

## RESPIRATORY DISEASES AMONG AGRICULTURAL INDUSTRY WORKERS IN INDIA: A CROSS-SECTIONAL EPIDEMIOLOGICAL STUDY

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**Abstract:** Epidemiological survey for respiratory diseases among agricultural industry workers, such as bakeries, poultry farms, granaries and a sugar refinery was carried out using a medical questionnaire on various respiratory symptoms such as cough, breathlessness, rhinitis. The questionnaire was filled up by two doctoral students during personal visits to these work environments. The survey revealed that 40–59% of workers in different occupational work environments suffered from one or more respiratory ailments. As much as 36–40% of the workers reported work-related symptoms which is close to similar data from Western countries. A higher incidence of respiratory disorders was recorded in workers with longer duration of employment. Older workers suffered more than the young ones. Family history of atopy was found to have least effect on the incidence of cough, breathlessness and rhinitis in the workers. Smoking was found to have definite impact on the incidence of cough and breathlessness.

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### INTRODUCTION

In recent years, a strong awareness has grown of the effects of environmental air pollution on the human respiratory tract. Increase in bronchitis, chronic cough and asthma among the population has been recorded with exposure to pollutants, even below standard international levels [1, 26]. Besides chemical pollutants, large quantities of organic dust particles are also released into the air of agricultural industries. The dust contains high concentrations of bioaerosols, such as bacteria, actinomycetes, and fungi of plant and animal origin. The concentration and pathogenicity of these bioaerosols depend on source materials, method of their storage, technology of processing materials and their disposal [9]. These bioparticulates play an important role in triggering respiratory allergic ailments and nonspecific inflammatory reactions in the lungs of exposed subjects [17, 22, 25].

Respiratory ailments associated with work place have been reported by various authors [11, 20, 27, 31, 33, 34, 41] from different countries among workers in different agricultural facilities, such as sugar refineries, granaries, bakeries, poultry farms, swine farms, tanneries, etc. There is substantial evidence that workers handling grain dust develop respiratory symptoms [37].

Epidemiological surveys pertaining to various forms of respiratory dysfunction are of paramount importance and are carried out as regular programmes in several countries [11, 14, 16]. Such studies have been lacking in India and need to be performed to obtain statistics of people suffering from occupational respiratory disorders. In the present investigation an attempt has been made for the first time to record from India the work-related respiratory dysfunction in workers of such diverse environments of bakeries, poultry farms, granaries and sugar refineries with the help of a medical questionnaire.

## MATERIALS AND METHODS

To determine the prevalence of respiratory disorders among the workers of bakeries, poultry farms, granaries and sugar refineries, a medical questionnaire (Appendix 1) was designed, based on the pattern of Love *et al.* [14]. The questionnaire was suitably modified for different occupational sites and comprised more than 100 parameters on the personal and family history of workers such as age, gender, family history of atopy, period of association with the job, nature, smoking habits and onset and duration of various respiratory disorders and.

### Working Sites

**Bakeries.** A public sector unit located in Delhi with more than 600 workers and 3 smaller units were selected for survey. The unit is surrounded by other small bakery units, and industrial units such as cold storage, ice cream and soft drinks manufacturing units. Major areas of activity in bakery were storage, mixing and packing sections, besides administrative and other supporting staff.

**Poultry farms.** There are about 70 large and small poultry farms located on the outskirts of Delhi employing more than 2000 workers. These were generally surrounded by agricultural tracts and small scale industries. The poultry sheds used deep litter system for older birds, and saw dust floors for young ones. Each farm comprises 10–20 sheds with 200–300 birds in each. Questionnaires were filled up from several of these poultry farms.

**Granaries.** The Food Corporation of India and Central Warehouse Corporation, the main grain storage houses in India and located near Delhi, were selected for epidemiological survey. Each of the granaries employ 400–600 regular and daily wage workers for handling incoming and outgoing cereals. The facilities are used to store wheat, rice, legumes, oilseeds, etc. Most of the workers do not use any mask during operation.

**Sugar refinery.** Sugar refinery located about 50 km from Delhi was selected. More than 500 regular and seasonal workers were employed in this facility. The operation period is generally from October to April. The different sections of the factory were broadly categorised as cane cutting, boiler, packing and bagasse storage areas. The workers handling bagasse use loose cloth and do not wear any protective mask.

