

The Relation between Family History of Allergy and the Prevalence of Allergic Rhinitis on Bakery Workers

Herlina I.S Wungouw^{1*}, Nancy Engka¹, Eko E.Surahmanto², Vicky Supit³, Irene Rumampuk³, Hizkia Rumampuk³

¹Department of Physiology, Faculty of Medicine, Sam Ratulangi University, Malalayang, Kota Manado, Sulawesi Utara, Indonesia

²Department of Internal Medicine, Faculty of Medicine, Sam Ratulangi University, Malalayang, Kota Manado, Sulawesi Utara, Indonesia

³Medical Student, Faculty of Medicine, Sam Ratulangi University, Malalayang, Kota Manado, Sulawesi Utara, Indonesia

*Corresponding author: Herlina I.S Wungouw

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Abstract

Original Research Article

Rhinitis has been stated as the most frequent respiratory disease worldwide, in which allergic rhinitis is the most one. Allergic rhinitis is an Ig-E mediated hypersensitivity of nasal mucosa characterized by clear nasal discharge, nasal pruritus, and sneezing as a result of allergen sensitization. Bakery workers are some of the most vulnerable jobs exposed to allergens, such as large quantities of flour and milk protein. Allergic rhinitis is a serious problem that can hinder a person's work productivity and eventually causing financial instability but the study that discusses this phenomenon and its risk factor such as family history are still scarce. **Purpose:** To find out the relation between family history of allergy and the prevalence of allergic rhinitis in bakery workers. **Methods:** This is an analytic -observational study using cross-sectional study in 30 bakery workers in 14 bakeries (12 local/conventional and 2 modern bakeries) in Manado, Indonesia between October to November 2018. This study uses ARIA questionnaire as allergic rhinitis diagnostic instrument, while a simple questionnaire is used to look for family history of allergic rhinitis, asthma, atopic dermatitis, and food or drug allergy. **Results:** Thirty bakery workers have been selected in this study randomly, consisted of 18 males and 12 females. It was found that 30% of bakery workers have family history of allergy and 16,7% of them have allergic rhinitis. Statistical analysis using Fisher's Exact test showed $p = 0,032$ ($p < 0,05$ for 95% CI). Male had a slightly higher percentage of allergic rhinitis than female (male = 27,78%; female = 25%), but the difference is not statistically significance ($p = 1.00$). The 36-45 years old age category showed highest percentage of allergic rhinitis (41,67%) among other age categories. **Conclusion:** A person with family history of allergic is more at risk of getting rhinitis allergy in environment with high levels of allergen exposure, in this case bakery workers. Workers should avoid the source of allergies in the workplace.

Keywords: Family history, allergic rhinitis, bakers.

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INTRODUCTION

Allergic rhinitis (AR) is an Ig-E mediated hypersensitivity of nasal mucosa characterized by clear nasal discharge, nasal pruritus, airflow obstruction and sneezing as a result of allergen sensitization driven by Th2 cells [1]. This reaction occurs typically within minutes after the interaction between the allergen and IgE antibody that triggers mast cells degranulation, release some chemical mediator such as histamine, cytokines (TNF- α , IL-4, IL-5, IL-13) [2].

Histamine stimulates sensory nerve and causes some clinical manifestations of allergic rhinitis, such as sneezing and itching of the nose and potentially the palate, throat, and ears. It also stimulates parasympathetic reflex of glandular secretions, vasodilation mechanism, increased permeability of

postcapillary venules resulting rhinorrhea and nasal congestion [3].

Tumor necrosis factor-alpha (TNF- α) is produced by sensitized epithelial barriers and immune cells at the early stage of allergen exposure and continues to promote the allergic reaction through inflammatory mechanism. It has pleiotropic function which is likely to mediated by its two receptors (TNFR1 and TNFR2) [4].

Interleukin-3 (IL-3), IL-4, IL-5 and IL-13 are synthesized by Th2 cells through Major Histocompatibility Complex type II (MHC II). They contribute significantly to the differentiation process of B cells into plasma cells that plays a main role in IgE production [5]. New cytokines such as IL-17, IL-22 also

significantly rising in the allergic rhinitis patients compared to healthy individuals [6].

Allergic rhinitis affects up to 40% of the population worldwide. The prevalence of allergic rhinitis is varies in different regions of the world (USA: 12-30%; Europe 23-30%; Turkey: 2,9-37,7%; China/ Hongkong/ Taiwan: 1,6-43%; Latin America 5,5-45,1%; Africa: 7,2-54,1%; Middle East: 7,4-45,2%; Japan/Korea: 9,1-35,7%); Australia: 12-41,3%; Southeast Asia: 5,5-44,2%) [7].

