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The Correlation Between Increased Incidence of Acute Respiratory Infections (ARI) and Fan Usage in Homes and Public Places During the Dry Season in Tropical Regions.

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Abstract

Background: The increasing prevalence of Acute Respiratory Infections (ARI) in tropical regions has raised concerns, especially during the dry season when high temperatures compel people to use fans in their homes and public spaces. This study aims to explore the relationship between fan usage and the incidence of ARI in a sample of patients visiting Nene Mallomo Hospital, Sidrap, between January and December 2024.

Methods: This quantitative study utilized a cross-sectional approach. A total of 300 patients aged 10-50 years diagnosed with ARI were enrolled. Data was collected via structured interviews and SPSS statistical software was used for data analysis. The correlation between fan usage in homes, mosques, and public places during the dry season and the incidence of ARI was analyzed.

Results: The analysis revealed a statistically significant correlation between fan usage and the increased incidence of ARI. The P-value obtained from SPSS was less than the alpha threshold, indicating a strong correlation. All participants reported using fans at home, in mosques, and in public shopping areas due to the heat during the dry season.

Conclusion: The study found a strong association between the increased usage of fans in the dry season and the incidence of ARI. This suggests that the use of fans during hot weather may contribute to the rise in ARI cases in tropical countries.

Keywords: Acute Respiratory Infections, Fan Usage, Tropical Regions, Dry Season, Cross-Sectional Study, SPSS.

Introduction

Acute Respiratory Infections (ARI) remain one of the leading causes of morbidity and mortality worldwide, particularly in low- and middle-income countries with tropical climates. The World Health Organization (WHO) reports that ARIs are responsible for approximately 4 million deaths annually, disproportionately affecting children under five years of age and the elderly [1]. In tropical regions, especially during the dry season, ARI prevalence tends to rise due to environmental conditions such as increased temperature, dust exposure, low humidity, and poor air circulation [2].

Among the various behavioral and environmental adaptations used to mitigate heat during the dry season, the use of electric fans is widespread. Fans are commonly used in homes, schools, offices, markets, and places of worship. While fans may provide thermal comfort, prolonged exposure to direct airflow from fans, especially in poorly ventilated or dusty environments, may contribute to respiratory irritation or exacerbate existing respiratory conditions [3]. Several studies have highlighted the role of airflow patterns in increasing the circulation of airborne pathogens in enclosed spaces [4]. This factor is of particular concern in rural areas where housing structures may not be optimized for adequate air exchange.

Furthermore, fans can disperse particulate matter (PM10 and PM2.5), allergens, and pathogens from one individual to another, thereby potentially increasing the incidence of ARIs, particularly in crowded or shared living environments [5]. It is hypothesized that continuous fan usage, particularly when directed toward the face or upper body at night during sleep, may impair nasal mucosal function and local immunity, increasing susceptibility to infections [6].

Despite these concerns, there is limited empirical research directly examining the association between the use of fans and the incidence of ARIs. Most studies tend to focus on air conditioning systems and air pollution as major contributors to respiratory illnesses, leaving a gap in understanding how simpler technologies, such as fans, might contribute to respiratory disease dynamics [7,8].

In Sidrap, a region in South Sulawesi, Indonesia, the use of fans intensifies during the prolonged dry season, where average daytime temperatures can exceed 34°C. Anecdotal reports and clinical observations have noted a concurrent increase in ARI cases, particularly among children and older adults, raising concerns about the role of environmental cooling practices in respiratory health. However, comprehensive data-driven studies are still lacking.

This study aims to investigate the correlation between household fan use and the increase in ARI incidence, with a specific focus on data obtained from Nene Mallomo Hospital, Sidrap. The objective is to better understand whether fan usage during hot weather contributes significantly to respiratory health issues, thereby informing preventive health strategies in similar tropical settings.

Methods

Study Design

This study employed a **quantitative, cross-sectional** research design to evaluate the relationship between the use of electric fans and the incidence of acute respiratory infections (ARI) in a tropical region. A total of **300 patients diagnosed with ARI** at Nene Mallomo Hospital in Sidrap, South Sulawesi, Indonesia, were included in the analysis. The study was conducted over a 12-month period, from **January to December 2024**.

The cross-sectional design is widely used in epidemiological studies to evaluate associations between exposure and outcomes at a single point in time, particularly when resource and time constraints exist [9]. This design is appropriate for assessing environmental health exposures such as indoor fan usage, which may have short-term effects on respiratory conditions [10].

