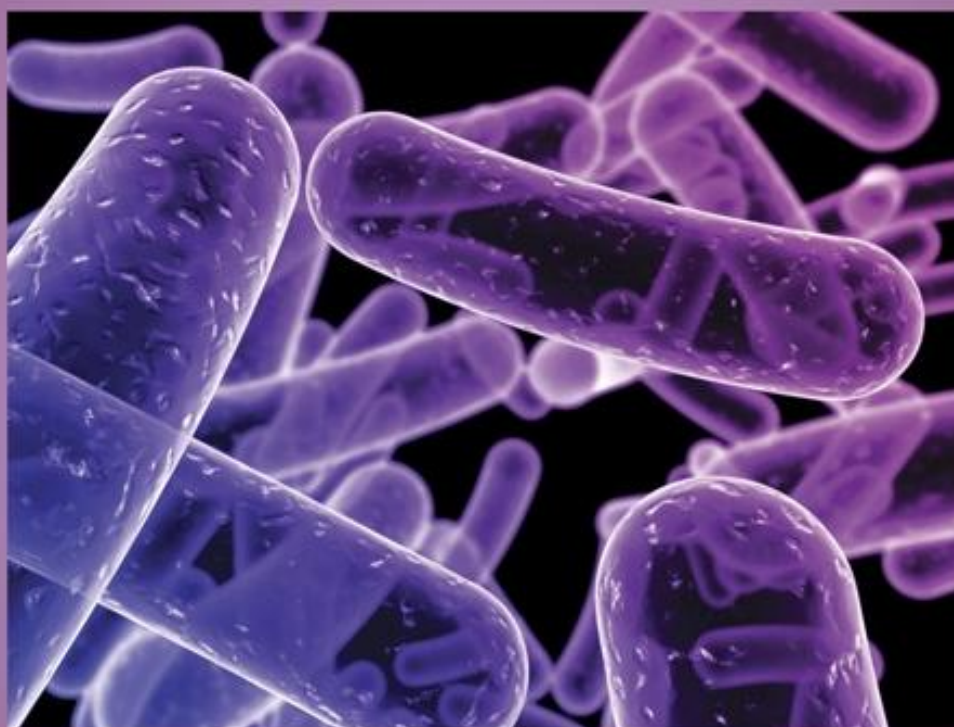




EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
MICROBIOLOGY

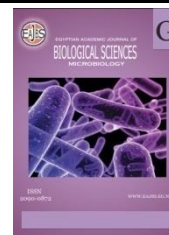
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ISSN
2090-0872

WWW.EAJBS.EG.NET

Vol. 17 No. 2 (2025)



Epidemiological Assessment of Chickenpox in Duhok Province, Kurdistan Region, Iraq: A Retrospective Study

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ARTICLE INFO

Article History

Received:20/5/2024

Accepted:12/7/2025

Available:16/7/2025

Keywords:

Chickenpox,
Varicella, Seasonal
Variation, Age
Distribution.

ABSTRACT

Geographical location and climate have an impact on the occurrence of chickenpox, a common viral infection. It usually affects youngsters and shows seasonal changes in temperate regions such as Iraq. The purpose of this study was to evaluate the seasonal and demographic trends of chickenpox cases in Duhok city, in 2024. This retrospective descriptive study was carried out at the Dermatology Department of Azadi Teaching Hospital in Duhok, Kurdistan Region, Iraq. From January to December 2024, all cases of chickenpox with a clinical diagnosis were included. A hospital-based questionnaire was used to gather patient information, including age, gender, date of infection, and domicile. A total of 680 cases were reported, with 342 females and 338 males, representing a roughly equal gender distribution. The 5–14 age group had the highest incidence, while the 1–4 age group had the lowest overall but demonstrated greater vulnerability in February. There was a noticeable seasonal trend, with a winter peak and a slow fall during the summer and autumn. Gender differences were not statistically significant, but seasonal change in the age distribution was statistically significant. There were clear seasonal and age-related tendencies in the number of chickenpox infections in Duhok in 2024, with the disease increasing in the winter, especially among younger children. These results emphasize the significance of vaccination campaigns and public health initiatives that are seasonally appropriate, particularly in the lead-up to the winter months.

