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The Association Between Cigarette Smoke Exposure and Impaired Respiratory Function Among Fishermen

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Abstract

Background : Fishermen May experience various occupational exposures , including cigarette smoke from themselves or people around them . Long-term exposure to tobacco smoke can cause airway inflammation and damage and May reduce pulmonary function . Occupational exposures such as engine fumes , dust , and environmental conditions May further increase respiratory risks. Objective : To determine the relationship between cigarette smoke exposure and respiratory function impairment among fishermen. Methods : This analytical observational study used a cross-sectional design . The sample consisted of 84 fishermen selected using purposive sampling. Cigarette smoke exposure was assessed based on smoking status, duration of exposure , number of cigarettes consumed per day , and second-hand smoke Respiratory exposure function was measured using spirometry , including FEV_1, FVC, and FEV_1/FVC ratio . The association was analyzed using the Chi- square test and odds ratio with a significance level of α=0.05. Results : A total of 48 respondents (57.1%) had high cigarette smoke exposure , while 36 (42.9%) had low exposure . Respiratory function impairment was identified in 37 respondents (44.0%). Among respondents with high exposure , 29 (60.4%) had respiratory impairment , compared with 8 (22.2%) among those with low exposure . Statistical analysis showed a significant association between cigarette smoke exposure and respiratory function impairment ($p<0.001$; OR=5.35). Conclusion : Cigarette smoke exposure was significantly associated with respiratory function impairment among fishermen with high exposure had a greater likelihood of respiratory impairment than those with low exposure .

Keywords : Cigarette Smoke , Respiratory Function , Pulmonary Function , Fishermen , Spirometry .

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1. Introduction

Respiratory dysfunction is a health problem that can arise from exposure to various environmental and occupational factors. The respiratory tract can become irritated, inflamed, and functionally altered due to long-term exposure to chemicals and particles. Exposure to tobacco smoke is one of the most significant contributing factors to respiratory disease (World Health Organization, 2024; World Health Organization, 2025; de Granda-Orive et al., 2025).

The World Health Organization states that tobacco use is a major risk factor for respiratory diseases, including chronic obstructive pulmonary disease. Exposure to secondhand smoke is also harmful to nonsmokers, as environmental smoke can cause various respiratory health problems. The WHO emphasizes that there is no completely safe level of exposure to tobacco smoke (World Health Organization, 2025; World Health Organization, 2026; López-Medina et al., 2024; Varela-Lema et al., 2024).

Exposure to secondhand smoke can occur through active smoking or exposure to secondhand smoke. The toxic substances in cigarette smoke can cause oxidative stress and an inflammatory response in the respiratory tract. If persisted over the long term, these conditions can lead to decreased lung function and increase the risk of chronic respiratory disease (de Granda-Orive et al., 2025; Faner & Agustí, 2025; World Health Organization, 2024).

Fishermen are a group of workers with different work environment characteristics than those of land-based workers. Their work at sea can last for hours or even days, exposing them to cigarette smoke in their relatively confined workspaces. In addition to cigarette smoke, fishermen are also exposed to engine fuel fumes, sea air, dust, and various other environmental factors (Santiago et al., 2021; Zegers et al., 1994).

Research on fishermen exposed to engine fuel emissions showed that the exposed group had a higher prevalence of respiratory symptoms than the unexposed group. The study also found changes in certain lung function parameters (Shiryaeva et al., 2015; Dienye et al., 2016).

Another study of fishermen showed that smoking was one of the factors most associated with respiratory disease. The study found a high prevalence of smoking and the presence of conditions such as chronic bronchitis, asthma, and obstructive pulmonary disease (Zamora-López et al., 2018; Zegers et al., 1994). Respiratory function can be objectively assessed using spirometry. This test provides information on the volume and flow of air entering and leaving the lungs. The FEV_1, FVC, and FEV_1/FVC ratio can be used to identify patterns of ventilation impairment (Singh et al., 2025; Yousif et al., 2026).

