EVALUATION OF ACUTE RHINOSINUSITIS IN THE OTORHINOLARYNGOLOGY CLINIC AT QUANG NAM GENERAL HOSPITAL: 2022-2024 PERIOD

ĐÁNH GIÁ TÌNH HÌNH VIÊM MŨI XOANG CẤP CỦA BỆNH NHÂN ĐẾN KHÁM TẠI PHÒNG KHÁM TAI MŨI HỌNG, BỆNH VIỆN ĐA KHOA QUẢNG NAM NĂM 2022-2024

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Abstract - Acute Rhinosinusitis (ARS) is a common respiratory disease, particularly in Vietnam, where the tropical monsoon climate favors its development. This study analyzed data from over 1,300 ARS patients at Quang Nam General Hospital, collected from January 2022 to June 2024, to assess epidemiological trends and environmental influences. The results showed that women and middle-aged individuals (45–60 years) had the highest prevalence. Tam Ky City recorded the highest number of cases (34.6%), followed by Tien Phuoc and Nui Thanh. ARS incidence peaked in the summer, particularly from June to August, correlating with hot, dry weather and air pollution. The findings provide essential insights to optimize ARS management and treatment at the local level while contributing to the development of effective public health policies to mitigate the disease's impact.

Keywords - Acute Rhinosinusitis; epidemiology; Quang Nam.

Tóm tắt - Viêm mũi xoang cấp (ARS) là bệnh lý hô hấp phổ biến, đặc biệt tại Việt Nam với khí hậu nhiệt đới gió mùa thuận lợi cho bệnh phát triển. Nghiên cứu này phân tích dữ liệu từ hơn 1.300 bệnh nhân ARS tại Bệnh viện Đa khoa Quảng Nam, thu thập từ tháng 1/2022 đến tháng 6/2024 nhằm đánh giá xu hướng dịch tễ và ảnh hưởng môi trường. Kết quả cho thấy nữ giới và nhóm tuổi trung niên (45–60 tuổi) có tỷ lệ mắc cao nhất. Thành phố Tam Kỳ ghi nhận số ca nhiều nhất (34,6%), tiếp theo là Tiên Phước và Núi Thành. ARS tăng mạnh vào mùa hè, đặc biệt từ tháng 6 đến tháng 8, liên quan đến thời tiết khô nóng và ô nhiễm không khí. Kết quả nghiên cứu cung cấp thông tin quan trọng để hỗ trợ tối ưu hóa quản lý và điều trị ARS tại địa phương, đồng thời xây dựng chính sách y tế công cộng hiệu quả nhằm giảm thiểu tác động của bệnh.

Từ khóa - Viêm mũi xoang cấp; dịch tễ học; Quảng Nam.

1. Introduction

Acute Rhinosinusitis (ARS) is an inflammatory condition of the nasal and sinus mucosa, typically occurring after upper respiratory viral infections. The global annual incidence of ARS ranges from 6–15%, depending on geographical and environmental factors [1]. In Vietnam, the tropical monsoon climate with high humidity increases the risk of respiratory diseases, including ARS, which accounts for an estimated 8–12% of respiratory cases [2]. Quang Nam General Hospital, a large medical facility in central Vietnam, receives and treats a significant number of patients with respiratory diseases, including ARS. Understanding the epidemiological patterns, clinical characteristics, and factors related to hospital admission for ARS is crucial to optimize diagnostic and therapeutic strategies.

Given the lack of comprehensive studies on ARS in Vietnam, this study aims to analyze patient data from the Otorhinolaryngology Clinic of Quang Nam General Hospital to assess epidemiological trends and identify demographic factors associated with hospital admissions due to ARS in this region.