### Study Population

Altogether, 279 workers from bakeries, 144 from poultry farms, 353 from granaries and 200 from the sugar refinery were surveyed to determine the incidence of respiratory disorders in working population. The facilities were located in and around Delhi. The study population in bakeries included workers from the production, laboratory,

maintenance and administration areas. In poultry farms, workers handling eggs, chicken feed, cleaning coops and veterinary officials were included. The work population in granaries comprised of workers involved in loading and unloading of grain bags and in cleaning, administration workers and overseers from two granaries. In the sugar refinery, the survey covered workers from cane cutting and bagasse storage regions, operational units and establishments.

### Method of the Survey

The objectives of the survey were explained to the workers in local language by personal visits by the two doctoral students over a period of two years. A detailed questionnaire (Appendix 1) was filled up with due consent from those who volunteered for the study, as most of the workers had a poor educational background. The workers suspected of having respiratory symptoms were studied for their inhalant allergens, particularly moulds. This study, however, was not included in the present paper.

### Statistical Analysis

The detailed questionnaire survey was analysed with the aid of a computer package. Chi square test was applied to study the association of two or more epidemiological factors after sorting out the data into  $r$  (row)  $\times$   $c$  (column) contingency tables. Pooling with adjacent cell was carried out, whenever observed cell frequency was found to be less than 5. In cases where chi square test could not be applied, the Fisher's exact probable test was used to find significant differences between groups.

## RESULTS

### Occurrence of Respiratory Disorders with Respect to Age and Duration of Job

Demographics of work population surveyed are provided in Table 1. The average age of workers in bakeries was 29, in poultry farms 26, granaries 35.5 and in sugar factory 39 years. The lowest age of the workers was 16 years in a poultry farm, while the maximum was 74 years in the sugar refinery. More than 99% of workers were male in all the workplaces. The percent of symptomatics, i.e. workers reporting to have one or more respiratory problems, was the highest in poultry farms (59%), followed by the sugar refinery (42.5%), granaries (40.5%) and bakeries (40.1%). The workers having a family history of respiratory problems (atopics) formed only 4.2% of the total workers surveyed in granaries, but 18% in poultry farms. The majority of the symptomatic workers in bakeries and poultry farms were in the age group of less than 29 years, whereas in the other two environments most of such workers were in the age group of 30–44 years.

**Table 1.** Distribution of workers with family history of atopy and symptoms of respiratory disorders at different occupational sites.

Sites	Total number of workers	Age (years)			Gender		Family history of atopy		Symptoms of respiratory disorders	
		Average	Max.	Min.	M	F	n	%	n	%
Bakeries	279	29	55	19	277	2	23	8.2	112	40.1
Poultry farms	144	26	70	16	141	3	26	18.1	86	59.0
Granaries	353	35.5	56	18	351	2	15	4.2	143	40.5
Sugar refinery	200	39	74	19	200	0	10	5.0	85	42.5

Atopy: Having definite family history of respiratory allergic symptoms. M - Male; F - Female

The highest prevalence of work-related symptoms (40.2%) was recorded in poultry farm workers, closely followed by workers of the sugar refinery (39.4%) (Tab. 2). An increase in work-related symptoms at respective workplaces was reported by most of the workers having work-related respiratory problems. The majority of these workers reported having less or no symptoms when away from workplace.

The distribution of a positive response to the query about occurrence of respiratory disorders with the progression of duration of job is given in Table 3. Considerable positive response (>60%) was recorded in poultry farm workers with more than 10 years duration of job, while the lowest (8.3%) was recorded in workers of the sugar refinery. In poultry farms, only two workers had a long association with the job greater than 15 years, while most of them had been working for less than 5 years. Granaries had 138 workers with more than 15 years of employment. A distinct relationship was recorded between positive response and job duration in poultry farms. Many workers felt an increase in their respiratory symptoms over a period since joining the poultry farms. In other environments such a relationship was not found.

The incidence of cough, breathlessness and rhinitis with respect to age and duration of job in different work environments is presented in Tables 4 and 5.

