

## CHICKENPOX, REVIEW AND PREVALENCE VARICELLA VIRUS IN NINEVEH PROVINCE

ALI ADEL DAWOOD<sup>1\*</sup>

<sup>1</sup>Department of Anatomy, College of Medicine, University of Mosul, Mosul, Iraq.

### AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

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### ABSTRACT

Chicken pox is a seasonal, highly contagious disease caused by varicella virus. This virus belongs to the herpesviridae family. Although its symptoms are mild, the attention is meager to prevent its dispersal. Varicella virus proportion is high in developing countries because of the rapid spread between students as a result of indirect contact with instruments and secretions of a patient, droplets and airborne diffusion of vesicular fluid.

**Aim:** This study aimed to find out the prevalence of Varicella in Nineveh province sectors from 2005-2018. Our statistical analysis was brought out from all sections of the province.

**Results:** In the last decade, the number of cases has been increased in Iraq due to lack of health awareness in addition to the lack of vaccine. To reduce number of infections, it is necessary to follow up the patients and detect the virus mutations.

**Conclusion:** Isolation of patients may decrease virus spreading. Moreover, using of the novel methods for diagnosis are more significant as well as assign of the clinical features.

**Keywords:** Chickenpox; Nineveh; varicella; virion; VZV.

### 1. INTRODUCTION

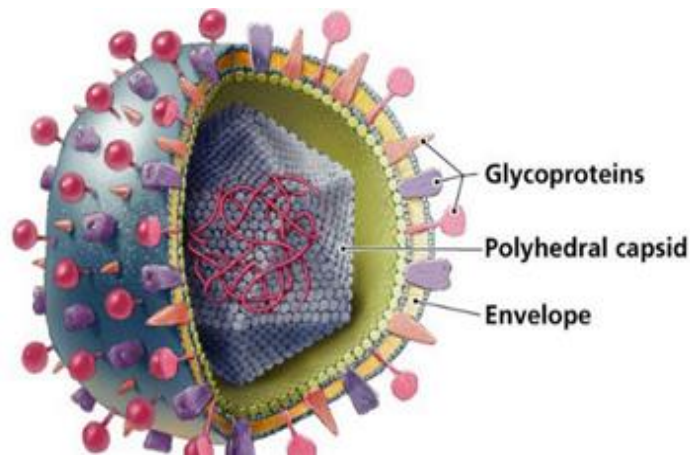
Varicella-Zoster virus is a highly contagious disease related to the family *Herpesviridae*. This wide diversity of this family makes it of great importance and has been taken into consideration in terms of pathological and therapeutic. VZV does not infect animals or any reservoir. Varicella is a member of genus *Varicello virus* causes chickenpox. Its main targets are T- lymphocytes, epithelial cells and ganglia [1]. This large virus has 150–200 nm in diameter and the nucleocapsid is approximately 100 nm with the icosahedral symmetry and 162 capsomeres. These capsomeres are surrounded by a lipid-containing envelope that is derived from the nuclear membrane of the infected cell. The

glycoprotein spikes ~ 8 nm long are emerged out of the capsid which gives the crown shape of the virus [2]. The viral genome is linear, double-stranded DNA (125–240 kbp.) in size. This genome encodes at least 100 different proteins. Of these, more than 35 polypeptides are involved in the structure of the virion particle Fig. 1 [3].

### 2. VIRUS HISTORY

One hundred years ago, VZV was assumed to be mysterious ultra-filterable. In 1943, the German physician Helmut Ruska visualized the virus although he was not completely certain whether the virus was Varicella or Zoster using developed electron microscope [4].

\*Corresponding author: Email: aad@uomosul.edu.iq, aliadeldawood@gmail.com;



**Fig. 1. Structure of varicella- zoster virus:** <https://varicellazostervirusroth.weebly.com/morphology.html>

### 3. VIRAL CULTIVATION

VZV can be inoculating by vesicular fluid onto monolayers of human fetal diploid kidney or lung cells. VZV is labile and every effort should be made to minimize the time spent in specimen transport and storage through the cultivation way due to sensitivity of the virion [5].

Since VZV is not shed asymptotically. Demonstration of virions, antigens, and nucleic acids in body fluids or tissues (other than sensory ganglia) are diagnostic of active infection. Visualization of multinucleated giant cells could be viewed in tissues by histopathology or transmission electron microscopy. By this way, it is difficult to distinguish between VZV and herpes simplex virus (HSV) [6].

### 4. SYMPTOMS

Contagious chickenpox takes 1-2 days before the rash appears to until the blisters have become crusted over. The virus can easily spread by close contact sharing breathing space or direct touching contact with infected secretions from the nose, throat, rash or through spray from sneezing and coughing of infected persons [5]. Varicella virus is also transmitted through direct contact with an infected child or by using personal belongings such as towels and sleeping on the same pillows [7].