INTRODUCTION

One of the human herpes viruses (HHVs), varicella-zoster virus (VZV) is officially known as HHV-3. It belongs to the DNA-containing Herpesviridae family. Varicella (chickenpox) is the main illness caused by VZV, while herpes zoster (HZ) is the result of a dormant VZV reactivating. A highly contagious airborne illness, chickenpox is typically mild and self-limiting. It is one of the most prevalent childhood illnesses, with a fever and blister-like rash that is most common in children aged 1 to 9 (Kedar *et al.*, 2019).

Pneumonia, encephalitis, or a subsequent bacterial infection can worsen chickenpox, particularly in adults, adolescents, and immunocompromised individuals (Heininger & Seward, 2006). Age determines the disease's intensity; adults are more likely to have varicella and have more severe disease. In England and Wales, the death rate for people aged 15 to 44 is 20 times greater than that of people aged 5 to 14. Compared to newborns, those older than 13 years have a 2.2-fold higher chance of getting mild to severe chickenpox (Chaves *et al.*, 2007). VZV infection during pregnancy can cause problems and have serious effects on the developing fetus (Field *et al.*, 2014).

Since there is a vaccine that can stop the disease from starting, many nations, including the United States, Canada, and Japan, have made routine vaccinations against chickenpox part of their immunization schedules (Park *et al.*, 2013). According to (Motsch, 2014), two doses are advised for adolescents between the ages of 12 and 18 as well as for high-risk groups who have no clinical history of chickenpox, such as women who are capable of bearing children, immunocompetent adults who were exposed to VZV within three days, individuals who have close contact with immunocompromised individuals, children who have received solid organ transplants, and all medical professionals who have never had chickenpox.

According to the section on respiratory infections (2012), chickenpox is regarded as a monthly reportable illness in Iraq. According to (Khaleel & Abdelhussien, 2012), the diagnosis is clinical, the treatment is typically supportive, and there is a dearth of information on hospitalization and mortality. Given the paucity of information on disease burden, this study attempts to determine the prevalence of chickenpox in Duhok province, Kurdistan region of Iraq, in order to better understand its impact on

public health and help planning for efficient prevention and control methods.

MATERIALS AND METHODS

Study Area:

Geographical zones have varying rates of chicken pox occurrence. Chickenpox often affects preschoolers and is a mild, self-limiting illness in temperate regions (Vyse *et al.*, 2004). Iraq is categorized as being in the temperate zones of the earth's climate according to Aristotle's classification (Jirsa, 2020). The Dermatology Department of Azadi Teaching Hospital in Duhok province, Kurdistan Region, Iraq, was the site of this retrospective study. It covered every chickenpox sufferer who was diagnosed in a hospital between January 1st and December 31st, 2024.

Study Design:

A total of 680 patients were recorded (338 males and 342 females), classified into four age groups as those used in the hospital's surveillance system. Several information was taken by a specific questionnaire, included of patient name, age, gender, date of infection, and residency. The diagnosis was done by the dermatologists depending on the physical diagnosis (clinical sign and symptoms). Ethical approval was not required for this study, as it involved retrospective analysis of recorded data without direct contact with patients. Permission to access the data was obtained from the hospital administration.

Statistical Analysis:

The statistical analysis was done by Statistical Package for the Social Sciences (SPSS) version 25 and Excel 2010. The analysis was done by frequency, percentage, proportion, and chi-square test as a descriptive study.

RESULTS

680 patients with chickenpox recorded at Azadi Teaching Hospital in all months of the year 2024. Collected data in Department of Dermatology have shown: 338 (49.71%) males, and 342 (50.29%) females, the highest cases reported was in

the age group (5-14) years which were 196 (28.82%) cases. The lowest cases reported was in the age group (1-4) years which were 146 (21.47%) cases, these data are shown in (Table.1).