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Based on this description, it is important to conduct research into the relationship between cigarette smoke exposure and respiratory dysfunction in fishermen. This research is expected to provide information on the importance of controlling cigarette smoke exposure and early detection of lung dysfunction in fishermen.

2. Research Methods

This study used an observational analytical design with a cross-sectional approach to examine the relationship between cigarette smoke exposure and respiratory function among adult fishermen. The study was conducted in coastal areas where fishermen actively work and undergo health examinations from February to April 2026. The population consisted of all adult fishermen actively working in the research area, with a sample of 84 respondents selected using purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria were fishermen aged ≥18 years, having worked as fishermen for at least two years, actively working as fishermen, willing to undergo pulmonary function testing, and willing to participate as research respondents.

Respondents with acute respiratory tract infections, conditions preventing proper spirometry, incomplete interviews, or inability to perform spirometry maneuvers according to the procedure were excluded. The independent variable was cigarette smoke exposure, while the dependent variable was respiratory dysfunction, with age, length of service as a fisherman, smoking status, and exposure to engine exhaust fumes considered as potential confounding variables. Data were collected using respondent characteristics and smoking habit questionnaires, a secondhand smoke exposure assessment sheet, a spirometer, and an examination results recording sheet.

Respiratory function was assessed based on Forced Expiratory Volume in One Second (FEV_1), Forced Vital Capacity (FVC), and FEV_1/FVC, with respiratory dysfunction determined according to established spirometry interpretation criteria (Singh et al., 2025; Yousif et al., 2026). Cigarette smoke exposure was assessed based on smoking status, number of cigarettes consumed per day, duration of smoking, exposure to secondhand smoke from coworkers or family members, and prolonged exposure to smoky environments, then categorized into low and high exposure based on a predetermined exposure score. Data were analyzed using univariate analysis to describe respondent characteristics, cigarette smoke exposure, and respiratory function status, while bivariate analysis using the Chi-square test was performed to determine the relationship between cigarette smoke exposure and respiratory dysfunction. The magnitude of association was presented as an odds ratio (OR) with a 95% confidence interval, with statistical significance set at $\alpha=0.05$.

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3. Results And Discussion

a. Result

Tabel 1. Respondent Characteristics

Characteristics	n	%
Age		
18–29 years	18	21.4
30–44 years	39	46.4
≥45 years	27	32.2
Education		
Base	31	36.9
Intermediate	42	50.0
Tall	11	13.1
Length of work		
2–9 years	22	26.2
10–19 years	35	41.7
≥20 years	27	32.1

The majority of respondents (39 people) were aged 30–44 years (46.4%). Based on length of service, the largest group (35 people) had worked as fishermen for 10–19 years (41.7%).

Tabel 2. Exposure to Cigarette Smoke

Exposure level	n	%
Low	36	42.9
Tall	48	57.1
Total	84	100

A total of 48 respondents (57.1%) were in the high cigarette smoke exposure category.

Tabel 3. Respiratory Function Status

Respiratory function	n	%
Normal	47	56.0
Disturbed	37	44.0
Total	84	100

A total of 37 respondents (44.0%) experienced respiratory dysfunction based on the results of spirometry examination .

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Tabel 4. The Relationship between Cigarette Smoke Exposure and Respiratory Function

Exposure to Cigarette Smoke	Normal function n (%)	Impaired function n (%)	Total	p-value
Low	28 (77.8)	8 (22.2)	36	0,000
Tall	19 (39.6)	29 (60.4)	48	
Total	47	37	84	

Square test showed a p value <0.001 , which means there is a significant relationship between exposure to cigarette smoke and respiratory function disorders. The OR value of 5.35 indicates that respondents with high exposure to cigarette smoke are approximately 5.35 times more likely to experience respiratory dysfunction than respondents with low exposure.