**Table 2.** Prevalence of work-related respiratory disorders in workers of different agricultural industry facilities.

Occurrence of symptoms	Percent (%) of workers with positive response			
	Bakeries	Poultry farms	Granaries	Sugar refinery
Symptoms associated with workplace	36.0	40.2	37.5	39.4
Increase in symptoms at workplace	30.0	36.4	34.5	36.2
Specific area where symptoms aggravate	26.0/10.0 ST/PK	32.1/8.2 SH/HT	14.0/20.4 GD/LD	27.2/3.8 BG/CC
Better when away from workplace	33.0	38.2	34.0	28.4

ST= Storage section; PK= Packing section; SH= Shed; HT= Hatchery; GD= Godown; LD= Loading /Unloading; BG= Bagasse storage; CC= Cane cutting section

### Symptoms of Persistent Cough

**Bakeries.** Cough was reported by 22.2% of the 279 bakery workers surveyed, of which 60% had it with phlegm and the rest had a dry cough. The worst period was from November to February. The incidence of cough was invariant with the age of the workers ( $p > 0.05$ ) (Tab. 4). Gradual increase in the incidence of cough was observed with increased duration of job. The highest incidence of cough (34.2%) was reported by workers more than 15 years association with the job (Tab. 5).

**Poultry farms.** Of the 144 poultry farm workers surveyed, 35.4% reported having the cough, with a worst period being from November to February. Dry cough was reported by 35.0% of symptomatic workers, while 65.0% had cough with phlegm. Older age significantly influenced the incidence of cough ( $p < 0.01$ ). Workers with more than 10 years of employment had cough in 85.7% of the cases.

**Granaries.** Of the 353 granary workers surveyed, only 21.5% reported having a cough. From those having a cough 35.5% had dry cough, while 63.1% had cough with phlegm. The worst period of suffering was from November to February, similar to other environments.

**Table 3.** Distribution of a positive response to the query about occurrence of respiratory problems with respect to period of association with the job.

Period of association with the job	Bakeries	Poultry farms	Granaries	Sugar refinery
	Total / Yes	Total / Yes	Total / Yes	Total / Yes
≤ 5	129/16 12.4%	102/23 22.5%	37/10 27.0%	44/9 20.5%
6–10	63/9 14.3%	26/6 23.1%	82/20 24.4%	24/2 8.3%
11–15	46/8 17.4%	14/9 64.2%	96/22 22.9%	28/3 10.7%
> 15	41/6 14.6%	2/2 100%	138/27 19.6%	104/17 16.4%

**Table 4.** Incidence of different respiratory symptoms among workers from different work environments with respect to the age (years).

Respiratory symptoms		Bakeries			Poultry farms			Granaries			Sugar refinery		
		<29	30–44	>45	<29	30–44	>45	<29	30–44	>45	<29	30–44	>45
Cough	n	30	29	3	32	17	2	12	48	16	5	16	17
	%	18.0	29.6	20.0	31.1	44.7	66.6	16.4	20.6	34.0	10.4	19.3	24.6
Breathlessness	n	11	15	4	14	12	2	2	23	10	1	9	10
	%	6.6	15.3	26.5	13.6	31.6	66.6	2.7	9.9	21.3	2.1	10.8	14.5
Rhinitis	n	33	23	5	30	21	2	12	37	9	8	17	11
	%	19.9	23.5	33.3	29.1	55.2	66.6	16.4	15.9	19.1	16.7	20.4	15.9

Older workers suffered significantly ( $p < 0.05$ ) more from cough than their younger counterparts. Incidence of cough in the workers of granaries was found to be significantly ( $p < 0.05$ ) influenced by the time of employment, and also by family history of atopy. A strong association ( $p < 0.001$ ) between smoking and incidence of cough was established, as out of 76 workers having cough, 53 were smokers.

**Sugar refinery.** Out of 200 workers surveyed in the sugar refinery, 38% reported having persistent cough. Of these, 21.1% had dry cough and 71% had cough with phlegm. The period from November to February was the worst period for most of the sugar refinery workers, as also observed in other agricultural facilities. Surprisingly, there was no significant association ( $p > 0.05$ ) of cough with age, family history of atopy and period of employment, contrary to the workers of poultry farms and bakeries.

**Symptoms of Breathlessness**

**Bakeries.** Out of 279 bakery workers surveyed, only 10.8% suffered from breathlessness, of whom 66% had it along with wheeze. The worst period of breathlessness was from November to February. Most of the workers suffering from breathlessness were over 45 years of age (Tab. 4). The workers with a longer period of employment reported a higher incidence (29.3%) of breathlessness (Tab. 5).

