.33)	20 (16.67)	12 (10.00)
12	Headache	42 (35.00)	56 (46.67)	-	22 (18.33)	-
13	Chest tightness	28 (23.33)	35 (29.17)	12 (10.00)	25 (20.83)	-
14	Itchy/watery eyes	68 (56.67)	25 (20.83)	5 (4.17)	12 (10.00)	10 (8.33)
15	Sneezing	59 (49.17)	37 (30.83)	-	-	24 (20.00)

cent were strongly disagreed that they had frequent or constant cough. More than thirty one per cent of the respondents were strongly agreed about wheezing, 36.67 per cent were agreed and 2.5 per cent were undecided, 22.5 per cent were disagreed and 6.67 per cent were strongly disagreed. Nineteen per cent respondents were strongly agreed about chest tightness, 50.83 were agreed 16.67 per cent were strongly disagreed and 13.33 per cent were disagreed about having chest tightness. When reported about problem of shortness of breath, it was revealed that majority (40.83%) of the respondents were strongly agreed, 35.83 per cent were agreed, 14.17 per cent were disagreed, 7.5 per cent were strongly disagreed and 1.67 per cent were undecided about the problem of shortness of breath. Wagh *et al.* (2006) also depicted in their study on flour mill workers and resulted that 42 per cent of the workers were having shortness of breathing, 34 per cent of the workers were having continuous coughing and 19 per cent of the workers were having respiratory illness. In the present study, Table 5 revealed that nearly half of the respondents (51.67 per cent) were strongly agreed about suffering from asthma and 32.50 per cent were agreed about suffering from pneumonias.

Majority (50.83%) respondents were strongly agreed about suffering from frequent bronchitis, 32.5 per cent were agreed that they suffer frequently by bronchitis due to working environment. The extended exposure to irritating or toxic substances may cause acute and chronic respiratory ailments although single exposure can cause chronic disease in lower respiratory tract. Smith *et al.* (2000) also determined the prevalence of respiratory symptoms and their relationship to sensitization to wheat flour allergens in a group of flour mill workers.

### Assessment of the prevalence of upper respiratory tract problems among flour mill workers

The flour mill workers are highly exposed to harmful factors in their work environment such as dust, unfavorable microclimatic conditions etc. the occupationally related upper respiratory tract problems among flour mill workers are most likely due to the deposition of dust in the upper respiratory tract and influenced by the sort of dusts, the period of exposure, the dust concentration and size of dust in the breathing zone. It is shown in the Table 5 that approximate half (47.50) of the respondents were strongly agreed and 20 per cent of the respondents were agreed for nasal congestion. Forty per cent workers were agreed for having runny nose and 35.83 per cent were strongly agreed whereas five per cent workers were disagreed and 7.5 per cent workers were strongly disagreed about for having runny nose. Thirty per cent respondents were disagreed for post nasal drip, 16.67 per cent of the respondents were strongly disagreed and nearly twenty per cent of the respondents were strongly agreed and 25.83 per cent of the respondents were disagreed for post nasal drip. Approximate forty per cent (40.83 per cent) of the respondents were strongly agreed for itchy nose but 18.33 per cent of the respondents were also strongly disagreed for having problem of itchy nose. More than half (55.00 per cent) of the respondents were strongly agreed for red and itchy eyes whereas 9.17 per cent of the respondents were strongly disagreed for red and itchy eyes. Thirty five per cent of the respondents were strongly agreed and nearly same per cent (34.17 per cent) of the respondents agreed for having sinus pressure or pain but 8.33 per cent of the respondents were strongly disagreed for having sinus pressure or pain.

**Table 3: Distribution of respondents as per reported problems of skin** (N=120)

S.No.	Skin problems	StronglyAgreed	Agreed	Undecided	Disagreed	Strongly Disagreed
1	Skin rash	45(37.5)	36(30.00)	12(10.00)	24(20.00)	3(2.5)
2	Itching	34(28.33)	54(45.00)	-	11(9.17)	21(17.5)
3	Dry skin	51(42.50)	47(39.17)	7(5.83)	15(12.5)	-
4	Hives	43(35.83)	35(29.17)	-	27(22.50)	15(12.5)
5	Swelling	67(55.83)	41(34.17)	5(4.17)	-	7(5.83)
6	Blistery rashes	49(40.83)	57(47.50)	-	14(11.67)	-

**Table 4: Distribution of respondents as reported lower respiratory tract problems**

S.No.	Lower respiratory tract problems	StronglyAgreed	Agreed	Undecided	Disagreed	Strongly Disagreed
1.	Frequent or constant cough	15 (12.50)	27 (22.50)	10 (8.33)	32 (26.67)	36(30)
2.	Wheezing	38 (31.67)	44 (36.67)	3 (2.50)	27 (22.50)	8 (6.67)
3.	Chest tightness	23 (19.17)	61 (50.83)	-	16 (13.33)	20 (16.67)
4.	Shortness of breath	49 (40.83)	43 (35.83)	2 (1.67)	17 (14.17)	9 (7.50)
5.	Asthma	62 (51.67)	20 (16.67)	-	24 (20.00)	14 (11.67)
6.	Pneumonias	39(32.50)	41 (34.17)	5 (4.17)	11 (9.17)	24 (20.00)
7.	Frequent bronchitis	61 (50.83)	39 (32.50)	-	20 (16.67)	-