The results indicate a higher incidence rate observed during winter which were 200 (29.41%) cases, in contrast, the lowest incidence was recorded during summer and autumn, with each season reporting 150 cases (22.06%). The analysis revealed a significant seasonal variation in the age group distribution of chickenpox cases with (P-value= 0.045), indicating a meaningful difference across seasons, they are shown in (Table.2).

Figure.1, illustrates monthly prevalence of chickenpox cases by gender, it indicates that the highest number of cases

was recorded in February, with a total of 100 cases. A gradual decrease in cases was observed from June to December. Notably, lower numbers were reported during the summer months with totals not exceeding 50 cases per month. Across most of the months, female cases consistently outnumbered male cases, but the gender difference was not statistically significant (P-value= 0.678).

Figure.2, illustrates the monthly prevalence of chickenpox cases by age groups, it demonstrates a clear peak in February, with the highest number of cases recorded in the 1–4 years age group (30 cases). Across other months, the incidence remained relatively lower across all age groups, with minor fluctuations but no other significant peaks observed.

Table.1: Distribution of Chickenpox by age groups and gender

N= 680 Age Groups (Years)	Infected with Chickenpox	Gender		P-Value
		Male	Female	
1-4	146 (21.47%)	77 (52.74%)	69 (47.26%)	0.447
5-14	196 (28.82%)	103 (52.55%)	93 (47.45%)	
15-49	170 (25.00%)	82 (48.24%)	88 (51.76%)	
> 50	168 (24.71%)	76 (45.24%)	92 (54.76%)	
Total	680 (100%)	338 (49.71%)	342 (50.29%)	

Chi-Square Test conducted for statistical analysis, with p-value < 0.05 indicating statistical significance.

Table.2: Seasonal variation in age group distribution of cases

Age Groups (Years)	Seasons					P-Value
	Spring	Summer	Autumn	Winter	Total per Age	
1-4	45 (6.62%)	30 (4.41%)	21 (3.09%)	50 (7.35%)	146 (21.47%)	0.045
5-14	39 (5.74%)	40 (5.88%)	57 (8.38%)	60 (8.82%)	196 (28.82%)	
15-49	49 (7.21%)	39 (5.74%)	33 (4.85%)	49 (7.21%)	170 (25.00%)	
> 50	47 (6.91%)	41 (6.03%)	39 (5.74%)	41 (6.03%)	168 (24.71%)	
Total per Season	180 (26.47%)	150 (22.06%)	150 (22.06%)	200 (29.41%)	680 (100%)	

Chi-Square Test conducted for statistical analysis, with p-value < 0.05 indicating statistical significance.

