

# Investigating the link between persistent para-nasal sinus cancer related infections, arterial hypertension and radiotherapy in adult oncology patients

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ABSTRACT

**Background:** Persistent or chronic paranasal sinus infection is one of the most common forms of inflammation of the upper airway. The relationship between upper airway infection, including chronic sinusitis, and the most significant risk factor for cardiovascular disorders, specifically, hypertension, persists unidentified.

**Aim of the Study:** This article is aimed at explaining whether there is a correlation between arterial hypertension and chronic para-nasal sinusitis in the Iraqi population.

**Methods:** A survey design and cross-sectional study were conducted by selecting two groups of patients (patients and a control group) in the department of otolaryngology at Alkhalis General Hospital in Diyala Governorate, Iraq. Each group in this prospective clinical study was composed of 200 adult participants of both genders.

**Results:** The ratio was 1% for those under the age of 20, 34% for those between the ages of 20 and 29, 25% for those between the ages of 30 and 39, 24% for those between the ages of 40 and 49, and 16% for those over 50. Whereas the distribution of age in the Group 2 or (control group) was as follows below the age of 20 years 2%, between 20 and 29 years 31%, between 30 and 39 years 31%, from 40 years to 49 years 23%, and lastly more than 50 years of age 14%.

**Conclusion:** In our group's study, we found that there is a strong association between chronic sinusitis and hypertension, especially among men. The elevated prevalence ratio of chronic sinusitis and high blood pressure emphasizes the significance of our results. Further studies need to be done to clarify the mechanisms associated with this correlation.

**Keywords:** chronic para-nasal sinusitis, rhinosinusitis, cardiovascular diseases, arterial hypertension

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## INTRODUCTION

Chronic para-nasal sinusitis is one of the most common diseases seen in ENT outpatient clinics. It has a great impact on the morbidity and costs of the health system. It is inflammation of the nasal sinuses for more than 3 months [1, 2]. Rhinosinusitis refers to the inflammation of both the nasal sinuses and the nasal cavity. Chronic sinusitis accounts for about 20% of patients seen by immunological and allergic physicians in U. S. [3]. Furthermore, the prevalence in Europe is approximately 11%. Unfortunately, medical treatment of chronic sinus infection is unsuccessful and frustrated in most cases eventually, surgical management may be the strategy of choice [3]. The elevated incidence of rhinosinusitis and hypertension are not uncommon in developed countries, with around 25% of the population suffering from both disorders [4-6].

Chronic paranasal sinus infection has been reported to be a contributing factor for other respiratory diseases such as bronchial asthma, respiratory allergy, polyposis, and other chronic pulmonary disorders. Furthermore, chronic rhinosinusitis exacerbates other systemic disorders, for instance, fatigue, headache, and halitosis [2, 3]. An epidemiological study done has been reported that there is a strong link between chronic rhinosinusitis and arterial hypertension. They selected randomly 146 men in middle age in Paris [4].

Recent studies reported a strong correlation between Cerebral Vascular Accident (CVA) and chronic sinusitis [5, 6]. The proposed theories for this relationship depend on many factors, for instance, the cerebral arterial spasm or emboli (inflammatory mediated emboli), post sinus surgery complications, adverse allergic drug reactions, and the anatomical relation of the brain to the paranasal sinuses. Therefore, the purpose of this study is to further investigate whether there is an association between hypertension and chronic sinusitis or not.

## METHODS

### Study design

This study was conducted from September 2017 to January 2020 in the department of otolaryngology, head and neck surgery in Alkhalis General Hospital in Diyala Governorate, Iraq. The analysis of the data is based on (population-based survey).

## Study sample

Two groups of cancer patients were observed and examined carefully in the outpatient clinic at Alkhalis General Cancer Hospital in Diyala Governorate, Iraq. The target individuals involved are residents of Alkhalis city and surrounding villages. A special questionnaire was used for each patient, which included name, age, gender, education, whether the patient smoked or not, the severity and duration of the illness (rhino-sinusitis). A detailed history of any other chronic diseases, which were clarified as (long term conditions) that persist for more than 6 months or longer. Special questions have been asked to them, for example, do you have a stuffy nose, facial pain, a runny nose, or postnasal drip? If the answer is yes, then the other question is, (How long have you been complaining of this illness)? Individuals who responded to the following questions are confirmed to have hypertension and chronic paranasal sinusitis: (Do you have a sinus infection diagnosed previously by a specialist doctor) and (Do you have hypertension detected by a physician?) Furthermore, a complete examination of the nose and para-nasal sinuses has been done for the included population in both groups.