**Table 5: Distribution of respondents as reported Upper respiratory tract problems**

S. No.	Upper respiratory tract problems	Strongly Agreed	Agreed	Undecided	Disagreed	Strongly Disagreed
1.	Nasal congestion	57 (47.50)	39 (32.50)	-	24 (20.00)	-
2.	Runny nose	43 (35.83)	48 (40.00)	14 (11.67)	6 (5.00)	9 (7.50)
3.	Postal nasal drip	25 (20.83)	31 (25.83)	8 (6.67)	36 (30.00)	20 (16.67)
4.	Itchy nose	49 (40.83)	27 (22.50)	10 (8.33)	12 (10.00)	22 (18.33)
5.	Red or Itchy eyes	66 (55.00)	23 (19.17)	-	20 (16.67)	11 (9.17)
6.	Sinus pressure or pain	42 (35.00)	41 (34.17)	12 (10.00)	15 (12.50)	10 (8.33)
7.	Poor sense of smell	34 (28.33)	59 (49.17)	-	9 (7.50)	18 (15.00)
8.	Frequent ear infections	36 (30.00)	40 (33.33)	11 (9.17)	13 (10.83)	20 (16.67)
9.	Frequent Sinus infections	52 (43.33)	33 (27.50)	-	28 (23.33)	7 (5.83)
10.	Frequent colds	46 (38.33)	25 (20.83)	-	33 (27.50)	16 (13.33)
11.	Hoarse voice	44 (36.67)	37 (30.83)	-	20 (16.67)	19 (15.83)

Fifteen per cent of the respondents were strongly disagreed for having poor sense of smell whereas approximate half (49.17 per cent) and nearby thirty per cent (28.33 per cent) of the respondents were agreed and disagreed respectively for having poor sense of smell. Thirty per cent of the respondents were strongly agreed and 33.33 per cent of the respondents were agreed for having frequent ear infections. Nearby forty five (43.33) per cent of the respondents were strongly agreed and 27.5 per cent of the respondents were agreed for having frequent sinus infections whereas 23.33 per cent of the respondents were disagreed for having frequent sinus infections. More than thirty five per cent (38.33 per cent) of the respondents were strongly agreed and 20.83 per cent of the respondents were agreed for having frequent colds but 27.5 per cent of the respondents were disagreed and 13.33 per cent of the respondents were disagreed for having frequent colds. More than thirty five per cent (36.67 per cent) of the respondents were strongly agreed that they were suffering from hoarse voice followed by 30.83 per cent of the respondents were agreed, 16.67 per cent respondents disagreed and 15.83 per cent of the respondents were strongly disagreed that they were suffering from hoarse voice. Due to exposure to different concentration of inspirable flour dust for different time period, respondents working in the flour mill were at risk of developing serious upper respiratory tract problems. Prajapati *et al.* (2014) conducted a study on flour mill workers and when the FEV1/FVC ratio was studied in correlation with exposure, it was observed that the reduction in FEV1/FVC ratio showed a significant ( $p < 0.01$ ) positive correlation with the exposure time.

## CONCLUSION

Breathing in high concentration of dust over a long period affects respiratory system and contribute to many health problems. The process of making flour from grain in grain mill can stir up dust particles, making them easier to inhale. Grain mill workers are exposed to flour dust in a great extent for a considerable period and when the flour dust overwhelmed by the grain mill workers it resulted in

many health problems. In the present study high prevalence of allergic disorder among flour mill workers were seen and approximate half of the respondents were in agreement that they have problems such as cough, eczema, wheezing, nasal congestion, poor sense of smell, hives/swelling, and shortness of breath, itchy nose, headache and sneezing due to dust. Grain mill workers also reported that the skin problems such as skin rash, itching, dry skin, hives, swelling and blistering rashes as 37.5 per cent of the respondents were strongly agreed and 30 per cent were agreed that they have skin rashes. Forty five per cent of the respondents were agreed and 28.33 per cent were strongly agreed that they were having itching due to dust of flour. More than forty per cent (42.5 per cent) of the respondents were strongly agreed about dry skin problem and nearby thirty six per cent workers were strongly agreed for having hives. More than half of the respondents were strongly agreed for having swelling due to dust of flour. In terms of blistering rashes of workers, majority of them agreed and strongly agreed of having problems due to flour. Respondents were reported about frequent or constant cough and wheezing while nineteen per cent respondents were strongly agreed about chest tightness and flour mill workers were also reported about having problem of breathing, pneumonias as lower respiratory tract problems and frequent bronchitis. Majority of the respondents were suffering from upper respiratory tract problems such as nasal congestion, runny nose, postal nasal drip, itchy nose, red or itchy eyes, sinus pressure or pain, poor sense of smell, frequent ear infections, frequent sinus infections, frequent colds and hoarse voice. Therefore, from the present study, it can be concluded that respondents in flour mill with workplace exposure to flour dust have high prevalence of allergic, skin and respiratory problems. Limitation of the present study was the restricted sample size due to non availability of other grain mills in the selected locale.

## Practical significance of the present study

The findings of the present study brought out a number of implications for concerned users, researchers,

manufacturers and extension workers.

**For concerned users:** This study may help to the users to make them aware about health risks and allergic disorders encountered at work so that they may adopt safety and preventive measures.

**For researchers:** This study is very helpful to the researchers to focus attention towards the safety and protection of the flour mill workers.

**For manufacturers:** The findings of the present study may provide useful data for those who are developing new personal protective equipments which reduce the risks and hazards of allergies among mill workers.

**For extension workers:** This study help the extension workers to sensitize the issues related to mill workers to develop interest among them to adopt safety and preventive measures.

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