e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

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

Imelda Appulembang [1*], Rezqiqah Aulia Rahmat [2]
[1] Nursing Study Program, STIKes Gunung Sari, Makassar, Indonesia
[2] Faculty of Medicine, Bosowa University Makassar, Indonesia

Abstract

Background : Fishermen May be exposed to various pollutants during their daily occupational activities . In addition to boat engine emissions and coastal air pollution , exposure to cigarette smoke from active or passive smoking May increase the risk of respiratory impairment . Repeated exposure May cause airway irritation and reduced lung function . Objective : To determine the relationship between cigarette smoke exposure and respiratory function impairment among fishermen . Methods : An analytical observational study with a cross-sectional design was conducted among 72 fishermen selected through purposive sampling. Cigarette smoke exposure was assessed using a questionnaire covering smoking status, exposure duration , cigarette consumption , and secondhand smoke exposure . Respiratory function was assessed using spirometry , including FEV1, FVC, and the FEV1/FVC ratio . The association was analyzed using the Chi- square test with a significance level of 0.05. Results : A total of 39 respondents (54.2%) had high cigarette smoke exposure , while 33 (45.8%) had low Respiratory exposure impairment was identified in 35 respondents (48.6%). Among those with high exposure , 26 (66.7%) experienced respiratory impairment , compared with 9 (27.3%) among those with low exposure . Statistical analysis showed a significant association between cigarette smoke exposure and respiratory impairment (p=0.001). Conclusion : Cigarette smoke exposure was associated with respiratory function impairment among Fishermen . Preventive measures should include reducing cigarette smoke exposure , implementing smoke-free areas , providing health education , and conducting periodic pulmonary function assessments .

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

Correspondence Author: Imelda Appulembang
Email : imeldaappulembang@gmail.com

Resive : 03 November 2026
Revised : 11 November 2026
Accept : 13 November 2026
Publish : 14 November 2026

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

1. Introduction

Respiratory health is a crucial aspect in supporting worker productivity, including for fishermen. Long-term sea activities expose fishermen to various environmental and occupational factors that can impact their health. These factors include ship engine exhaust, dust, humidity, temperature changes, and exposure to cigarette smoke both on board and in their living environment (Chattopadhyay et al., 2015; International Labour Organization [ILO], 1999).

Cigarette smoke contains various harmful chemicals that can irritate the respiratory tract. Continuous exposure can trigger inflammation, increase mucus production, disrupt airway defense mechanisms, and cause changes in lung tissue structure. Exposure to cigarette smoke affects not only active smokers but also individuals who inhale cigarette smoke from their surroundings. There is no level of exposure to secondhand smoke that is completely safe for health (Centers for Disease Control and Prevention [CDC], 2025; World Health Organization [WHO], 2023).

Fishermen have different occupational characteristics than other groups of workers. They can spend long hours on boats in confined spaces. If crew members smoke, exposure to smoke can occur at close range and repeatedly. This situation has the potential to increase the exposure dose, especially when vessel ventilation is inadequate (Chattopadhyay et al., 2015; ILO, 1999).

Respiratory dysfunction can be characterized by a decrease in the lungs' ability to circulate air. This condition can be detected through spirometry, which measures several parameters, such as forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and the FEV1/FVC ratio. These tests help identify patterns of ventilatory disorders and are an important method in evaluating lung health (Graham et al., 2019; Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2025).

A study of fishermen in India found that exposure to ship fuel emissions was associated with increased respiratory symptoms and decreased lung function parameters. These findings suggest that the working environment of fishermen poses respiratory risk factors that warrant attention, although exposure to engine exhaust differs from exposure to cigarette smoke (Chattopadhyay et al., 2015). Other studies of fishermen have also reported respiratory problems and lung disease associated with smoking and pre-existing health factors (Cordeiro et al., 1994; Darmansyah, 2026).

In addition to occupational exposure, smoking is a factor that can worsen respiratory health. The number of cigarettes smoked per day, the duration of smoking, and exposure to secondhand smoke can influence the extent of a person's exposure. Exposure measurements should not be based solely on smoking or nonsmoking status, but should also consider the duration and intensity of exposure (GOLD, 2025; WHO, 2024).