**Poultry farms.** Breathlessness was observed in 19.4% of poultry workers surveyed. Of these, 57% reported having wheeze, while 28% had no wheeze. The remaining 15% either could not pinpoint or had both the types of symptoms during different times of the year. A high incidence of breathlessness (31.6%) was observed in the age group of 30–44 years, as compared to only 13.6% incidence in workers under 29 years. Workers with a long period of association with their jobs in poultry farms (11–15 years) had significantly higher incidence ( $p < 0.05$ ) of breathlessness (42.9%) as compared to workers with a short period (<5 years) of employment (11.8%).

**Granaries.** Of the total of 353 granary workers surveyed, only 35 (9.9%) suffered from breathlessness. Breathlessness with wheeze was observed in 34.2% of symptomatic workers, while others experienced no wheeze. Older workers suffered significantly more ( $p < 0.05$ ) from breathlessness as compared to their younger counterparts (Tab. 4). However, duration of job did not significantly influence breathlessness ( $p > 0.05$ ) in granary workers (Tab. 5).

**Sugar refinery.** In the sugar refinery, 10% of the 200 workers surveyed suffered from breathlessness and 80% of them had wheeze. Breathlessness was found independent of age and family history. However, it varied significantly ( $p < 0.05$ ) with the duration of job (Tab. 5).

**Table 5.** Incidence of different respiratory symptoms among workers of different work environments with respect to duration of the job (years).

Respiratory symptoms		Bakeries				Poultry farms				Granaries				Sugar refinery			
		<5	6–10	11–15	>15	<5	6–10	11–15	>15	<5	6–10	11–15	>15	<5	6–10	11–15	>15
		129 <sup>a</sup>	63	46	41	102	26	14	2	37	82	96	138	44	24	28	104
Cough	n	21	13	14	14	29	8	12	2	3	19	15	39	6	2	4	26
	%	16.3	20.6	30.4	34.1	28.4	30.8	85.7	100	8.1	23.2	15.6	28.3	13.6	8.3	14.3	25.0
Breathlessness	n	4	5	9	12	12	6	6	2	2	7	8	18	2	2	1	15
	%	3.1	7.9	19.6	29.3	11.8	23.1	42.9	100	5.4	8.5	8.3	13.0	4.5	8.3	3.6	14.4
Rhinitis	n	23	18	10	10	28	9	14	2	5	12	17	24	8	4	4	20
	%	17.9	28.6	21.7	24.4	27.5	34.6	100	100	13.5	14.6	17.7	17.4	18.2	16.7	14.3	19.2

<sup>a</sup> Total number of workers

### Effect of Smoking Habits on Cough and Breathlessness

Among "bidi"\* and cigarette smokers from bakeries 33.3% and 25.0%, respectively, reported having persistent cough and 17.4% and 16.6%, respectively, reported having breathlessness. In poultry farms, almost 50% of the workers who smoked suffered from bouts of cough.

In granaries, out of the total 353 workers surveyed, 151 were regular smokers and 28 were irregular smokers. Considering the type of smoking it was found that 63.2% used "bidies", 18.9% chewed tobacco and only 10.6% were cigarette smokers. In the sugar refinery, out of 200 workers, 42% were regular smokers. Smoking habit significantly influenced the incidence of cough ( $p < 0.001$ ) in workers of granaries and sugar factory, but did not influence significantly breathlessness ( $p > 0.01$ ).

### Symptoms of Rhinitis

**Bakeries.** Various symptoms of rhinitis (running nose, persistent cold and watery eyes) were observed in 21.9% of 279 workers surveyed in the bakeries, and more than half of them were below 29 years of age. Contrary to cough and breathlessness, there was no evidence of significant association of any kind between age and period of association with the job and the incidence of rhinitis ( $p > 0.05$ ). It is interesting to note that 50.8% of workers having rhinitis were also suffering from cough, and 20% from breathlessness. This indicates a strong influence of rhinitis on the incidence of cough and breathlessness ( $p < 0.05$ ) as also observed in clinical practice.

**Poultry farms.** Symptoms of rhinitis were reported by 36.8% of the poultry workers. All the workers with a job duration greater than 11 years in a poultry farm, had symptoms of rhinitis (Tab. 5). As in the case of bakery workers, the incidence of rhinitis had a bearing on the incidence of both cough and breathlessness.

