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Occupational respiratory dysfunction among bakery workers

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ABSTRACT

Background: Work environment has a great influence on health of an industrial worker. Various health effects have been reported in workers of small and large-scale industries. The pulmonary involvement among the workers in small bakeries was assessed in the present work.

Methods: Thirty bakery workers between 20–40 years of age, working for at least 1 year were assessed for their respiratory symptoms and pulmonary functions. Parameters were compared with 30 age and sex matched controls that were not exposed to the same environment.

Results: Respiratory symptoms were observed in the exposed group—cough and breathlessness being the commonest. A significant decrease in forced expiratory volume in first second (FEV1) (2.89 ± 0.52 vs. 3.38 ± 0.48) and forced vital capacity (FVC) (3.37 ± 0.44 vs. 3.75 ± 0.62) was observed in bakery workers. No significant difference was observed in the flow rates, FEV1/FVC ratio and other lung volumes and capacities.

Conclusion: Results are pointing towards restrictive involvement of lungs in these workers. Regular periodic screening and preventive measures should be undertaken.

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1. Introduction

Health of an industrial worker is greatly influenced by their work environment. Indian industries often employ inexpensive and hazardous technology due to financial constraint resulting in adverse health effects to its employees [1–14]. This is especially true for unorganized small scale sector.

The respiratory involvement has been reported in workers exposed to a variety of dusts in small and large-scale industries, which generate dust during their production process [5]. The lung is an important site of contact with these substances in the environment as it has extensive surface area, high blood flow and thin alveolar epithelium [6].

Respiratory disease in bakers has been reported earlier [7]. In the baking industry, exposure to wheat flour dust may cause respiratory illness of varying nature and severity, ranging from simple irritant symptoms to allergic rhinitis or occupational asthma [8–10]. Potential allergens implicated are the components of wheat flour itself, flour contaminants, such as mites, weevils and moulds, or flour additives, especially yeast and *Aspergillus* derived

amylase [11]. Bakers are exposed to higher temperatures which also contribute to ill health. While working near ovens, temperatures zoom to 55–60 °C, moreover the ventilation and fresh air supply is not proper in these areas. Various studies have reported deranged respiratory functions and sensitization among bakery workers [9–11].

There is a scarcity of researches done on bakery workers per se, especially in India. Very few studies have been done regarding measurement and documentation of pulmonary functions of bakery workers especially those working in small bakeries [5,7]. Therefore, the proposed cross sectional study aims to analyze the pulmonary involvement among the workers in small bakeries and compare these functions with age and sex matched non exposed controls.

2. Methodology

The study was conducted in Department of Physiology, University College of Medical Sciences (UCMS) and Guru Teg Bahadur Hospital, Delhi. Ethical clearance was obtained from Institutional Ethics Committee for Human Research (IEC-HR), UCMS, Delhi. Written informed consent was taken from the subjects before starting the study.

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2.1. Subjects

Thirty male bakery workers, between 20 and 40 years of age, occupationally exposed to bakery were recruited for the study. They were working for at least 4–6 hours/day & 5–6 days/week for at least 1 year. All the workers were recruited from the same bakery. Controls were thirty males not exposed to bakery works. Controls were sweepers, sanitary workers, daily wage laborers and security guards of UCMS having similar socioeconomic status as that of bakery workers. They were matched for age and sex.

Exclusion criteria were subjects working in bakery for less than 1 year, those on medication which affect lung functions, and those with a history of respiratory illness before joining the job. Workers with upper respiratory tract infections in preceding 3 weeks or with any systemic illness were also excluded. Thirty percent of workers as well as controls were smokers.

Since this was a pilot study, the sample size of 30 was considered as a sample of convenience. Forty subjects were shortlisted for the study. Out of these, three declined to take part in the study. Lung functions were tested on the remaining 37 subjects. Of these, 7 were unable to perform maneuver correctly and were excluded from the study. The acceptability and reproducibility criteria for Spirograms were used to check the correct maneuver [12]. Hence, finally our study group comprised of 30 subjects.

2.2. Work plan

The questionnaire used in the study covered items related to respiratory symptoms, personal and family history of the subjects. History, general physical examination and systemic examination were carried out. Anthropometric measurements [weight, height and body mass index (BMI)] were recorded. The standing height of each subject was measured without shoes to nearest 1 cm and weight by weighing scale to nearest 1 kg.