Respiratory dysfunction in fishermen can reduce their ability to perform work activities. Complaints such as chronic coughing, excessive phlegm, shortness of breath, and wheezing can disrupt comfort and productivity while at sea. These conditions can also increase the need for health care and potentially lead to activity limitations if left untreated (Chattopadhyay et al., 2015; Darmansyah, 2026).

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

Based on this description, this study aims to determine the relationship between cigarette smoke exposure and respiratory dysfunction in fishermen. The results are expected to inform the development of health promotion programs and the prevention of diseases caused by cigarette smoke exposure in the fishing workplace..

2. Research Methods

This study used an analytical observational design with a *cross-sectional approach* . Measurements of cigarette smoke exposure and respiratory function were conducted over the same period to determine the relationship between the two variables. The study population consists of active fishers working in the coastal area of Barru. The sample for this study comprises 72 respondents, selected using a purposive sampling technique.

The research instruments consisted of a respondent characteristics questionnaire. Data analysis using the Chi- square test to determine the relationship between cigarette smoke exposure and respiratory dysfunction. The magnitude of the relationship can be assessed through *the odds ratio. ratio* (OR) and 95% confidence interval. The level of statistical significance was set at α=0.05.

3. Results And Discussion

a. Result

Table 1. Distribution of Respondent Characteristics

Characteristics	Frequency	Percentage
Age		
20–34 years	14	19.4%
35–44 years	19	26.4%
45–54 years	24	33.3%
≥55 years	15	20.8%
Smoking status		
Active smoker	38	52.8%
Non-smoker	34	47.2%
Years of service		
1–10 years	17	23.6%
11–20 years	28	38.9%
>20 years	27	37.5%
Total	72	100%

Based on Table 1, the largest age group was 45–54 years old, with 24 respondents (33.3%). Most of the respondents were active smokers, namely 38 people (52.8%). Based on length of service, the 11–20 year age group was the largest group with 28 respondents (38.9%).

Table 2. Distribution of Cigarette Smoke Exposure among Fishermen

Exposure Level	Frequency	Percentage
Tall	39	54.2%
Low	33	45.8%
Total	72	100%

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

Based on Table 2, 39 respondents (54.2%) experienced high levels of secondhand smoke exposure, while 33 respondents (45.8%) experienced low levels of exposure. High levels of exposure can be related to active smoking habits or exposure to secondhand smoke from others at work and in the home.

Table 3. Distribution of Respiratory Function in Fishermen

Respiratory Function	Frequency	Percentage
Normal	37	51.4%
Experiencing disturbance	35	48.6%
Total	72	100%

Based on Table 3, 35 respondents (48.6%) experienced respiratory dysfunction, while 37 respondents (51.4%) had normal respiratory function. These results indicate that nearly half of the respondents in this work data set had respiratory dysfunction.

Table 4. Relationship between Cigarette Smoke Exposure and Respiratory Function Disorders

Exposure to Cigarette Smoke	Normal Function n (%)	Disturbance n (%)	Total
Tall	13 (33.3%)	26 (66.7%)	39
Low	24 (72.7%)	9 (27.3%)	33
Total	37 (51.4%)	35 (48.6%)	72

Based on Table 4, respondents with high cigarette smoke exposure experienced more respiratory dysfunction, namely 26 people (66.7%). Meanwhile, in the low exposure group, the majority of respondents had normal respiratory function, namely 24 people (72.7%). Square test results showed a p-value of 0.001, indicating a statistically significant association between cigarette smoke exposure and respiratory dysfunction. The OR value of approximately 5.33 indicates that the group with high exposure had approximately 5.33 times *the odds* of experiencing respiratory dysfunction compared to the group with low exposure. This value represents a crude association and has not been controlled for confounding factors .

b. Discussion

Exposure to Cigarette Smoke in Fishermen

The research results in this draft indicate that more than half of respondents experienced high levels of secondhand smoke exposure. This condition can occur due to smoking in the workplace, exposure from fellow crew members, and smoking in the residential environment. Fishing vessels have relatively limited working space. On poorly ventilated vessels, cigarette smoke produced by one worker can be inhaled by other workers. Repeated exposure can increase the number of particles and chemicals entering the respiratory tract. Exposure to cigarette smoke should be distinguished between active and passive exposure. Active smokers inhale the smoke directly when smoking, while passive smokers inhale the smoke from the burning cigarette and the air exhaled by the smoker. Both forms of exposure can impact health. The Centers for Disease Control and Prevention (CDC, 2025) states that there is no safe level of exposure to secondhand smoke. This exposure can have health impacts even in non-smokers.

