



Survey Risk Factors of Occupational Asthma in Home Workers in the Bakery Industry

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(Received: 16 May 2025

Revised: 20 June 2025

Accepted: 02 July 2025)

KEYWORDS

Occupational Asthma;
Risk Factors;
Home industry Bakery; PEFR

ABSTRACT:

Introduction: Occupational asthma is an asthma disease caused by allergens in the workplace. Respiratory disorders or lung function in workers are influenced by several factors, namely the work environment that produces a lot of dust, vapor, gas and others as well as medical history, length of work / length of exposure, work period. In addition to these factors, there are other factors that cause respiratory disorders, namely PPE masks, gender, and smoking habits.

Objectives: The purpose of this study was to determine the description of risk factors that have the potential to cause occupational asthma in workers at home Bakery Industry

Methods: The type of research used in this study is descriptive analytical research with a cross-sectional design. The location of the study was at Salsa Bakery Jepara, Indonesia with a sample size of 40 respondents. The sampling technique used purposive sampling. The data analysis used was univariate analysis.

Results: The results of the study conducted on 40 respondents, there were respondents who experienced symptoms of occupational asthma, namely coughing 12 people (30%), shortness of breath 10 people (25%), chest pain 8 people (20%) and 4 people experienced a decrease in PEFR of more than 20%.

Conclusions: This shows that no respondents experienced occupational asthma but there is potential for occupational asthma in bakery workers as indicated by the discovery of 2 out of 4 symptoms of a 20% decrease in PEFR in bakery workers. A work environment control program is needed with the risk of exposure to flour dust. to bakery workers.

1. Introduction

Occupational asthma is a condition that arises specifically due to factors present in the workplace and is not triggered by stimuli outside of it. This disease is characterized by airflow obstruction or fluctuating bronchial hyperresponsiveness, which results from specific conditions in the work environment rather than external factors. Thus, occupational asthma is solely caused by allergens or irritants found in the workplace [1]. Furthermore, occupational asthma can also occur due to exposure to recognized irritant agents integral to workplace processes. [2]

According to ILO data from 2018, approximately 270 million workers experience work-related accidents annually, while 160 million suffer from occupational diseases. In the Asia-Pacific region alone, there are 1.8 million work-related deaths each year, with two-thirds of these deaths occurring in Asia. One significant cause of these fatalities is respiratory disease. The WHO reported that in 2018, the global number of asthma cases was estimated at 300 million and is projected to rise to 400 million by 2025. A survey conducted in 2018 revealed that 1,017,290 people suffered from asthma, making it one of the top 10 causes



of illness and death in Indonesia. Furthermore, 2%–5% of asthma cases in Indonesia are attributed to occupational asthma.[3]

Work-related asthma (WRA) is a common condition among adults and is categorized into two types. The first is occupational asthma (OA), which arises from workplace exposure, and the second is work-exacerbated asthma (WEA), where pre-existing asthma is worsened by factors related to the work environment. Over 300 irritants can contribute to the occurrence of WRA, including animal dander, insects, chlorine-free cleaning agents, tobacco smoke, and cold air. These irritants are linked to two forms of occupational asthma: sensitizer-induced occupational asthma (allergic occupational asthma), caused by sensitization to workplace allergens involving high molecular weight (HMW) and low molecular weight (LMW) compounds, mediated by IgE, and accounting for 90% of cases; and irritant-induced occupational asthma (non-allergic occupational asthma), which results from exposure to irritants without sensitization to specific substances.[4]

Indonesia, as a developing country, has seen notable economic growth in recent years, driven in part by the expanding industrial sector, including the bread-making home industry, which has become a significant contributor [5]. According to Presidential Decree No. 7 of 2019 on occupational diseases, asthma can be caused by recognized sensitizing agents or irritants associated with workplace processes.[6]

Research on the assessment and measurement of flour dust has been carried out in various countries, including England, revealing that workplace exposure to flour dust is relatively high. Lung function or respiratory health in workers is affected by several factors, such as a work environment with high levels of dust, vapors, gases, and similar pollutants, as well as individual factors like medical history, duration of exposure, and years of service. Additionally, other factors contributing to respiratory issues include the use of PPE masks, gender, and smoking habits.[7]

Previous research has shown that flour dust and its associated microbes can lead to health issues among workers in the flour industry [5]. A study by Ahmed et al. on bakery workers in Sudan reported a high prevalence of respiratory symptoms, including coughing with phlegm, shortness of breath, and wheezing, which were linked to exposure to flour dust. Similarly found five cases of workers experiencing coughing with

phlegm and shortness of breath, but without wheezing, based on anamnesis and physical examination. Additionally, a study involving 142 bakers revealed a connection between respiratory symptoms (both upper and lower) and biomarkers of inflammation associated with workplace exposure to flour dust [8]. Given this context, it is crucial to investigate the risk factors for occupational asthma among workers home industry bakery in Indonesia.