2.3. Pulmonary function tests

The pulmonary function tests were done on SIBELMED DATOSPIR 120 B precision portable spirometer using the standard laboratory methods. The apparatus provides a detailed analysis of predicted and derived lung function values.

The subjects were tested on relatively empty stomach (i.e. about 2–3 hours after a light meal). They were familiarized with the procedure and apparatus to be used. The ambient temperature on different days varied from 18 to 24 °C. Subject was connected to the spirometer through a disposable mouth piece attached to transducer which can be replaced and helps to ensure proper hygiene. Subjects were encouraged to perform the test with maximum possible effort. The shape and size of the flow volume curve was an indicator of adequate performance. The guidelines specified in ATS statement (Snowbird workshop on standardization of spirometry [12]) were followed. Adequate demonstrations were given to the subject prior to the starting of the tests. The best of the three tests performed by the subject was considered for analysis.

2.4. Statistical analysis

Analysis was done by SPSS 21.0 statistical package. The lung functions were compared using Unpaired 't' test. The influence of confounding factors was studied using Univariate analysis.

3. Results

The two groups (bakery workers and controls) did not differ in age, height, weight and BMI (Table 1). Various respiratory

Table 1

Anthropometric measurements of subjects (bakery workers) and controls.

Variables	Control n=30	Bakery workers n=30	p value
Age (yrs)	27.12 ± 7.75	26.72 ± 6.53	0.845
Height (cm)	165.92 ± 8.23	169 ± 4.30	0.053
Weight (Kg)	66.04 ± 9.22	66.04 ± 6.45	1.000
BMI (kg/m ²)	24.04 ± 3.34	22.93 ± 1.83	0.153

BMI: body mass index.

Table 2

Prevalence of respiratory symptoms among bakery workers.

Symptoms	Number of workers	Percentage prevalence (%)
Eye irritation	11	36.66
Rhinitis	8	26.66
Cough	14	46.66
Difficulty in breathing	11	36.66
Wheeze	3	10
Chest tightness	8	26.66
Eczema	5	16.66

symptoms were prevalent in the bakery workers as shown in Table 2. Forced vital capacity (FVC) and forced expiratory volume in first second (FEV1) were observed to be low ($p < 0.05$) in subjects as compared to controls (Table 3). FEV1/FVC ratio, all other lung volumes, capacities and flow rates were also decreased in bakery workers but not significantly.

4. Discussion

Present study was planned to assess the pulmonary involvement in occupationally exposed bakery workers. We observed various respiratory symptoms in the workers. FVC and FEV1 were also decreased in the bakery workers as compared to controls.

Exposure to flour dust causes diverse lung diseases with different severity of symptoms in bakery workers [13,14]. In our study, the prevalence of allergic rhinitis was reported in 26.6% and eye irritation in 36.66% of bakers. This was lower than earlier study which had 62% prevalence [15]. This difference could be due to differences in environmental conditions, workload, ventilation systems and equipment used in the process.

None of our subjects had family history of atopy or allergy. This result goes with earlier study, which showed that respiratory symptoms were not influenced by the hereditary factors (atopy) [13].

Air is becoming polluted with different bioaerosols due to rapid industrialization and urbanization. In Delhi, many small bakeries are functioning to meet the needs of the public. Their workers are noted to have various respiratory disorders [16]. Fungal spores can become airborne in large concentrations in enclosed environment and are a potential hazard to lungs [17].

Although workers suffering from upper respiratory diseases were excluded in our study, but symptoms indicating chronic bronchitis were observed to be prevalent in them. Signs of chronic bronchitis like cough and chronically increased mucus production were found in 46.66% bakery workers. Wheat flour proteins including albumins and globulins, flour parasites and added enzymes seem to be contributing to harmful respiratory effects of the flour dust as reported earlier [15,18].

On comparing the prevalence of symptoms of our bakery workers with that of earlier studies, there were a few discrepancies. For instance, for wheeze, our observed 10% value was lower to the value reported in the Australian study [19]; whereas, for dyspnoea, our 37% value was greater than the 14% found among British bakers [10] and lower than the 55% observed in a study from

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