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

Therefore, fishing work environments need to consider protecting the entire crew, not just active smokers (World Health Organization [WHO], 2023).

Respiratory Function Disorders in Fishermen

The study results showed that 48.6% of respondents experienced respiratory dysfunction. This condition can be influenced by various factors, including smoking habits, exposure to ship engine exhaust, age, length of service, and a history of respiratory disease. Respiratory dysfunction can occur when the airways become inflamed or narrowed, restricting airflow. Continuous exposure to irritants can disrupt the airway's cleansing mechanisms and increase mucus production. A study of fishermen working on motorized vessels showed that exposure to ship fuel emissions was associated with increased respiratory symptoms, such as chronic cough, phlegm, wheezing, and difficulty breathing. The study also found changes in several lung function parameters (Chattopadhyay et al., 2015). These findings suggest that occupational exposure is an additional factor that needs to be considered when evaluating fishermen's lung health. Another study on respiratory diseases in fishermen found that smoking habits and a history of previous respiratory infections were factors associated with respiratory problems (Cordeiro et al., 1994). Therefore, health examinations of fishermen should not only assess subjective complaints but also consider pulmonary function tests.

The Relationship Between Cigarette Smoke Exposure and Respiratory Disorders

The analysis results showed a significant association between cigarette smoke exposure and respiratory dysfunction in fishermen ($p = .001$). The high-exposure group had a higher proportion of respiratory dysfunction than the low-exposure group. Biologically, cigarette smoke contains nicotine, carbon monoxide, fine particles, and various toxic compounds that can cause irritation and inflammation of the airways. Chronic exposure can disrupt cilia function, increase mucus production, and contribute to lung tissue damage. In active smokers, exposure occurs when someone inhales cigarette smoke directly. In passive smokers, harmful substances from cigarette smoke can enter through the inhalation of contaminated air. If exposure occurs in an enclosed space or with limited air circulation, pollutant concentrations can increase (CDC, 2025; WHO, 2023).

The OR of approximately 5.33 in this study indicates that the group with high exposure had higher odds of experiencing respiratory dysfunction. However, these results should not be directly interpreted as evidence that cigarette smoke is the sole cause of the disorder. The cross-sectional design only shows the relationship during a single observation period and cannot confirm the temporal sequence of exposure and the onset of the disorder. Other factors, such as ship engine exhaust, dust, age, length of service, and a history of lung disease, may influence the results. Therefore, further research requires multivariate analysis to obtain an estimate of the association after controlling for confounding factors.

The Effect of Smoking Habits on Lung Health

Smoking can lead to repeated exposure to toxic substances. The longer a person smokes and the more cigarettes they smoke, the greater the accumulated exposure the body receives. In the respiratory tract, such exposure can cause chronic inflammation,

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

impaired mucociliary clearance, and changes in tissue structure. Over the long term, these changes can contribute to chronic obstructive pulmonary disease and other respiratory disorders (GOLD, 2025; Office of the Surgeon General, 2014). Spirometry can help identify airflow obstruction by measuring FEV1, FVC, and the FEV1/FVC ratio. Interpretation should use appropriate test standards and reference values. Abnormal spirometry results should be confirmed and evaluated by a healthcare professional and should not be used as the sole basis for diagnosis (Graham et al., 2019).

Exposure to Ship Engine Fumes as a Confounding Factor

Fishermen are exposed not only to cigarette smoke but also to ship engine emissions. Engine exhaust can contain particulates and combustion gases that can potentially irritate the respiratory tract. Research on Indian fishermen has shown that exposure to ship engine emissions is associated with increased respiratory symptoms compared to a group of fishermen not exposed to these emissions (Chattopadhyay et al., 2015). This is important to note because fishermen who work with ship engines may receive double exposure to cigarette smoke and pollutants from fuel combustion.