**Granaries.** In the granaries, only 58 (16.4%) workers out of 353 had rhinitis. Of these, 4% had sneezing, 45 had running nose and 41 had itching in the nose. Incidence of rhinitis was invariant with age, family history of atopy and duration of employment, but was significantly associated with smoking habit of workers ( $p < 0.01$ ). Further, the incidence of rhinitis was significantly associated ( $p < 0.01$ ) with cough as well as with breathlessness.

**Sugar refinery.** In the sugar refinery, 18% of the surveyed workers reported having rhinitis. Its incidence was invariant with age and duration of the employment of the subjects. It appeared to be slightly related to family history of atopy. Incidence of rhinitis was strongly related ( $p < 0.01$ ) to the incidence of cough and breathlessness.

### DISCUSSION

Response to questionnaire survey in different workplaces revealed that 40% of bakery and granary workers, 42% of sugar refinery workers and even 59% of poultry farm workers suffered from one or more respiratory problems. This figure is 4–5 times higher than the estimates from a small sample of general population survey for allergic ailments carried out about 3 decades ago in Delhi [39]. According to a survey conducted recently [7] occupational asthma alone accounts for 5–15% of total cases of asthma.

The prevalence of respiratory symptoms among agricultural subjects residing near the workplaces was not investigated and thus the prevalence of respiratory disorders in workers could not be compared with such a control group. The percentage of employees working in offices and establishments was far less than those working in other sections of different facilities.

The information on family history of disease from workers of all the facilities surveyed, has shown that hereditary factors (atopy) did not influence the incidence of respiratory symptoms in examined workers ( $p > 0.05$ ), except in granaries where incidence of cough was significantly associated with family history ( $p < 0.05$ ). Thus, environment seems to have influenced the onset of symptoms in these groups of workers. The greater role of environment as compared to genetic factor has also been emphasised by other workers in the case of respiratory allergy [3, 27].

Work-related respiratory symptoms in different agricultural industry facilities were reported by more than 40% workers of poultry farms, followed by sugar refinery workers. In all the work environments, respiratory symptoms were reported to increase by most of the symptomatic workers. In the storage section of the bakeries, more workers suffered compared to those working in the packing unit. This could be due to the presence of flour dust containing microbial and mite populations [16].

In poultry farms, those working in sheds suffered more than the workers of the hatchery section. It is possible that feeds in the poultry shed with a rich microbial content could sensitize work population due to extensive exposure.

In granaries, workers engaged in the loading and unloading of grain had a higher prevalence of respiratory symptoms than those working in godowns. Workers handling grain are exposed to much higher levels of microbial allergens than the general population [13]. Grain dust asthma and rhinitis is known to be triggered by different allergens present in grain dusts around the exposed population [4, 5, 43]. Occurrence of work-related respiratory symptoms in India is observed to be as high as in Polish farmers [36] handling grain dust. Work-related respiratory symptoms are also reported by 58.5% of the employees working on pig farms in Poland [15]. Our observations on occupation-related respiratory disorders are thus broadly in agreement with other workers.

\* "Bidi smokers": Those who smoked "bidi", e.g. an indigenous preparation made of dry tobacco powder wrapped in a tree leaf.

It is interesting to note that age had no influence on the incidence of cough and rhinitis in workers of bakeries, granaries and sugar factory. By contrast, age significantly ( $p < 0.05$ ) influenced the incidence of breathlessness in the subjects of all the work environments under study. Older workers had a higher incidence of breathlessness as compared to their younger counterparts. This could be partially due to chronic obstructive lung damage. Age significantly ( $p < 0.05$ ) influenced the incidence of cough and rhinitis in poultry farm workers.

In the case of poultry farm workers, the incidence of respiratory symptoms increased with the duration of employment. Thus, it could be possible to predict association between the duration of job in this environment and the severity of symptoms. It is probable that different environments have a different effect on the workers, with poultry environment playing a greater role in causing respiratory/allergic dysfunction, compared to other environments studied.

Period of association with the job is an important epidemiological factor that influenced the incidence of cough and breathlessness among the bakery and poultry farm workers. It also influenced the incidence of cough in the granary workers, and the incidence of breathlessness in sugar refinery workers. More than 50% of bakery and poultry farm workers were employed for 1–10 years, and it was found that the incidence of cough, breathlessness and rhinitis in both work environments was significantly correlated with job duration ( $p < 0.05$ ).