Allergic rhinitis is a serious health problem that causes large number of financial losses due to work productivity reduction. It is estimated that one of 10 workers suffer from allergic rhinitis. The rhinitis sufferers in the United States are absent for 3,6 days per year due to the condition, and they are being unproductive for 2,3 hours per day when experiencing rhinitis symptoms at work. This work productivity reduction due to rhinitis causes financial loss of 593 US dollars each year [8, 9].

Food industry workers had the highest risk for occupational rhinitis (50%). Flour is a major factor causing occupational rhinitis in the food industry sector. Bakery workers are the most often workers affected by

rhinitis (83%) compared to other food industry workers. Flour is not the only allergen that can cause rhinitis in bakery workers. They also exposed to amylase substances produced by *Aspergillus oryzae*, and dust mites found in grains [10-12].

METHODS

This was a cross-sectional study conducted from October to November 2018 in 30 bakery workers from 14 randomly selected bakeries (12 local and 2 modern bakeries) in Manado, Indonesia. The variables studied in this study were family history of allergic rhinitis and the incidence of allergic rhinitis in bakery workers. This research uses sociodemographic questionnaire in which we collect information regarding family history of and ARIA (Allergic Rhinitis and its Impact on Asthma) questionnaire as diagnostic instrument of allergic rhinitis.

RESULTS

Demographic data have been obtained from this study, presented in table 1. The most respondents were in the 36-45 years old age group (12 respondents; 40%). Male were the most represented gender with 18 (60%) respondents, and the remaining 12 (40%) respondents were female.

Table-1: General characteristics of respondents based on age and gender

Variable	Number (n)	Percentage (%)
Age		
17-25 years	5	16,7
26-35 years	6	20
36-45 years	12	40
46-55 years	6	20
56-65 years	1	3,3
Total	30	100
Gender		
Male	18	60
Female	12	40
Total	30	100

Table-2: Relationship between family history of allergy and prevalence of AR among workers

Family history of Allergy	Suffer from Allergic Rhinitis				Total		p
	Yes		No		N	%	
	N	%	N	%			
Positive	5	16,7	4	13,3	9	30	0,032
Negative	3	10	18	60	21	70	
Total	8	26,7	22	73,3	30	100	

*AR: Allergic Rhinitis

The prevalence rate of allergic rhinitis in bakery workers was 26,7%. Thirty percent of respondents had family history of allergic rhinitis, and 16,7% of them suffered from allergic rhinitis. Male had a slightly higher percentage of allergic rhinitis incidence than female (male = 27,78%; female = 25%), but the difference is not statistically significance ($p = 1.00$). The 36-45 years old age category showed

highest percentage of allergic rhinitis (41,67%) among other age categories. Statistical analysis using Fisher's exact test regarding the family history of allergic rhinitis with the incidence of allergic rhinitis showed $p = 0,032$, significant for CI (Confidence Interval) = 95%.

DISCUSSION

This study is a pioneer to explore the prevalence of AR among bakery worker in Manado related to family history, to the best of authors knowledge. Most of respondents fit in category of age group 36-45-year-old, indicating the most of the worker are in their productive age.

Based on the statistical analysis using Fischer's exact test, the *p* value is 0,032. It means that the family history of allergic has a significant relationship with the incidence of allergic rhinitis in bakery workers. This study showed results similar to study conducted in Makassar by Quadarusman, *et al.*, [13] although the length of work is not related to AR prevalence but atopic family history contributes to the development of AR in workplace.

Excessive IgE antibody responses in a person with atopic history are allergic predisposing factors. A person with atopic history who works in a workplace environment with high dust level have a higher risk of suffering from AR due to exposure to irritants or allergens, so atopic history is one of the predisposing factor of AR in bakery workers. This study also supports the previous concept that genetic background, in this case atopic history/family history of AR, is the strongest factor in the development of allergic symptoms [14].

The results of this study are also in accordance with the theory which states that the most important risk factor that plays a role in the development of AR is atopic history, especially in the onset that occurs at early age. The risk of developing AR is more than 30% if one of the parents or siblings has atopic history and 50% or greater if both parents have atopic history [15, 16]. Other factors that can be the basis of allergic disease, in this case allergic rhinitis, including: early antibiotic use, dietary factors and exposure to cigarette smoke (active and passive) also play a role in increasing the risk of developing allergic symptoms in a person. The consumption of omega-3 fatty acids, the use of masks at work and the hygiene of the work environment can also affect the development of allergic symptoms [17]. Further study needed to investigate those factors.

CONCLUSION

This study showed a significant relationship between family history of allergic rhinitis/atopic history with the incidence of allergic rhinitis in bakery workers. It means a person with family history of allergic rhinitis is more at risk of getting rhinitis allergy in environment with high levels of allergen exposure, in this case bakery workers.

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