Based on this, I conducted the study titled: "**Evaluation of Acute Rhinosinusitis in the Otorhinolaryngology Clinic at Quang Nam General Hospital**", with the following objectives:

1. Analyzing the epidemiological patterns of acute rhinosinusitis at Quang Nam General Hospital.

2. Evaluating trends in hospital admissions for acute rhinosinusitis at the hospital.

2. Study subjects and methods

2.1. Study Subjects

Inclusion Criteria: patients visiting the otorhinolaryngology clinic were diagnosed with and treated for ARS at Quang Nam General Hospital from January 2022 to June 2024.

Exclusion Criteria: patients with severe comorbidities or complications unrelated to ARS or those who could not undergo nasal sinus examinations due to adverse reactions.

Sample Size: the study included over 1,300 patients.

2.2. Research Methods

Study Design: a retrospective study, descriptive and statistical methods based on available medical records, including gender, age, address, occupation, and admission time.

Data Processing and Analysis:

- Descriptive Statistics:

Patients were categorized by *age*, *gender*, *locality* (district), and *admission time*.

Mean Calculation:

$$\mu = \frac{1}{n}\sum_{i=1}^{n} x_i$$

(x_i is the value of a variable and n is the sample size)

Percentage Calculation:

$$Percentage\ \% = \left(\frac{Number\ in\ Group}{Total\ Patients}\right) X\ 100$$

- *Frequency Analysis*

Analysis of *age distribution by gender* and patient distribution by *admission time* was conducted by calculating the frequency for each patient group:

The frequency (f) of a variable XXX was determined based on the number of patients belonging to that group:

$$f(X) = \sum_{i=1}^{n} 1(x_i = X)$$

where $1(x_i = X)$ is an indicator function, 1 if x_i belongs to group X, and 0 otherwise.

- *Visualization Tools*

Heatmap: heatmap was used to represent patient distribution across variables like **geographic location** and **admission time**. The heatmap is expressed as a matrix with rows representing districts and columns representing months of admission:

$$Heatmap(i,j) = f(District_i, Month_j)$$

where $f(District_i, Month_j)$ is the number of patients in the district i admitted during month j.

Boxplot: Boxplots illustrated patient age distribution by gender or geographic groups, showing minimum, first quartile (Q1), median, third quartile (Q3), and maximum values:

$$Boxplot = \{Min, Q1, Median, Q3, Max\}$$

Bar Chart: Bar charts visualized the number of patients admitted monthly. The frequency for each month j was calculated as:

$$f(Month_j) = \sum_{i=1}^{n} 1(Month_j = j)$$

- *Data Analysis Tools*

Python programming language was used for data processing and analysis. Libraries such as **Pandas** managed data, while **Matplotlib** and **Seaborn** were utilized to draw charts and visualize relationships between variables.

3. Research result

3.1. Patient Distribution by Age Group and Gender

Table 1. *Distribution of ARS patients categorized by gender, age group, geographic area type, and occupation*

	Gender	Age Group	Region Type	Occupation
18-30	-	97	-	-
30-45	-	295	-	-
45-60	-	437	-	-
60-75	-	359	-	-
75+	-	107	-	-
<18	-	24	-	-
City	-	-	456	-
District	-	-	863	-
F (Female)	747	-	-	-
M (Male)	572	-	-	-
Farmer	-	-	-	264
AF	-	-	-	27
Fisherman	-	-	-	1
Freelancer	-	-	-	437
Healthcare	-	-	-	20
Intellectual	-	-	-	20
Officer	-	-	-	128
Other	-	-	-	6
Retired	-	-	-	281
Student	-	-	-	23
Teacher	-	-	-	8
Worker	-	-	-	104

Observations: middle-aged groups, particularly those aged 45-60 and 60-75, have the highest risk of ARS. In contrast, the incidence rate is lower among younger and older age groups. Females tend to have a higher prevalence of the disease compared to males. However, in younger age groups, such as under 18 and 18-30, the gender difference is not significant.