However, in bakery workers, rhinitis was not observed to be influenced by period of employment. Moreover, the incidence of rhinitis usually did not vary among the workers of different sections, indicating that rhinitis is not associated or influenced ( $p > 0.05$ ) by working sections of a particular facility. In bakeries, this could be due to rotational shift of workers in different sections. On the contrary, workers dealing with chicken feed in poultry farms had the highest incidence (55.8%) of rhinitis.

Most of the workers having symptoms reported their seasonal occurrence, with the worst period being the winter season (November–February). This could be due to bacterial or viral infections, as has been suggested by other workers [11, 26].

Smoking habit was recorded in more than 30% of bakery and poultry farm workers and over 70% of the smokers smoked “bidi”. An interesting feature observed was that smoking habit influenced significantly the incidence of cough in the workers ( $p < 0.001$ ) but had no direct effect on breathlessness and rhinitis. It is assumed that smoking has an additive effect on the incidence of respiratory diseases [8, 38]. Recently, Zuskin *et al.* [41] have observed that swine confinement workers with smoking habit had significantly higher prevalence of chronic cough, phlegm and bronchitis as compared to nonsmokers.

Another interesting observation made during the present survey was the significant association of incidence of cough and breathlessness with the incidence

of rhinitis. This confirms the common clinical observation that rhinitis if not treated in time may lead to development of bronchial asthma.

### **Airborne Fungi in Agricultural Industry Facilities and Their Effect on Exposed Workers**

We have reported qualitative and quantitative prevalence of airborne fungi in each of the above work environments studied [19, 21, 32, 35]. *Aspergillus* spp., *Penicillium* spp., smuts and *Cladosporium* spp. constituted up to 90% of the total fungal spore load in a bakery. *Aspergillus flavus* was characteristic of the storage section of a bakery while *Aspergillus niger* of the packing section. Skin test results in bakery workers with fungal allergens prevalent indoors showed a marked positivity which was confirmed by the raised specific IgE antibodies in the sera of symptomatic workers [32, 34].

In poultry farms, the air had a higher concentration of fungi in the places where poultry was kept (sheds), than in control air. *Candida albicans*, smuts, *Scopulariopsis brevicaulis* and *Penicillium nigricans* were found to be characteristic of poultry sheds, while *Aspergillus flavus*, *A. niger* and *Cladosporium* of hatchery. ELISA measurements in the sera of poultry farm workers for fungal specific IgE antibodies revealed that *Aspergillus sydowi*, *A. japonicus* and *Scopulariopsis brevicaulis* elicited raised IgE in a greater number of workers compared to the control group [33, 35].

*Aspergillus flavus* and *Ustilago* (smut) were the most predominant fungi in a grain storage facility. Their concentration was significantly higher ( $p < 0.005$ ) than in outside control air [21].

In the bagasse unit and cane cutting sections of the sugar refinery, thermophilic fungi and actinomycetes were important components of air. We found sensitization to different species of *Aspergillus*, *Penicillium nigrum* and *Saccharomyces cerevisiae* in the workers of the sugar refinery. Thermophilic actinomycetes and *A. fumigatus* are known causes of bagassosis in the sugar refinery workers. High titres of specific IgE antibodies against these microorganisms were observed in the sera of the symptomatic workers of the sugar refinery [19, 20].

### **CONCLUSIONS**

From the present survey pertaining to respiratory/allergic symptoms among the workers of different agricultural industry facilities in India, it is concluded that: respiratory symptoms in employees of different facilities range from 40–60%, and 36–40% of workers have definite work-related symptoms. These figures are broadly comparable to the prevalence of respiratory symptoms in workers from UK, USA and Poland. Family history seems to have least effect on the incidence of work-related cough, breathlessness and rhinitis. The longer the duration of employment, the higher was the prevalence of respiratory symptoms in workers. Smoking

habits influence the incidence of cough, and to some extent breathlessness. Rhinitis influences significantly the incidence of both cough and breathlessness.