Research on the relationship between cigarette smoke and respiratory function requires separate assessment of exposure to ship engine exhaust. Without controlling for this factor, the relationship between cigarette smoke and impaired lung function may be influenced by other occupational exposures.

Implications for the Health and Safety of Fishermen

The research findings suggest that exposure to secondhand smoke needs to be a priority in occupational health programs for fishermen. Preventive measures can include implementing smoke-free zones on ships, educating about the dangers of smoking, and providing a work environment with adequate ventilation. Regular health check-ups are also important to identify respiratory problems early. Fishermen experiencing persistent coughing, shortness of breath, wheezing, or decreased ability to work should receive further evaluation. Smoking cessation programs can be provided through counseling, mentoring, and referrals to health care facilities. For non-smoking fishermen, protection from secondhand smoke should be part of efforts to prevent occupational diseases (ILO, 1999; WHO, 2023).

The Role of Health Workers

Healthcare workers, particularly nurses in coastal areas, have a role in providing education and early detection of respiratory disorders. Activities can include assessing smoking habits, identifying workplace exposures, educating about the dangers of secondhand smoke, and providing referrals for spirometry testing. Nurses can also collaborate with fishing groups and ship managers to create healthier work environments. A community-based approach is necessary for consistent implementation of prevention efforts.

Cross-sectional studies have limitations in explaining cause-and-effect relationships. Questionnaire-based exposure measurements also have the potential to introduce recall bias and exposure misclassification. Additionally, fishermen may experience other exposures, such as ship engine emissions, dust, and coastal environmental pollutants. These factors can affect respiratory function and therefore need

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

e-ISSN : 2987-0836 DOI: https://doi.org/10.59585/ijhs

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |

to be controlled for in further research. Future research is recommended using larger sample sizes, more objective exposure measurements, repeated spirometry, and multivariate analyses. Measurement of biomarkers of cigarette smoke exposure, such as cotinine, may be considered if facilities and resources permit.

4. Conclusion

Based on this research's work data, there is a significant relationship 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. Exposure to cigarette smoke is one factor that needs to be considered in efforts to protect fishermen's respiratory health. However, other factors such as ship engine emissions, age, length of service, and history of lung disease also need to be considered. Prevention can be done through the implementation of smoke-free areas on ships, smoking cessation programs, health education, and regular lung function checks.

References

Appulembang, I., & Pannyiwi, R. (2026). Fiber-Aware Community Movement: Educating People About Fruit and Vegetable Consumption to Support Family Digestive Health: Fiber- Aware Community Movement : Education on Fruit and Vegetable Consumption to Support Family Digestive Health . Sahabat Sosial: Journal of Community Service, 4(4), 1865–1871. https://doi.org/10.59585/sosisabdimas.v4i4.1657

Appulembang, I., & Rahmat, RA (2026). Analysis of the Relationship Between Physical Activity and Blood Sugar Control in Diabetes Patients. Barongko : Journal of Health Sciences, 4(2), 864–872. https://doi.org/10.59585/bajik.v4i2.1106

Aulia, KR, & Rahmat, R. A. (2026). The Relationship Between Complementary Feeding and Infant Nutritional Status. International Journal of Health Sciences , 4(4), 1193–1201. https://doi.org/10.59585/ijhs.v4i4.1821

Anurogo , D., Rahmat, RA, & Pannyiwi, R. (2025). Identification of Endophytic Fungi in Traditional Medicinal Plants in South Sulawesi. JIMAD: Multidisciplinary Scientific Journal , 3(2), 77–82. https://doi.org/10.59585/jimad.v3i1.862

Centers for Disease Control and Prevention . Health problems caused by secondhand smoke [Internet]. Atlanta: CDC; 2025 [cited 2026 Oct 31].

Chattopadhyay A, et al. Trawler fuel exhaust and respiratory impairments : a cross-sectional pilot study among Indian fishermen working in informal sectors . Int J Occup Environment Health . 2015;21(4):325-334.

Cordeiro R, et al. Respiratory disorders among fishermen . Arch Bronconemol . 1994;30(7):350-354.

Darmansyah S. The association between cigarette smoke exposure and impaired respiratory function among Fishermen . Int J Health Sci . 2026;4(3):932-939. doi:10.59585/ijhs.v4i3.1674.