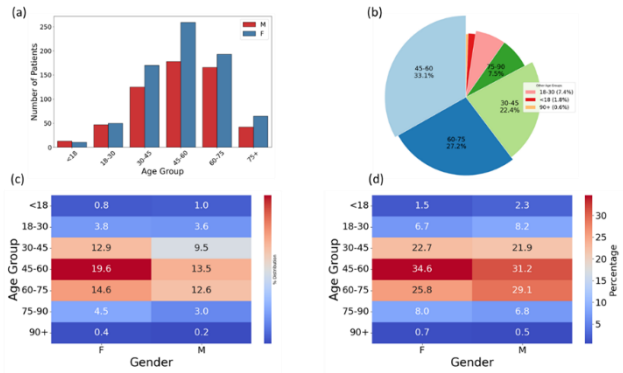

Figure 1. *Distribution of patients by age group and gender. (a) A bar chart illustrating the number of patients by age group and gender. (b) A pie chart showing the percentage of patients categorized by age groups. (c) A heatmap displaying the average age percentage of patients by gender. (d) A heatmap indicating the percentage distribution of patients by age group within each gender*

3.2. Patient Distribution by Occupation, Age Group, and Gender

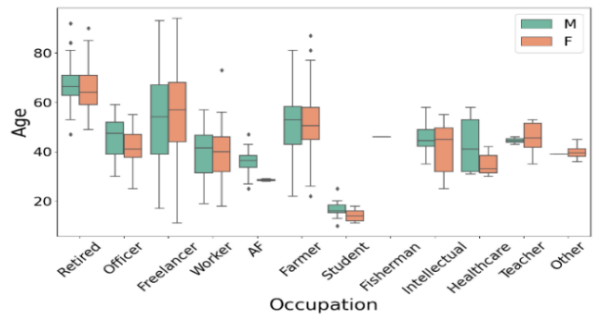

Figure 2. *Boxplot illustrating the age distribution of patients by occupation and gender*

Observations: the retired group, intellectuals, and teachers show a broader age range of female patients

compared to males. Conversely, in the healthcare group, the age distribution of male patients is much wider than that of females. The average age of male patients is higher than females, with no significant disparity between the two genders.

3.3. Patient Distribution by Geographic Area

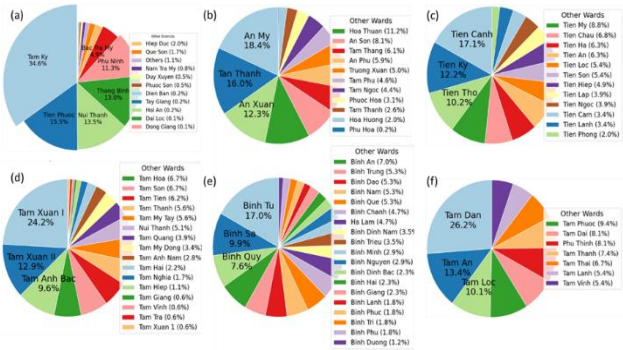

Figure 3. *Distribution of acute rhinosinusitis (ARS) patients by geographic area (a) Patient distribution by districts/cities in Quang Nam province and patient distribution inwards/ communes with the highest proportions within: (b) Tam Ky city, (c) Tien Phuoc district, (d) Nui Thanh district, (e) Thang Binh district, and (f) Phu Ninh district*

Observations: Tam Ky city has the highest proportion of ARS patients, accounting for 34.6% of the total cases. Neighboring districts such as Tien Phuoc (15.5%), Nui Thanh (13.5%), Thang Binh (13.0%), and Phu Ninh (11.3%) also show relatively high patient rates.