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**APPENDIX 1**

**QUESTIONNAIRE FOR SURVEY OF OCCUPATIONAL RESPIRATORY DISORDERS DUE TO OCCUPATIONAL HAZARDS  
(FUNGAL SPORES AND OTHER FACTORS)  
IN WORKERS OF DIFFERENT WORK ENVIRONMENTS**

**Delhi University Campus, Centre for Biochemical Technology, Delhi - 110007 (India)**

Place of work \_\_\_\_\_

Kindly answer questions wherever possible

**PERSONAL DATA**

1. Name \_\_\_\_\_  
 2. Address \_\_\_\_\_  
 3. Gender  Male /  Female  
 4. Age \_\_\_\_\_ Years  
 5. Date of birth \_\_\_\_\_  
 6. Occupation \_\_\_\_\_  
 7. Association with present occupation \_\_\_\_\_  
 8. Period of stay in Delhi \_\_\_\_\_ Years  
 9. State of origin \_\_\_\_\_

**HEALTH STATUS**

Nature of symptoms	Yes / No	Duration
Cough	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Wheezing	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Rhinitis	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Conjunctivitis	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Breathlessness	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Eczema	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years
Other _____	<input type="checkbox"/> Yes / <input type="checkbox"/> No	_____ Years

**A. COUGH**

1. Nature of cough	Dry cough <input type="checkbox"/>		Cough with phelgm <input type="checkbox"/>					Blackish <input type="checkbox"/>					
2. Colour of phlegm	Yellow <input type="checkbox"/>		White <input type="checkbox"/>										
3. Period of symptoms	Seasonal <input type="checkbox"/>		Perennial <input type="checkbox"/>					Irregular <input type="checkbox"/>					
4. Worst months	J	F	M	A	M	J	J	A	S	O	N	D	
5. Time of onset of symptoms	(a.m.)	1	2	3	4	5	6	7	8	9	10	11	12
	(p.m.)	1	2	3	4	5	6	7	8	9	10	11	12

**B. BREATHLESSNESS**

1. Nature of breathlessness	With wheezing <input type="checkbox"/>		Without wheezing <input type="checkbox"/>					Exertional <input type="checkbox"/>					
2. Period of symptoms	Seasonal <input type="checkbox"/>		Perennial <input type="checkbox"/>					Irregular <input type="checkbox"/>					
3. Worst months	J	F	M	A	M	J	J	A	S	O	N	D	
4. Time of onset of symptoms	(a.m.)	1	2	3	4	5	6	7	8	9	10	11	12
	(p.m.)	1	2	3	4	5	6	7	8	9	10	11	12

**C. RHINITIS**

1. Nature of symptoms	Running nose <input type="checkbox"/>	Itchiness of nose <input type="checkbox"/>					Sneezing <input type="checkbox"/>				Stuffiness of nose <input type="checkbox"/>		
2. Period of symptoms	Seasonal <input type="checkbox"/>	Perennial <input type="checkbox"/>					Irregular <input type="checkbox"/>						
4. Worst months	J	F	M	A	M	J	J	A	S	O	N	D	
5. Time of onset of symptoms	(a.m.)	1	2	3	4	5	6	7	8	9	10	11	12
	(p.m.)	1	2	3	4	5	6	7	8	9	10	11	12

**D. CONJUNCTIVITIS**

1. Nature of symptoms	Watering of eyes <input type="checkbox"/>	Redness of eyes <input type="checkbox"/>					Irritation of eyes <input type="checkbox"/>				Swelling of inner lids <input type="checkbox"/>		
2. Period of symptoms	Seasonal <input type="checkbox"/>	Perennial <input type="checkbox"/>					Irregular <input type="checkbox"/>						
3. Worst months	J	F	M	A	M	J	J	A	S	O	N	D	
4. Time of onset of symptoms	(a.m.)	1	2	3	4	5	6	7	8	9	10	11	12
	(p.m.)	1	2	3	4	5	6	7	8	9	10	11	12

**E. ECZEMA**

1. Site of occurrence _____													
2. Period of symptoms	Seasonal <input type="checkbox"/>	Perennial <input type="checkbox"/>					Irregular <input type="checkbox"/>						
3. Worst months	J	F	M	A	M	J	J	A	S	O	N	D	
4. Time of onset of symptoms	(a.m.)	1	2	3	4	5	6	7	8	9	10	11	12
	(p.m.)	1	2	3	4	5	6	7	8	9	10	11	12

**F. OTHER CHEST ILLNESS**

		Duration
Heart trouble	Yes / No	_____ Years
Bronchitis	Yes / No	_____ Years
Pneumonia	Yes / No	_____ Years
Tuberculosis	Yes / No	_____ Years
Other _____	Yes / No	_____ Years
Other _____	Yes / No	_____ Years