## Inclusion and exclusion criteria

To complete the analysis of the data collected, we exclude patients who refuse to answer any of the above questions. Additionally, pregnancy, patients with airway cancer tumors and uncompensated cardiopulmonary disorders have been correspondingly excluded from the study.

## Sample size

Two groups of Cancer patients were observed and examined. The first group (Group 1) in this prospective clinical research was composed of 200 adult participants of both genders. The age range involved in this group was between 17 years and 65 years. Those patients complained of chronic sinusitis for more than 12 weeks. The gender distribution was 134 males and 66 females. Whereas, the second group (group 2) or control, was correspondingly composed of 200 participants. The gender distribution was 122 males and 78 females. The ages ranged from 17 years to 65 years. Those individuals do not suffer from any complaint of a chronic sinus infection.

## Procedure of study

The present and previous histories of the illness have been taken, and examinations have been done and documented from both control and patient groups equally. A mercury sphygmomanometer was used to measure the blood pressure in both groups in a comfortable supine position. The test was done on the upper right arm on three different occasions. The time between each reading was at least 10 minutes. After that, the middling of these three readings was

documented. When the systolic readings of blood pressure were 140 mmHg or over and the diastolic readings were 90 mmHg or over, hypertension was identified in the cancer patients.

## Ethical consideration

Official and legal approvals for the completion of the research were obtained from each of the Cancer Research and Development Committees in the Diyala Health Directorate and the College of Medicine at the University of Diyala, Iraq.

## Statistical analysis

Data analysis between the measurements has been done by using, the X2 "Chi-square" A significant level of  $\alpha=0.05$  was used for the measurements. To process the analysis of the data, a statistical software "version22 SPSS" was applied by a statistics specialist.

## RESULTS

The characteristics of the age distribution of individuals who complain of chronic sinusitis (group 1) were described in table 1. The ratio was: below the age of 20 years 1%, between 20 years and 29 years 34%, between 30 years and 39 years 25% from 40 years to 49 years 24%, and more than 50 years of age 16%. Whereas the distribution of age in the (Group 2) or (control group) was as follows: below the age of 20 years 2% between 20 years and 29 years 31% between 30 years and 39 years 31% from 40 years to 49 years 23%, and lastly, more than 50 years of age, 14%. The association between chronic sinusitis and hypertension has been increased in the first group of patients who are over 50 years old (4%), while in the second group or control individuals, the ratio was 2% at the same age groups. On the other hand, the ratio of chronic sinusitis has also increased in the patients between 20 years–29 years old compared to the second group or control group which is 0%. Our results represent no significant high ratio of hypertension between the two groups below 20 years of age, as shown in table 1. In the first or patient's individual, the prevalence rate of gender distribution was 68% (136 patients) men and 32% (64 patients) women. In the second group, or control group, the men made up 61% while the women made up 39% of selected individuals. There are statistical differences between the two genders in patients who complain of chronic sinusitis, with 12% being men and only 4% being women, as shown in table 2. Accordingly, in table 3, the results of the patients with chronic sinusitis found that 24% (48 patients) are known to have hypertension (32 patients have been observed to have elevated blood pressure, and 16 patients had normal blood pressure at the time of the examination). On the other hand, in the second or control group, 14% or 24% individuals have high blood pressure (Eight had normal blood pressure, and 20% had high blood pressure at the time of the examination).

**Tab. 1.** Shows the statistical distribution of the age of both the patient group (Group 1) and the control group (Group 2)

Age Distribution	Selected Groups		Blood Pressure		
			Normal BP	Hypertensive	Total
Less than 20 years	Group 1	No.	2	0	2
		%	33.30%	0	33.30%
	Group 2	No.	4	0	4
		%	66.70%	0	66.70%

20 year-30 year	Group 1	No.	61	6	68
		%	50.80%	100.00%	53.10%
	Group 2	No.	60	0	60
		%	49.20%	0.00%	46.90%
30 year-39 year	Group 1	No.	42	8	50
		%	42.90%	57.10%	44.60%
	Group 2	No.	56	6	62
		%	57.10%	42.90%	55.40%
40 year-49 year	Group 1	No.	38	10	48
		%	52.80%	45.50%	51.10%
	Group 2	No.	34	12	46
		%	47.20%	54.50%	48.90%
≥ 50 years	Group 1	No.	24	8	32
		%	50.00%	66.70%	53.30%
	Group 2	No.	24	4	28
		%	50.00%	33.30%	46.70%