3.4. Patient Distribution by Occupation and Geographic Area

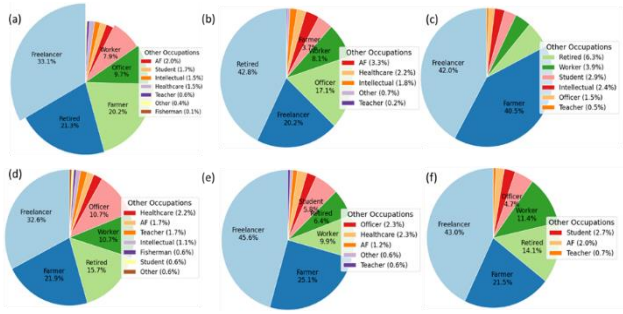

Figure 4. *Occupational distribution of acute rhinosinusitis (ARS) patients: (a) Overall occupational distribution and occupational distribution of patients respectively in (a) Tam Ky city, (c) Tien Phuoc district, (d) Nui Thanh district, (e) Thang Binh district, (f) Phu Ninh district*

Observations: the freelancer group accounts for the largest proportion of patients, followed by the farmer group across all districts in Quang Nam, except for Tam Ky city, where the retired group has the highest proportion.

3.5. Patient Distribution by Admission Time

Observations: June was recorded the highest number of patients, followed by March and November. The 30-45 age group showed the broadest distribution of admission times across the year. The 45-60 and 60-75 age groups occupied the highest proportion of admissions, particularly in March, June, July, and December, with a peak in June. Notably, the under-18 and over-75 age groups had the lowest number of patients, with very few admissions throughout the year.

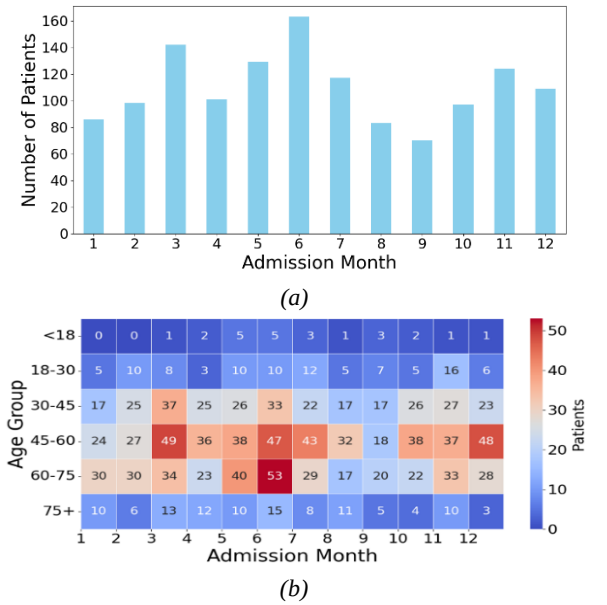

Figure 5. *Distribution of acute rhinosinusitis (ARS) patients by month of admission. (a) Number of patients admitted each month of the year; (b) Distribution of patient age groups by month of admission*

4. Discussion

4.1. Distribution of Patients by Age Group and Gender

Analysis shows that the 45–60 age group has the highest prevalence of ARS, particularly among females. This may be attributed to hormonal changes in this age group as well as occupational and environmental factors [3]. In males, the distribution is relatively even across age groups but it is still concentrated in the 45–60 age range. This can be explained by factors such as working conditions and exposure to allergens or irritants [4]. Additionally, behavioral factors such as smoking, which are commonly observed among men in this age group, may also increase the risk of ARS. Younger age groups (under 18 and 18–30) have significantly lower prevalence, likely due to better immunity and reduced exposure to harmful environmental factors. Moreover, a healthier lifestyle, including regular physical activity and less exposure to occupational hazards, also contributes to reducing the risk of ARS in this age group.