**G. OTHER PROBLEMS**


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**H. SMOKING HABITS**

1. Do you smoke?	Yes / No											
2. If yes	Irregularly <input type="checkbox"/>	Regularly <input type="checkbox"/>	Chain smoker <sup>a</sup> <input type="checkbox"/>									
3. No of smokes / day _____												
4. Type	Manufactured cigarettes <input type="checkbox"/>	Handrolled cigarettes <input type="checkbox"/>	Bidis <sup>b</sup> <input type="checkbox"/>	Pipe <input type="checkbox"/>	Cigar <input type="checkbox"/>							

**I. FAMILY HISTORY**

1. Relatives affected	Father <input type="checkbox"/>	Mother <input type="checkbox"/>	Grand father / mother <input type="checkbox"/>	Siblings <input type="checkbox"/>
2. Brief history in words _____				

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**J. PREVIOUS MEDICATION IF ANY**

Allopathic <input type="checkbox"/>	Homeopathic <input type="checkbox"/>	Ayurvedic <sup>c</sup> <input type="checkbox"/>	Unani <sup>d</sup> <input type="checkbox"/>
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Drugs taken if any, give details \_\_\_\_\_

<sup>a</sup> Chain smokers are those who smokes several cigarettes / bidi at frequent intervals per day.

<sup>b</sup> Bidi is an indigenous preparation where dry tobacco powder is wrapped in a tree leaf.

<sup>c</sup> Ayurvedic medicines are based on traditional hindu system of ancient medicine and are made from natural products.

<sup>d</sup> Unani medicines are also based on alternative medicine. They originated from Greece, flourished in Persia and were adopted in India during mughal period.



**QUESTIONNAIRE FOR SURVEY OF OCCUPATIONAL RESPIRATORY DISORDERS DUE TO OCCUPATIONAL HAZARDS  
(FUNGAL SPORES AND OTHER FACTORS)  
IN WORKERS OF GRANARY**

**Delhi University Campus, Centre for Biochemical Technology, Delhi - 110007 (India)**

Name of the GRANARY \_\_\_\_\_

Kindly answer question wherever possible

1. Employment at the granary                      Regular                       Casual                       Seasonal
2. Number of years with the present job                      \_\_\_\_\_ Years
3. Numbers of hours spent at the granary/ day                      \_\_\_\_\_ Hours
4. Nature of work                      Handling                       Cleaning                       Office work                       Transportation
5. Type of food grain handled                      Rice / wheat / maize / others
6. Do you feel your symptoms are associated with your work in granary ?                      Yes / No  
If yes, whether                      Immediately                       After some time
7. Is there any specific area / section where your symptoms aggravate ?  
If yes, specify \_\_\_\_\_
8. Do you feel worse in                      Close environment                       Open environment
9. Do you feel better                      Away from work place                       After working hours                       During holiday
10. Any other information you wish to give \_\_\_\_\_

Signature \_\_\_\_\_

**QUESTIONNAIRE FOR SURVEY OF OCCUPATIONAL RESPIRATORY DISORDERS DUE TO OCCUPATIONAL HAZARDS  
(FUNGAL SPORES AND OTHER FACTORS)  
AMONG WORKERS OF SUGAR REFINERIES**

**Delhi University Campus, Centre for Biochemical Technology, Delhi - 110007 (India)**

Name of the SUGAR REFINERY \_\_\_\_\_

Kindly answer questions wherever possible

1. Employment at the sugar refinery                      Regular                       Casual                       Seasonal
2. Number of years with the present job                      \_\_\_\_\_ Years
3. Number of hours spent at the sugar refinery/day                      \_\_\_\_\_ hours
4. Nature of the work                      Office work                       Handling instruments                       Handling sugar cane                       Handling bagasse   
Others \_\_\_\_\_
5. Do you feel your symptoms are associated with work in sugar refinery?                      Yes / No
6. Do your symptoms increase when you enter the sugar refinery?                      Yes / No  
If yes, whether                      Immediately                       After some time
7. Is there any specific area in the sugar refinery where your symptoms aggravate?  
If yes, specify \_\_\_\_\_
8. Do you feel worse in                      Closed environment                       Open environment
9. Do you feel better                      Away from the working place                       After working hours                       During holidays
10. Any other information you wish to give \_\_\_\_\_

SIGNATURE \_\_\_\_\_