As a general, the symptoms start appearance from 14-16 days after exposure but in some cases can occur as early as 10 days or may late to 21 days which can be diagnosed by appearance of the rashes. Malaise and fever are the earliest symptoms before rash emerging [8]. There is also a rise in temperature (37.7-38.8°C) and flu-like symptoms may occur. Firstly, the rash

starts on the trunk and then on the face, the limbs, the buccal and pharyngeal mucosa in the mouth. Fresh vesicles appear in crops, so that all stages of macules, papules, vesicles, and crusts may be observed at one time [9]. The rash begins in the form of red dots such as those that result from insect bites and then swell to form transparent water vesicles first then soured and burst these vesicles to open sores. Moreover, the dry sores are formed brown scales then disappear after 1-2 weeks [10]. In this stage, the itching is increased and secondary bacterial infection may occurs. Complications are rare and the mortality rate is very low. Encephalitis and Varicella pneumonia occur in rare cases. The common complications arise in neonates, adults, and immunocompromised patients which is responsible for many varicella-related deaths. Subclinical varicella is uncommon [11,12]. All symptoms are abbreviated into two stages:

**Primary infection:** After entering, VZV proliferates in the oral pharynx (tonsils). Infected T-cells are passed in to the circulation and disseminate virus to the skin with possibly other organs. Infections at first stage are controlled by innate immunity. VZV remodels diverse T-cell populations to facilitate skin trafficking. VZV DNA can be detected in T-cells (viraemia) as early as 10 days prior to the occurrence of a rash and can persist for a week afterwards [13,14].

**Latency infection:** VZV is latent in neurons of cranial nerve ganglia, dorsal root ganglia, and enteric and autonomic ganglia. Latent case may reactivate to produce zoster virus (shingle). VZV has long been thought to enter epidermal nerve endings during varicella and undergoes retrograde axonal transport to reach neuronal cell bodies in the ganglia [15]. At the end of this stage, the varicella lesions are diffusion throughout the whole body Fig. 2.



**Fig. 2. Adolescent female with varicella lesion in late stage.**  
<http://www.vaccineinformation.org/photos/variaap002.jpg> icon

## 5. EPIDEMIOLOGY

VZV emerges worldwide and is endemic in populations of sufficient size to sustain year round transmission, with epidemics occurring every 2–3 years [6]. VZV is seemed to be diseases of little consequence compared with other viral infections such as influenza, measles and poliomyelitis [14]. It has been shown prevalent in childhood under 10 years of age and frequently in adult. It is much more communal in winter and spring than in summer in temperate climates. VZV is usually not a serious disease, but can cause severe morbidity and mortality in adults and in immuno compromised individuals [15].

## 6. LABORATORY DIAGNOSIS

Tzanck staining smear is used for scrapings or swabs of the base of vesicles. Multinucleated giant cells are examined by transmission electron microscopy [16]. Viral antigens can be demonstrated by immunofluorescence staining of similar smears. Viral DNA can be detected in vesicle fluid, skin scrapings, or in biopsy material [8]. Immunoglobulin (IgG) in serum is estimated for several days after the onset of varicella and titers peak after 2 to 3 weeks, so the routine serologic testing provides only a retrospective diagnosis. Acute VZV infection can be confirmed by specific serum IgM titers. Antigen detection techniques are usually faster and more reliable [17]. ELISA is the main assay used for detecting IgG or IgM responses which is an indicator of immune status following natural infection. High specificity and sensitivity, types of PCR assays can be used to detect VZV DNA from CSF fluid in 75% of cases [18].

## 7. TREATMENT

VZV in healthy children is mild, self-limiting and uncomplicated. Antiviral therapy can reduce the duration of illness. Uncomplicated varicella in children is usually limited to symptomatic relief Acetaminophen (paracetamol) [19]. The medication works best if it is given as early as possible within the first day of onset after the rash starts [18]. Acyclovir is an extremely safe and well tolerated drug. Local inflammation and phlebitis may ensue following extravasation of intravenous acyclovir [19]. Penciclovir triphosphate blocks viral DNA synthesis through modest inhibition of viral DNA polymerase. Foscarnet is a pyrophosphate analogue that functions as an inhibitor of viral DNA polymerase by blocking the pyrophosphate binding site. Antihistamine is also used to relieve itching. But for the most part, the disease is allowed to run its course. In the event of a bacterial infection is treated with antibiotics as prescribed by the attending physician [20].