4.2. Distribution of Patients by Occupation and Age

The analysis of occupational distribution highlights significant differences between occupational groups and age ranges. The retired group has the highest proportion of patients, especially in the 60–75 age group, which may be attributed to weakened immunity and impaired capacity of self-protection with age, making them more susceptible to respiratory conditions like ARS [5]. Moreover, retirees often tend to live in enclosed environments or engage in limited physical activity, which can reduce air circulation and increase the risk of exposure to irritants within their living spaces. Farmers also exhibit a high prevalence, with an average age of 50-60, likely due to outdoor work environments and frequent exposure to dust, pollen, and other environmental factors that irritate the nasal mucosa [6, 7]. Additionally, prolonged exposure to pollutants can

impair the natural protective functions of the respiratory system, making this group more vulnerable to environmental factors. Freelancers form a substantial proportion of the study population, with a wide age range of 30–50. While they benefit from flexible work environments, the diversity in work settings and related factors can still influence ARS risk [8]. Factors such as work-related stress, inadequate working conditions, or indirect exposure to polluted environments can also negatively impact respiratory health.

4.3. Patient Distribution by Geographic Area

The analysis indicates that Tam Ky City has the highest proportion of ARS patients, accounting for 34.6% of the total. This can be explained by its role as the provincial capital and the location of Quang Nam General Hospital. Rapid urbanization in Tam Ky has also increased the risk of respiratory diseases, including ARS, due to rising traffic, industrial activities, and high population density, which contribute to air pollution. Fine dust (PM2.5 và PM10) and other pollutants in the air significantly affect respiratory health [9]. Urban areas with high building density and a lack of green spaces exacerbate air pollution issues. The use of improperly maintained air conditioning in enclosed spaces also contributes to nasal dryness, creating conditions conducive to bacterial and fungal growth and increasing the risk of sinusitis [10]. These factors are particularly severe during the summer when high temperatures and dry climate conditions frequently occur. Although Tien Phuoc is a rural area, this district also has a high patient proportion, ranking second after Tam Ky. This may be due to environmental and lifestyle factors, such as exposure to dust during agricultural activities [11]. Lower population density compared to urban areas helps mitigate the impact of air pollution from traffic or industrial activities. However, hygiene conditions and indoor air quality in rural areas remain suboptimal, which can lead to a higher risk of respiratory infections. However, it is important to note that these results may be influenced by the hospital's location and the population density of each region. Tam Ky City, being close to the hospital and serving as the administrative center, is likely to receive more patients compared to neighboring districts. Nevertheless, presenting this data still provides valuable insights into the trends of patient distribution in surrounding areas. These findings can help guide appropriate public health measures to improve respiratory health in high-risk regions.

4.4. Impact of Admission Time on Disease

The analysis reveals a significant increase in ARS cases during the summer and early autumn months, particularly from June to August. Summer in Quang Nam is characterized by hot, dry weather and elevated air pollution due to increased traffic and industrial activities [12]. These conditions can dry out the nasal mucosa, impairing its natural protective function, and facilitating bacterial and viral infections. Additionally, the increased use of air conditioning in enclosed spaces during these months further exacerbates these effects.

A slight increase in cases is also observed during the rainy season, from September to November, especially among older age groups. High humidity during this period increases the risk of respiratory diseases, particularly among individuals with weakened immune systems, such as the elderly. Humidity also fosters the growth of mold and allergens in living environments, contributing to nasal and sinus problems [13].

In summary, the variation in ARS cases across months highlights the clear relationship between weather, climate, and disease risk. Environmental factors such as air pollution, humidity, and air conditioning use significantly impact respiratory health, particularly during the summer and rainy seasons. This underscores the importance of monitoring and preventing ARS in specific periods to reduce disease risks and improve treatment quality.

4.5. Distribution of Patients by Age Group and Admission Month

The highest number of patients was recorded during the summer and early autumn months, particularly from May to July, and this trend was more pronounced among middle-aged and older groups. The 45–60 age group accounted for the largest proportion during the summer months, particularly in June and July, when ARS cases rose significantly. The 60–75 age group also experienced a notable increase during this period, with a more pronounced rise in the rainy months, from September to November. This may reflect the sensitivity of older individuals to humid and cold weather conditions. High humidity during the rainy season can irritate the nasal mucosa, weakening the respiratory system's natural defenses, and increasing the risk of sinus infections [13]. Comorbidities such as diabetes, chronic lung disease, and weakened immunity further heighten this group's susceptibility to environmental changes [14]. Conversely, the under-18 and 18–30 age groups had lower patient numbers, with less variations in monthly distribution. This may be due to better immunity among younger individuals, who are less affected by harsh weather conditions compared to older groups.