2. Methods

Type of Research

This type of research uses analytical descriptive research with a cross-sectional design. This study aims to determine the description of risk factors that have the potential to cause work-related asthma in workers in the Bakery home industry.

Place and Time of Research

This research was conducted at the home industry Salsa Bakery Jepara, Central Java, Indonesia. The research period was August-September 2024.

Population and Sample

The population in this study were all workers as many as 48 people, with the number of research samples as many as 40 respondents. The sampling technique used purposive sampling, with inclusion criteria: workers at Salsa Bakery, Willing to be respondents and Working in the production section that is at risk of being exposed to Bakery flour dust.

Data Collection

This study utilized the *Peak Expiratory Flow Rate* (PEFR) measurement, conducted twice before and during work to diagnose occupational asthma. A PEFR decrease of $\geq 20\%$ was identified using a Peak Flow Meter [9]. The Peak Flow Meter is a simple, portable, cost-effective, and user-friendly tool for assessing lung function and measuring PEFR [10]. Additionally, anamnesis was performed to gather data on factors such as age, duration of employment, use of personal protective equipment (PPE), smoking habits, and symptoms of occupational asthma experienced by bakery workers [9]. This study received ethical approval from the Health Research Ethics Commission of Sekolah Tinggi Ilmu Kesehatan Kendal under the reference number 080/EC/KEPK_STIKES_KENDAL/VIII/2024.



Data Analysis and Processing

In this study, the data analysis used was univariate analysis, namely to determine the frequency distribution of risk factors that have the potential to cause occupational asthma in bakery workers. The variables studied included characteristics of age, gender, length of service, use of PPE, smoking habits and symptoms of occupational asthma (cough, chest pain, shortness of breath, wheezing, decreased PEFR and incidents of occupational asthma) experienced by bakery workers.

3. Result

Respondent Characteristics

Table 1. Frequency Distribution Based on Respondent Characteristics

Variables	n	%
Age		
<40 years	16	40.0
>40 years	24	60.0
Gender		
Man	12	30.0
Woman	28	70.0
Length of working		
<5 years	18	45.0
>5 years	22	55.0

Based on table 1. according to age, it shows that 60% of respondents are over or equal to 40 years old. Based on gender, there are 12 male respondents and 28 female respondents. Based on length of service, 55% of respondents have a service period of less than 5 years.

Use of PPE

Table 2. Frequency Distribution of Respondents Based on Use of PPE

Use of PPE	n	%
Use	4	10.0
Do not use	36	90.0
Total	40	100.0

Based on table 2. It can be seen that more than 50% of respondents do not use personal protective

equipment in the form of masks while working. This shows that most workers do not comply with the use of masks.

Smoking Habit

Table 3. Frequency Distribution of Respondents Based on Smoking Habits

Smoking Habit	n	%
Smoke	8	20.0
Do not smoke	32	80.0
Total	20	100.0

Based on table 3. the smoking habits of respondents in this study are categorized into two groups, namely the smoking group and the non-smoking group. As many as 20% of respondents are in the active smoker category.

Occupational Asthma Symptoms

Table 4. Frequency Distribution of Respondents Based on Occupational Asthma Symptoms

Variables	n	%
Cough		
Yes	12	30.0
No	28	70.0
Out of breath		
Yes	10	25.0
No	30	75.0
Chest pain		
Yes	8	20.0
No	32	80.0
Wheezing		
Yes	0	0.0
No	40	100.0
PEFR measurement		
There is a decrease	4	10.0
No decrease	36	90.0
Occupational Asthma		
Yes	0	0.0
No	40	100.0

Based on table 4. the symptoms of occupational asthma found in this study were coughing (30%), shortness of breath (25%), chest pain (20%) and



wheezing (0%). For the decrease in PEFR, 10% of respondents experienced a decrease in PEFR > 20% while all respondents did not experience occupational asthma.

4. Discussion

Respondent Characteristics

The univariate test results in this study revealed that 24 respondents (60%) were over 40 years old, 18 respondents (45%) had less than five years of work experience, and 12 respondents (30%) were male while 28 (70%) were female. Study found shows that 60% of respondents are over or equal to 40 years old, with univariate analysis indicating a link between worker age and occupational asthma. Despite this, limited research explores the relationship between age and occupational asthma [11]. Most studies primarily focus on the working-age group without considering age as a significant factor. However, comparative studies on OA and non-OA cases suggest that OA onset tends to occur later in life, particularly among workers with longer employment durations.[12]

The risk of lung function impairment increases with prolonged exposure to dust. Continuous exposure leads to dust accumulation in the lungs, which can reduce lung capacity. Lestari's research indicates that workers with more than five years of experience face a higher likelihood of lung function decline. A chi-square test analysis yielded a p-value of 0.006 ($p < 0.05$), confirming a significant correlation between work duration and lung capacity. Additionally, the phi test showed a value of $\phi = 0.422$, signifying a "moderate" relationship and attributing 42.2% of the decrease in lung capacity to the length of exposure [13].