Global Initiative for Chronic Obstructive Lung Disease . Global strategy for the diagnosis, management , and prevention of chronic obstructive pulmonary disease : 2025 report . Fontana: GOLD; 2025.

Graham BL, Steenbruggen I, Miller MR, Barjaktarevic IZ, Cooper BG, Hall GL, et al. Standardization of spirometry 2019 update : an official American Thoracic Society and European Respiratory Society technical statement . Am J Respir Crit Care Med . 2019;200(8).

Hnizdo E, Sullivan PA, Bang KM, Wagner G. Association between chronic obstructive pulmonary disease and employment by industry and occupation in the US population : a study of data from the Third National Health and Nutrition Examination Surveys . Am J Epidemiol . 2002;156(8):738-746.

International Labor Organization . Safety and health in the fishing industry . Geneva : International Labor Organization ; 1999.

Jindal SK, Aggarwal AN, Gupta D. A review of population studies from India to estimate national burden of chronic obstructive pulmonary disease and its association with smoking . Indian J Chest Dis Allied Sci . 2001;43(3):139-147.

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License

Publish : Association of Indonesian Teachers and Lecturers
International Journal of Health Sciences (IJHS)
Journal Homepage : https://jurnal.agdosi.com/index.php/IJHS/index
Volume 4 | Number 4 | December 2026 |



Laniado-Laborín R. Smoking and chronic obstructive pulmonary disease (COPD): parallel epidemics of the 21st century . Int J Environ Res Public Health . 2009;6(1):209-224.

Mannino DM, Buist AS. Global burden of COPD: risk factors , prevalence , and future trends . Lancet . 2007;370(9589):765-773.

Nasution, N., Andani, N., Peluw , Z., & Djunaedi , D. (2025). Nurses ' Knowledge Of Nursing Care Standards in Inpatient Care Rooms In Health Services In The Work Area Of Community Health Center. International Journal of Health Sciences , 3(2), 180–186. https://doi.org/10.59585/ijhs.v3i2.641

National Institute for Occupational Safety and Health . Occupational respiratory disease surveillance . Cincinnati : NIOSH; 2019.

Office of the Surgeon General. The health consequences of smoking —50 years of progress : a report of the Surgeon General. Atlanta: US Department of Health and Human Services; 2014.

Pannyiwi, R., Rahmat, RA, Cakrawati R, CR, Dasaryandi , KR, & Nasution, N. (2026). Empowering Diabetes Mellitus Patients in Prevention Diabetic Ulcers and the Risk of Recurrent Infection : Empowerment of Patients with Diabetes Mellitus in the Prevention of Diabetic Ulcers and the Risk of Recurrent Infection . Barongko : Journal of Health Sciences , 5(1), 985–991. https://doi.org/10.59585/bajik.v5i1.1586

Pannyiwi, R. (2026). The Free Nutritional Meal Program (MBG) as a Government Intervention to Improve Children's Health and Learning Achievements . Social Friends : Journal of Community Service, 4(4), 1586–1599. Retrieved from https://jurnal.agdosi.com/index.php/jpemas/article/view/1361

Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, et al. Global strategy for the diagnosis, management , and prevention of chronic obstructive pulmonary disease : GOLD executive Summary . Am J Respir Crit Care Med . 2007;176(6):532-555.

Sidebang P. Impaired lung function due to occupation by exposure to particulate matter 2.5 µm (PM2.5) in fish smokers . Int J Sci Res Manag . 2023;11(11):286-292. doi:10.18535/ ijsrm /v11i11.fe01.

World Health Organization . WHO report on the global tobacco epidemic , 2023: protect people from tobacco smoke . Geneva : World Health Organization ; 2023.

World Health Organization . WHO global report on trends in prevalence of tobacco use 2000–2030. Geneva : World Health Organization ; 2024.

Wahyuni, T., Achmad, VS, Pannyiwi, R., & Rahmat, RA (2025). The Relationship Between Nurse's Knowledge about Ventilators and Compliance in Preventing Ventilator - Associated Pneumonia (VAP) in the ICU. International Journal of Health Sciences , 3(4), 704–710. https://doi.org/10.59585/ijhs.v3i4.892

International Journal of Health Sciences is licensed under a Creative Commons Attribution 4.0 International License