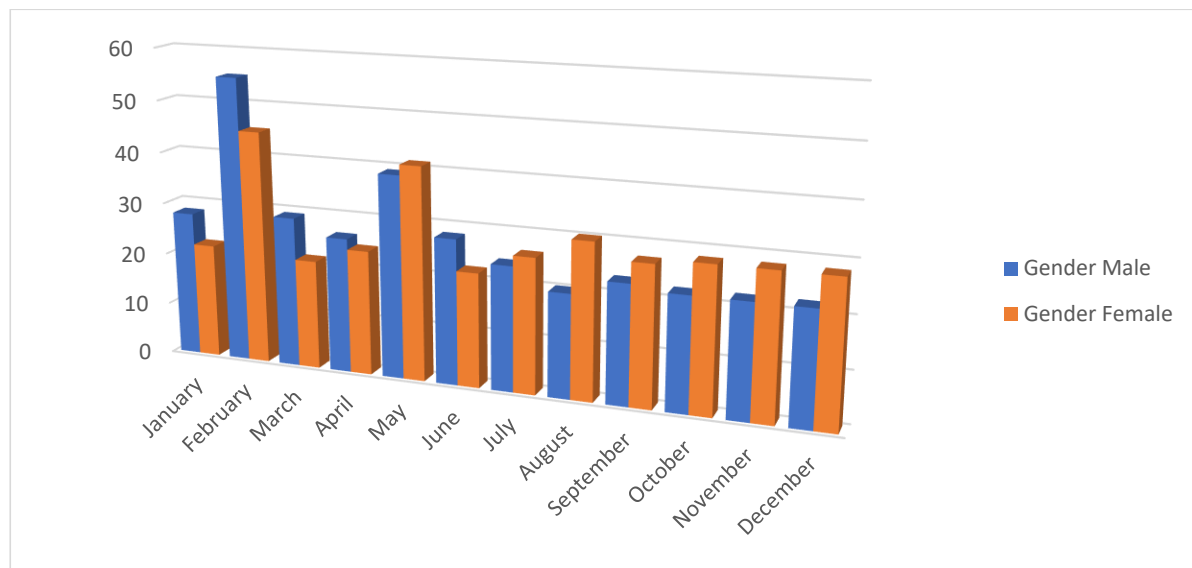


Fig.1: Monthly prevalence of Chickenpox cases by gender.
Data analyzed using Descriptive Statistics. Chart is generated using Microsoft Excel 2010.

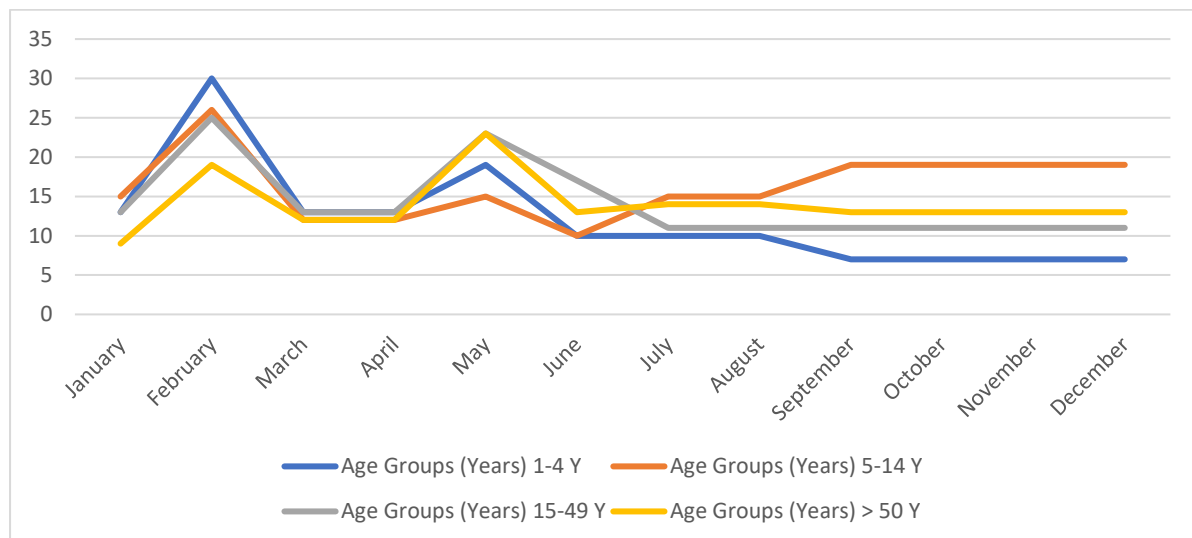


Fig.2: Monthly prevalence of Chickenpox cases by age groups.
Data analyzed using Descriptive Statistics. Chart is generated using Microsoft Excel 2010.

DISCUSSION

Over 95% of adults have had chickenpox at some point in their lives. Poor cleanliness, social norms, and the absence of the chickenpox vaccine from the Iraqi immunization program could all contribute to the prevalence of varicella in schoolchildren. The epidemiology of varicella varies in tropical nations, where a greater percentage of cases are in adults (Abbood *et al.*, 2021).