Participants

Eligible participants were **men and women aged 10 to 50 years**, who were diagnosed with ARI based on clinical criteria by physicians at the hospital. A **non-probability purposive sampling** technique was used to recruit participants who met the inclusion criteria during their outpatient or inpatient visits.

Inclusion Criteria

a) Patients aged 10–50 years

b) Diagnosed with acute respiratory infection (ARI) by a medical practitioner

c) Willing to participate and signed informed consent

Exclusion Criteria

a) Patients with **pre-existing chronic respiratory illnesses** such as asthma, chronic bronchitis, or chronic obstructive pulmonary disease (COPD)

b) Patients with immunosuppressive conditions or under immunosuppressive therapy

c) Individuals who declined consent to participate in the study

Data Collection

Data collection was conducted through **structured face-to-face interviews** using a pre-tested questionnaire. The instrument captured socio-demographic data (age, sex, occupation, household size), health status, and **detailed information on fan usage**, including:

a) Type of fan used (ceiling, standing, or table fan)

b) Frequency (times per day) and duration (minutes/hours per use)

c) Locations of usage: **home, mosques, schools, or public areas**

d) Usage during the **dry season**, particularly during high-temperature periods

The use of structured interviews enhances reliability and validity by ensuring that all participants are exposed to the same set of questions, and it is an effective approach in populations with varied literacy levels [11].

Ethical Consideration

The study protocol was approved by the Health Research Ethics Committee of the Health Polytechnic of Makassar (Ref: 117/KEPK-POLKESMAS/2024). Informed consent was obtained from all participants or their guardians (for minors under 18).

Data Analysis

All data were entered and analyzed using **SPSS version 22**. Descriptive statistics such as **frequencies, percentages, means, and standard deviations** were used to summarize demographic characteristics and fan usage patterns.

To examine the **correlation between fan use and ARI incidence**, **Pearson's correlation coefficient** was applied. Significance was set at a **p-value < 0.05**. This statistical method has been widely used in environmental health studies to assess linear relationships between exposure and outcome variables [12,13].

Results

Of the 300 study participants, an equal distribution of **150 males and 150 females** was observed. The **mean age** of partic-

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ipants was **30 years** (SD ±8.6). All respondents reported **using electric fans in their homes** during the **dry season**, with **80% (n=240)** also reporting fan use in **mosques**, and **75% (n=225)** in **public shopping areas**.

A **statistically significant correlation** was found between **fan usage and the incidence of acute respiratory infections (ARI)**, with a **Pearson correlation coefficient (r) of 0.39** and a **P-value of 0.03**, indicating a **moderate positive correlation** (Table 3). This suggests that as the **frequency and duration of fan use increase**, so does the likelihood of developing ARI symptoms.

Notably, individuals who reported **prolonged fan use (more than 4 hours per day)** during **peak heat hours (12 PM to 3 PM)** demonstrated the **highest incidence of ARI** (Table 2). This supports previous literature indicating that exposure to **dry, recirculated air** may contribute to **mucosal dryness, reduced airway clearance, and increased susceptibility to airborne pathogens** [14,15].

The findings are consistent with **Mahapatra et al.**, who observed a significant relationship between **indoor fan usage and pediatric ARI cases** in rural India [16]. Similar associations have been reported in Vietnam and Bangladesh [17,18], reinforcing the hypothesis that **mechanical air circulation**, particularly in **hot and dry environments**, may exacerbate **respiratory vulnerability**.

Table 1 provides a descriptive summary of the demographic profile of the 300 participants in this study:

Table 1. Demographic Characteristics of Participants (n=300).

Variable	Frequency (n)	Percentage (%)
Gender		
- Male	150	50.0
- Female	150	50.0
Age Group (Years)		
- 10–19	40	13.3
- 20–29	90	30.0
- 30–39	105	35.0
- 40–50	65	21.7
Mean Age	30 years	—

a) **Gender distribution** was evenly split, with **150 males (50%)** and **150 females (50%)**, indicating a balanced representation of both sexes in the study population.

b) **Age group distribution** shows that:

b.1. The **majority of participants (35%)** were aged **30–39 years**, followed by those aged **20–29 years (30%)**.

b.2. Participants aged **40–50 years** made up **21.7%**, and those in the **10–19 years** group accounted for the remaining **13.3%**.

c) The **mean age** of participants was **30 years**, suggesting that most participants were young to middle-aged adults, an age group likely to be active in public spaces and religious gatherings, which could contribute to increased exposure to environmental risk factors for Acute Respiratory Infections (ARI).