5. Conclusions

The results indicate that females have a higher prevalence of ARS than males, particularly in the 45–60 and 60–75 age groups, which account for the highest proportions of patients. Younger age groups, such as under 18 and 18–30, have lower patient numbers, and gender differences in these groups are minimal.

The occupational analysis reveals significant differences in ARS prevalence across various professions. Farmers, freelancers, retirees, and workers have the highest prevalence rates, with retirees primarily concentrated in Tam Ky City.

The geographic distribution analysis also shows significant differences across districts and cities in Quang Nam. Tam Ky City has the highest patient proportion, followed by nearby districts such as Phu Ninh, Nui Thanh, and Thang Binh due to their proximity to the city center. Notably, Tien Phuoc district, despite being a more remote rural area, ranks second in patient proportion after Tam Ky.

The analysis of admission time highlights a peak in patient numbers during May, June, and July, likely due to high temperatures and humidity. The 45–60 and 60–75 age

groups have the highest admissions during these months, reflecting their higher susceptibility to unfavorable weather conditions or sudden climate changes.

These findings suggest that ARS is influenced by multiple factors, including gender, age, occupation, geographic location, and seasonal variations. Older populations, particularly females and those working in challenging environments are at higher risk of developing ARS.

6. Recommendations

The study provides a clear understanding of the distribution of ARS patients at Quang Nam General Hospital, however, we should highlight the need for further research to improve diagnosis and treatment. Factors such as age group, gender, occupation, geographic location, and admission time reveal notable trends, however, they do not fully explain the overall impact of the disease.

Calculating the proportion of patients in each group (age, occupation, geography) relative to the total local population would provide greater value in accurately assessing disease risk. Incorporating data from official population surveys, such as the size of each demographic group, is essential but beyond the initial scope of this study. Future research should integrate census data to enhance the accuracy and applicability of epidemiological analyses.

Future studies should focus on environmental factors like air pollution, air quality, and the impact of air conditioning in urban areas such as Tam Ky. These factors may contribute to the increased prevalence of ARS, particularly in summer. In-depth studies on these relationships will support health recommendations, such as mask usage or improved ventilation systems. Additionally, future studies should integrate the collection of environmental data through local climate monitoring systems and reliable data sources. The use of multivariate regression analysis will aid in identifying key influencing factors, such as environmental impacts, occupational exposure, or individual characteristics, on the risk of developing ARS. This approach will not only clarify potential underlying relationships but also provide a foundation for developing more effective prevention and treatment strategies, particularly for high-risk areas.

Clinical factors such as patient medical history and lifestyle habits (e.g., smoking, antibiotic misuse) should also be explored to develop personalized treatment strategies. Long-term monitoring of post-treatment conditions, the effectiveness of current methods, and antibiotic resistance risks will help optimize treatment protocols.

Underlying conditions such as diabetes, chronic respiratory diseases, or weakened immune systems can increase susceptibility to ARS, exacerbate symptoms, and affect treatment efficacy. Future studies should expand the scope of research to include patients with severe underlying conditions, thereby enabling the development of more effective strategies for diagnosis, treatment, and prevention.

Expanding research to other regions will determine whether trends observed in Quang Nam are local or universal. Comparing climate, geography, and social conditions across regions will help develop more accurate ARS risk prediction models.

For prevention, raising community awareness about personal hygiene, mask usage, and maintaining clean living environments, regular health checkups is crucial. Improving air quality in both urban and rural areas is essential to reduce future disease risks.

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