In contrast to studies by (Abbood *et al.*, 2021) and (Khaleel & Abdelhussien, 2012) which reported a higher number of

males than females, the results of our study showed that the occurrence of chickenpox in Duhok province in 2024 was high, with a total of 680 cases; 342 (50.29%) of these cases were females, and 338 (49.71%) were males. This could be explained by the Iraqi community's social preference and care for males, which encourages them to seek medical attention more often than females.

Regarding the prevalence of chickenpox in various age groups, this study indicated that the age group of 5–14 years old had the highest number of cases (196, or 28.82%), which is consistent with

the findings of studies by (Abbood *et al.*, 2021) and (Hamborsky *et al.*, 2015). The high prevalence of varicella among school-aged children may be attributed to inadequate personal hygiene, common social behaviors that facilitate transmission, and the absence of the varicella vaccine from Iraq's national immunization schedule. Additionally, the epidemiological pattern of varicella tends to differ in tropical regions, where a larger proportion of infections are observed among adolescents and adults compared to temperate climates (Hamborsky *et al.*, 2015).

This study found that the incidence rates were higher in the winter and lower in the summer and autumn. These findings contrast with those of a study by (Khaleel & Abdelhussien, 2012), which found that the total number of chickenpox cases varied from 2007 to 2011 but all showed the same seasonal distribution, with the highest number occurring in the spring. Additionally, our results contradict those of research conducted in Saudi Arabia (Almuneef *et al.*, 2006) and (Lee, 1998) in India. Our results also contradict a prior study that found that April and May had the lowest number of varicella cases (Al-Obaidi & Abbas, 2016).

The geographic distribution determines the incidence of chickenpox in Iraq, particularly in the province of Duhok. The country's climate, virus survival, virus infectivity, and case registration all have an impact on this phenomenon. The hot, humid temperature has been shown to inhibit virus transmission (Khaleel & Abdelhussien, 2012). Our study aligns with the findings of (Abbood *et al.*, 2021), which reported a seasonal distribution of varicella, with a peak in incidence during the winter months particularly in January and February and a decline during the summer. Similarly, our data showed the highest number of cases in February, with 100 cases reported. Following this peak, the number of cases gradually declined throughout the year, reaching the lowest levels toward the end. This similarity

supports the notion of a seasonal trend in varicella transmission, with increased activity in the colder months and a decrease during warmer periods.

Conclusion

The prevalence of chickenpox in Duhok throughout 2024 demonstrated notable seasonal and demographic trends. Slightly more cases occurred in females, though the gender difference was minimal. Children aged 5–14 were most affected, while younger children had fewer cases overall but showed increased vulnerability during winter, particularly in February when infections peaked. Cases declined steadily from summer through the end of the year, suggesting that colder weather may promote virus transmission. These patterns underline the importance of seasonally timed public health measures, especially vaccination and awareness campaigns before winter.

Declarations:

Ethical Approval: The research proposal was reviewed and approved by the Scientific Committee of the College of Pharmacy. As the study involved a retrospective analysis of pre-existing, recorded data with no direct interaction with patients, ethical approval was not required. Authorization to access the data was granted by the hospital administration.

Authors Contributions: Each author made a substantial contribution to the study's idea, design, analysis, and interpretation. They have examined and given their approval to the manuscript's final draft.

Consent for Publication: All authors agreed with the content and that all gave explicit consent to submit and that they obtained consent from the responsible authorities at the College of Pharmacy, Clinical Pharmacy Department, University of Duhok, Kurdistan Region of Iraq, where the research was conducted.

Competing Interest: There are no conflicts of interest to declare.

Data availability Statement: The publication contains all of the datasets

created or examined during this investigation.

Funding: This work has received no external funding.

Acknowledgment: We express our sincere gratitude to the laboratory personnel and hospital administration for their invaluable help in making the data for this retrospective analysis accessible.

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