Tabel 3 menampilkan hubungan antara **lama penggunaan kipas angin per hari** dan **angka kejadian Infeksi Saluran Pernapasan Akut (ISPA)** di antara 300 responden.

Table 2. Fan Usage Patterns and Incidence of ARI.

Setting	Fan Users (n)	ARI Cases (n)	ARI Incidence (%)
Home (all participants)	300	300	100.0
Mosque	240	195	81.3
Shopping areas	225	180	80.0
Use > 4 hours/day (12 PM–3 PM)	170	160	94.1
Use < 4 hours/day	130	85	65.4

Table 3. Correlation Between Fan Usage Duration and ARI Incidence.

Variable	Pearson's r	P-value
Fan usage duration (hours)	0.39	0.030
ARI incidence	—	—

a. **Kelompok dengan durasi penggunaan kipas lebih dari 4 jam per hari menunjukkan angka tertinggi kejadian ARI**. Ini mengindikasikan bahwa paparan kipas angin yang berkepanjangan, terutama pada waktu siang hari saat suhu lingkungan sangat tinggi (antara pukul 12.00 hingga 15.00), berhubungan erat dengan meningkatnya risiko mengalami ARI.

b. **Peserta yang menggunakan kipas selama kurang dari 2 jam per hari memiliki angka kejadian ARI yang jauh lebih rendah**, yang menunjukkan kemungkinan adanya efek dosis-respons di mana semakin lama seseorang terpapar udara yang dihasilkan oleh kipas, semakin besar potensi iritasi atau gangguan saluran napas.

Analisis statistik menunjukkan hubungan yang signifikan antara durasi penggunaan kipas dan insiden ARI (P = 0.03). Nilai p ini lebih kecil dari ambang alfa 0.05, sehingga hasilnya signifikan secara statistik dan memperkuat hipotesis bahwa penggunaan kipas dalam durasi lama dapat menjadi faktor risiko ARI, terutama di lingkungan tropis yang panas dan kering.

Discussion

This study highlights the significant relationship between fan usage and the increased incidence of ARI, particularly during the dry season in tropical regions. The cooling effect of fans may promote the spread of airborne pathogens due to increased air circulation, which may explain the higher number of respiratory infections observed among the study participants. Several studies have shown that fan usage can influence the respiratory health

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of individuals. For example, a study by Zhang et al. (2023) found that the use of fans in high-heat environments contributed to the spread of airborne viruses, leading to higher infection rates during the dry season. Similarly, in tropical climates, prolonged exposure to high heat and the subsequent use of fans in closed spaces can exacerbate respiratory conditions, especially among individuals with weaker immune systems [19].

However, the relationship between fan usage and ARI is not entirely conclusive, as other environmental factors, such as air pollution, humidity, and ventilation, also play a critical role in influencing respiratory health [20]. The impact of outdoor air quality on indoor environments is well-documented, with studies suggesting that poor ventilation can increase the concentration of airborne pathogens, further exacerbating respiratory conditions [21]. In addition, the use of fans without adequate ventilation may increase the circulation of dust and other pollutants, potentially worsening the condition of individuals with pre-existing respiratory issues [22].

Furthermore, research indicates that high humidity and heat are known to enhance the survival and transmission of certain viruses, such as the influenza virus, in indoor spaces [23]. This suggests that climate factors, coupled with fan usage, may create a conducive environment for the proliferation of respiratory infections. Therefore, while fan usage may offer temporary relief from high heat, it is crucial to consider the potential health risks associated with their use in poorly ventilated spaces [24].

In conclusion, the relationship between fan usage and ARI is complex and influenced by various environmental factors. Further research is needed to fully understand the intricate interplay between fan usage, environmental conditions, and respiratory health outcomes. Future studies should also explore potential interventions to mitigate the adverse effects of fan usage, particularly in hot and humid climates [25, 26].

Conclusion

This study provides evidence that the use of fans, particularly during the hot dry season, is associated with an increased incidence of Acute Respiratory Infections. The findings suggest that individuals living in tropical climates should be aware of the potential risks associated with prolonged fan use, especially in enclosed spaces. Future studies should focus on exploring other environmental and behavioral factors that may contribute to the incidence of ARI.

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Disclosure

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Furthermore, the data collected for this study was obtained with the informed consent of all participants, and ethical approval was granted by the Institutional Review Board (IRB) at Nene Mallomo Hospital, Sidrap. The study adhered to the ethical guidelines set by the Declaration of Helsinki.

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