**Tab. 2.** Illustrates the statistical distribution among women plus men of the measurement of arterial pressure in both selected groups, group 1 or patients' group and group 2 or control group

Gender	Groups		Blood Pressure			Total	p-value
			Normotensive		Hypertensive		
Men	Group 1	No	112	24	136	0.18	
		%	51.40%	60.00%	52.70%		
	Group 2	No	106	16	122		
		%	48.60%	40.00%	47.30%		
Women	Group 1	No	56	8	64	0.16	
		%	43.80%	57.10%	45.10%		
	Group 2	No	72	6	74		
		%	56.30%	42.90%	54.90%		
p-value		0.16					

**Tab. 3.** Shows the statistical distribution and p-value of well-known cases in both groups of selected individuals (Group 1) or patients' group and (Group 2) or control group

Hypertension		Blood Pressure			Total	p- value
		Normotensive		Hypertensive		
Present	Group1	No	16	32	56	0.26
		%	66.70%	61.50%	63.20%	
	Group2	No	8	20	28	
		%	33.30%	38.50%	36.80%	
Not present	Group1	No	152	0	152	0.21
		%	47.20%	0.00%	46.90%	
	Group2	No	170	2	172	
		%	52.80%	100.00%	53.10%	
p-value		0.12				

## DISCUSSION

The strong point of this research is the large number of individuals involved. We found that the ratio of high arterial pressure (4%) is elevated in patients with chronic sinusitis, especially those over 50 years old, whereas at the same age group in the control group, it was only 2%. Between 20 years and 30 years in patients with chronic sinusitis, the ratio of high blood pressure was 3%, while in the control group the percentage was zero. These findings are supported by other research done by Dales et al. (2005), who found

a strong correlation between high blood pressure and chronic rhinosinusitis [4]. Concomitantly, our results are consistent with Aung et al. (2010) study, which explained that the elevation of blood pressure in the patient with chronic upper airway infections may be due to the idiopathic etiology of hypertension. The weakness of the methodology used in the present study was the error in the measurement of blood pressure as well as the exclusion of the radiological diagnosis of chronic sinusitis because it is based on data obtained from questionnaires and clinical assessments. This may lead to low assessment and misclassification of paranasal si-

nus infections and lower our finding accuracy. These arguments are mentioned by Sokol et al (2019) and Peppard et al (2000), who are reported 4 studies explained that primary healthcare practitioners can establish the assessment of the possibility of chronic sinusitis by comparing with different radiological investigations [7-18].

We analyze the results between men and women with chronic sinusitis. The correlation between hypertension and persistent sinus infection was stronger among men than women. The result analysis was 12% of patients who complain of chronic sinusitis and hypertension were men, while only 4% were women. The explanation of this association was explained by a study was done. The by Peppard et al. (2001) in Wisconsin in the United States. They reported that hormonal influence, smoking, and body-built differences between the genders increase the susceptibility of sinus infections in males more than females [18]. Furthermore, another research done by Kony et al. (2003) in Paris, France. This study explains that women may be protected from cardiovascular diseases and hypertension before menopause [11].

Conversely, a study made by Dales et al. (2000) in Canada. They detected women with sinusitis are more susceptible to having high blood pressure at about 4%, whereas, the men's ratio was 2%

[13]. The pathophysiological factors behind that are women are more susceptible to asthma and an increase in smoking among women. Moreover, the Ostia of the paranasal sinuses is smaller in women, which may lead to the likelihood of chronic sinusitis [18].

On the other hand, Young et al. (2000) have established in their study that there are no significant differences between both genders in patients with or without infective rhinitis [13]. We observed 4% differences between patients and control groups, in which 32 patients have been shown to have hypertension in the patient's group while 20 cases in the second or control group. Moreover, 48 individuals had high blood pressure in the first group whereas, 32 in healthy patients. Therefore, there is a correlation between high blood pressure and chronic sinusitis [19-21].

## CONCLUSION

Chronic sinusitis is strongly associated with hypertension, especially among men in our group's-based study. The elevated ratio population of chronic sinusitis and high blood pressure emphasizes the significance of our results. These outcomes open up further investigations and studies to explore the correlation and pathophysiological mechanisms between upper airway infection and cardiovascular disorders.

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