Previous research has highlighted that gender significantly impacts the prevalence of sensitization to respiratory allergens. This study found that men generally exhibit higher sensitization rates compared to women. Approximately 62% of men showed signs of sensitization to allergens like flour and yeast, while the prevalence among women was around 45%. This disparity is likely due to differing exposure levels, as men are more frequently assigned tasks involving direct and intensive contact with allergenic substances [14].

Use of PPE

The univariate test results indicated that 90% of respondents did not use PPE masks while working. Most

workers avoided wearing masks due to discomfort and difficulties in communicating with coworkers. Study found that the use of PPE masks is significantly associated with a reduced risk of chronic respiratory health symptoms. Workers who wore masks were 56% less likely to develop such symptoms compared to those who did not. Despite recognizing the importance of PPE in preventing exposure to flour dust particles, PPE utilization among flour mill workers remains low, partly because factories fail to provide adequate PPE. Similar findings were reported in flour mills in Hawassa, India, and Nigeria. In this study, only 22.4% of workers used masks, a figure significantly lower than the 55.8% reported in Tanzania, potentially due to limited awareness and occupational health and safety training.[15]

Additionally, bread-making processes pose a risk of occupational diseases, such as respiratory issues caused by exposure to bread flour dust. Research from Italy has shown that exposure to flour dust exceeding permissible limits can lead to nasal inflammation and allergic reactions [16]; [17].

Smoking Habit

The univariate test results categorized smoking habits into two groups: smokers and non-smokers. Among the respondents, 20% were active smokers, while the remaining 80% were non-smokers. The findings revealed that smoking significantly influences the occurrence of occupational asthma among bakery production workers. Smoking exacerbates the effects of exposure to flour dust and allergens, heightening both the risk and severity of asthma. Studies conducted in Ethiopia and Nigeria demonstrated that bakery workers who smoked were more likely to exhibit asthma symptoms compared to non-smokers. Smoking promotes sensitization to occupational allergens through the IgE mechanism, intensifying allergic reactions and causing airway inflammation. This compromises lung defenses, impairs mucociliary clearance, and reduces lung function. To mitigate the risk of occupational asthma in the bakery industry, interventions should focus on environmental controls and behavioral strategies, such as smoking cessation programs. Additionally, research indicated that smoking increases MDA and NO levels in bakers, although it does not significantly affect TAC levels. [18]; [19]



Occupational Asthma Symptoms

The univariate test results in this study did not identify any respondents diagnosed with occupational asthma; however, there is a potential risk of occupational asthma among workers at Salsa Bakery. Through anamnesis and physical examinations, several respondents were found to exhibit asthma-related symptoms, including coughing (30%), shortness of breath (25%), chest pain (20%), and a decrease in PEFR exceeding 20%.

In a study data collection was conducted in two phases. The first phase involved two questionnaires: one gathered information about workers' socio-demographics, including gender, age, vocational training, and job roles in the bakery, while the other focused on identifying respiratory symptoms such as wheezing, shortness of breath, chest pain, frequency of asthma attacks, asthma history, symptom development outside the work environment, and rhinitis. In the second phase, lung volume measurements were performed using a portable spirometer.[20]

This study found that bakery workers experienced symptoms such as wheezing, shortness of breath, chest tightness, and coughing while on the job. The prevalence of confirmed asthma was 8.43% among workers suspected of having occupational asthma and 8.04% among all bakery workers with potential occupational asthma. Notably, 50% of confirmed asthma cases were diagnosed in bakers who had neither reported asthma symptoms in the past 12 months nor had a history of asthma. The study also demonstrated that workplace dust exposure contributes to an increased prevalence of asthma [21]

The study revealed that exposure to inhalable flour dust elevated oxidative stress markers (MDA and NO) while reducing TAC levels. Additionally, improvements in FVC and FEV1 were significantly associated with lower MDA and NO levels and higher TAC levels. The findings indicated that flour dust accumulating in the respiratory tract could lead to respiratory issues by activating the oxidative system and impairing antioxidant defenses. Therefore, implementing preventive and control measures is crucial to safeguard bakers from the harmful effects of flour dust. Bakers should be educated about the risks of flour dust exposure and effective protective measures. [19]

5. Conclusion And Suggestion

The results of a study on risk factors for occupational asthma among workers at Bakery Industry concluded that most respondents were aged 40 years or younger, had less than five years of work experience, and were predominantly female. The majority of workers did not use PPE masks, and most were non-smokers. From physical examinations and anamnesis, symptoms such as coughing (30%), shortness of breath (25%), chest pain (20%), and a decrease in PEFR (10%) were observed, though no cases of wheezing were reported. While no workers were diagnosed with occupational asthma, some were identified as being at potential risk, exhibiting asthma symptoms and a 20% reduction in PEFR.

Further research is recommended to develop more effective strategies for preventing and managing asthma risks in the workplace. Such research could drive innovation in the design of personal protective equipment to better shield workers from hazardous exposures. Additionally, it could enhance awareness and education among workers about the risks of occupational asthma, emphasizing the importance of preventive measures.

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