## 8. VACCINATION

Chickenpox vaccine is very safe and high effective to prevent the disease. People who get Varicella vaccine will not get chickenpox [21]. If a vaccinated person does get chickenpox, the symptoms are usually milder with fewer or no blisters (may have just red spots) with mild or no fever. A vaccine based on live attenuated VZV (Oka strain) was developed and clinically tested in the 1970s and 1980s. It was first licensed in Germany and Sweden in 1984 [22]. Varicella caused about 4 million illnesses, 11,000 hospitalizations, and 100 deaths annually in the United States. Since the vaccine was introduced, there has been a steady decline in the incidence of varicella diseases. Varicella outbreaks continue to occur among

school children due to some children are unvaccinated. Attenuated vaccine is effective for 80-85% [22,23].

**9. PREVENTION**

The spread of chickenpox can be prevented by isolating affected individuals. Contagion is by exposure to respiratory droplets or direct contact with lesions within a period lasting from 3-4 days before the onset of the rash and 4 days after the onset of the rash. The chickenpox virus is susceptible to disinfectants such as chlorine bleach (sodium hypochlorite). Like all enveloped viruses, VZV is a sensitive to desiccation, heat and detergents [23].

Pregnant women who have not previously had chickenpox or who have not received the vaccine are advised to stay away from any infected patients, especially in the first trimester or more precisely in the first 20 weeks of pregnancy, This is due to the infection at this stage carries the risk to fetal malformations [24].

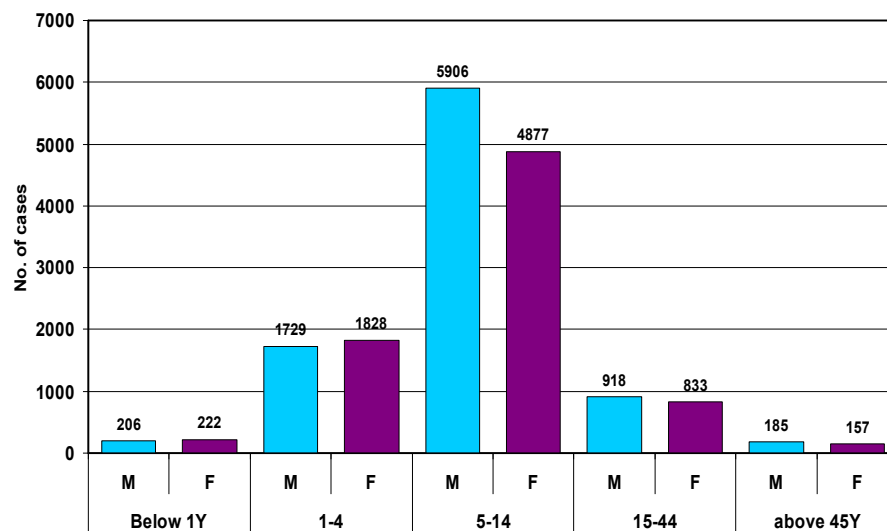
**10. PREVALENCE OF CHICKENPOX IN NINEVEH PROVINCE**

Chickenpox is widespread and reported in large numbers annually in Nineveh governorate with a significant increase in the number of cases recorded in 2008. The disease is not subjected to the expanded program of immunization, where Iraq does not have the vaccine against VZV. A 88% of injuries were recorded under 15 year old age, despite injuries among elderly people. All Nineveh sectors recorded the cases in proportion to the population density of each sector.

Annual distribution of varicella virus in Nineveh province from 2005-2009 according to the age groups and genders is shown in Table 1 and Fig. 3. Conferring to the data, the total number of chickenpox is started increasing from this duration due to deprived of healthy attention. These data was recorded higher rates of infection for male than female. Not only that, but it has been shown high incidence of infection in the age group (5-14 year) than other age groups.

**Table 1. Chickenpox cases by age groups and genders from 2005-2009 in Nineveh province**

Year	Below 1Y		1-4		5-14		15-44		above 45Y		Total		Grand total
	M	F	M	F	M	F	M	F	M	F	M	F	
2005	30	38	166	186	648	514	31	38	10	10	885	786	1671
2006	22	21	239	239	1136	996	144	100	6	7	1547	1363	2910
2007	16	11	226	260	893	788	181	197	13	6	1329	1262	2591
2008	63	70	698	724	2081	1762	313	261	6	2	3161	2819	5980
2009	75	82	400	419	1148	817	249	237	150	132	2022	1687	3709
Total	206	222	1729	1828	5906	4877	918	833	185	157	8944	7917	16861



**Fig. 3. Chickenpox cases by age groups and genders reported in Nineveh province from 2005-2009**

Prevalence of chickenpox according to Nineveh sectors reported in Table 2 and Fig. 4. The number of cases have been raised in both Aymen and Ayser sectors due to high proportion of the population in both regions of Mosul city.

There is a significant increase in the number of injuries recorded in 2015 (5683) compared to that in 2015 with (3709) cases and the median for the past five years. There is no discrepancy in the registration of infections between the sexes, Fig. 5. All sectors recorded cases of disease and the incidence of 77.5% in Aymen sector Fig. 6.