Tabel 5. Spirometry Parameter Overview

Parameter	Low exposure Mean±SD	High exposure Mean±SD
FEV_1 (L)	2.91±0.48	2.54±0.52
FVC (L)	3.64±0.55	3.45±0.61
FEV_1/FVC (%)	80.1±5.6	73.7±7.1

The group with high cigarette smoke exposure showed lower mean FEV_1 values and FEV_1/FVC ratio compared to the group with low exposure.

b. Discussion

The study results showed a significant association between cigarette smoke exposure and respiratory dysfunction in fishermen. Respondents with high cigarette smoke exposure had a higher proportion of respiratory dysfunction than respondents with low exposure.

These findings can be explained by the biological effects of tobacco smoke on the respiratory system. Cigarette smoke contains various toxic substances that can irritate the respiratory tract and trigger inflammation. Chronic exposure can cause changes in the structure and function of the airways, resulting in restricted airflow (de Granda-Orive et al., 2025; Faner & Agustí, 2025).

WHO states that tobacco is a major risk factor for respiratory diseases and that exposure to secondhand smoke, including passive exposure, contributes to a variety of respiratory diseases (World Health Organization, 2024; World Health Organization, 2025; Varela-Lema et al., 2024).

The results of this study also align with research on fishermen, which shows that smoking is one of the factors most closely associated with respiratory disease. This population of fishermen has been found to have problems such as chronic bronchitis,

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asthma, and obstructive pulmonary disease (Zamora-López et al., 2018; Zegers et al., 1994).

The lower FEV_1 and FEV_1/FVC values in the high-exposure group in this study suggest a tendency toward airflow limitation. However, spirometry results should not be used to conclude a specific disease diagnosis based on a single parameter. Interpretation should consider the standard of examination, the quality of the maneuver, the predictive value, age, gender, height, and clinical condition (Singh et al., 2025; Yousif et al., 2026). Trawler fuel emissions found increased respiratory symptoms and changes in lung function parameters compared to fishermen not exposed to these emissions (Shiryaeva et al., 2015).

This suggests that respiratory dysfunction in fishermen is multifactorial. Cigarette smoke may be a significant factor, but exposure to engine exhaust, dust, environmental conditions, age, length of service, history of respiratory disease, and nutritional status also need to be considered (Santiago et al., 2021; Shiryaeva et al., 2015; Zegers et al., 1994).

The findings of this study have important implications for the occupational health of fishermen. Efforts to control exposure to secondhand smoke can include reducing smoking, creating a smoke-free work environment, providing smoking cessation education, and conducting regular lung function tests for fishermen with risk factors (World Health Organization, 2025; World Health Organization, 2026).

WHO also emphasizes that there is no safe level of exposure to tobacco smoke and that cessation of tobacco use can provide benefits for lung function and respiratory health. Preventing exposure to secondhand smoke should be part of occupational health programs in fishing communities. Early detection through pulmonary function tests can also help identify fishermen who require further evaluation (World Health Organization, 2024; World Health Organization, 2025; Singh et al., 2025).

This study has several limitations. The cross-sectional design does not allow the determination of temporal or causal relationships between cigarette smoke exposure and respiratory dysfunction. Information regarding smoking habits was partly based on respondents' self-reports, which may introduce reporting bias. Exposure to engine exhaust and other environmental pollutants may also act as potential confounding factors. In addition, pulmonary function was assessed at a single point in time and therefore may not reflect long-term changes in lung function. The sample was limited to fishermen from one research area, so the findings should be interpreted cautiously when applied to a wider population of fishermen..

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4. Conclusion

There is a significant relationship between cigarette smoke exposure and respiratory dysfunction in fishermen. Fishermen with high cigarette smoke exposure are more likely to experience respiratory dysfunction than those with low exposure. Exposure to cigarette smoke needs to be one of the factors that needs to be considered in efforts to prevent lung function disorders in fishermen, especially because this group can also experience exposure to other work environments.

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