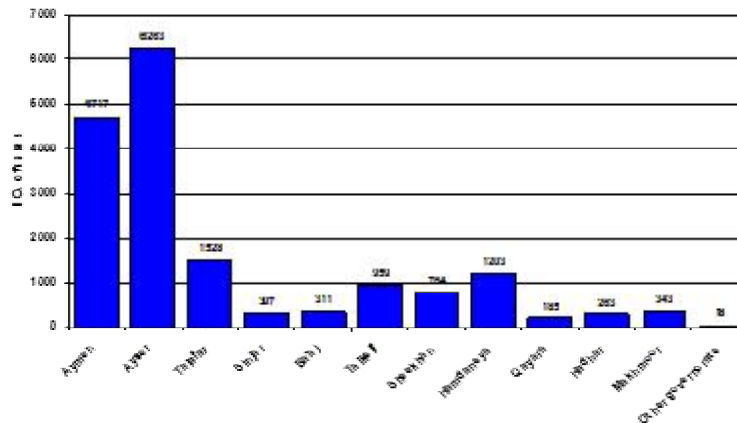
In 2017, the number of cases is recorded (3910), which is much lower than had recorded in 2017 with (8757) cases and the median for the past five years was (5783). A 1865 (47.7%) of injuries were recorded during the spring months. Chickenpox cases were recorded in all age groups and even among those older than 45 years. Almost two-thirds of the patients were in the age group 5-14 years (2404), which is the age group found in primary and middle schools. Cases were distributed in both sexes with a slight increase among males Fig. 7. Cases were recorded in all

sectors except urban and were almost proportional to the population density of each sector. The share of the Ayser sector was 1667 case (42.6%) followed by the sectors of the Aymen, Hamdaniya, Tal Afar, Tilkif and Qyara respectively. Hamdaniya sector also recorded the highest incidence among urban sectors, Fig. 8.

In 2018, the number of cases recorded in Nineveh province was (7161), which was doubled the number recorded last year (3910) and more than the median for the past five years (5683). The highest number of infections were recorded in April- May (1861) and in November- December (2420). Chickenpox were recorded in all age groups and even among those older than 45 years, and almost two thirds of the cases were in the age group 5-14 years (4816). Cases were distributed in both sexes with a slight increase among males Fig. 9. All cases were recorded in all sectors except urban and were almost proportional to the population density of each sector. Ayser sector is recorded 3392 (47.2%) of the total infections, followed by the sectors of the Aymen, Tal Afar, Hamdaniya, Qayyarah and Talkayeif respectively, Fig. 10.

**Table 2. Chickenpox cases by district from 2005-2009 in Nineveh sectors**

Years	Aymen	Ayser	Talafar	Sinjar	Ba'aj	Talkeif	Sheekhan	Hamdaneya	Qayara	Hadhar	Makhmoor	Other governorate	Total
2005	527	625	39	22	10	74	186	55	64	38	31	0	1671
2006	887	1265	137	53	0	139	123	174	27	47	58	0	2910
2007	647	1050	193	70	17	193	108	142	45	48	69	9	2591
2008	1150	2194	929	48	160	423	136	718	12	61	149	0	5980
2009	1506	1129	230	114	124	130	211	114	37	69	36	9	3709
<b>Total</b>	<b>4717</b>	<b>6263</b>	<b>1528</b>	<b>307</b>	<b>311</b>	<b>959</b>	<b>764</b>	<b>1203</b>	<b>185</b>	<b>263</b>	<b>343</b>	<b>18</b>	<b>16861</b>



**Fig. 4. Chickenpox cases by district from 2005-2009 in Nineveh sectors**

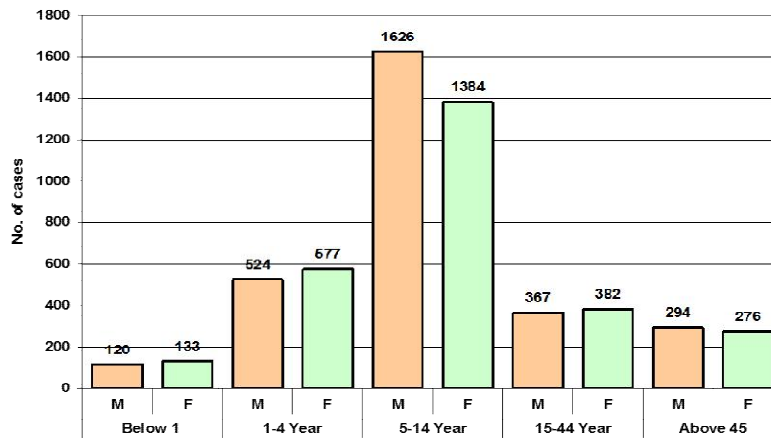


Fig. 5. Chickenpox cases by age groups and genders in Nineveh province 2015

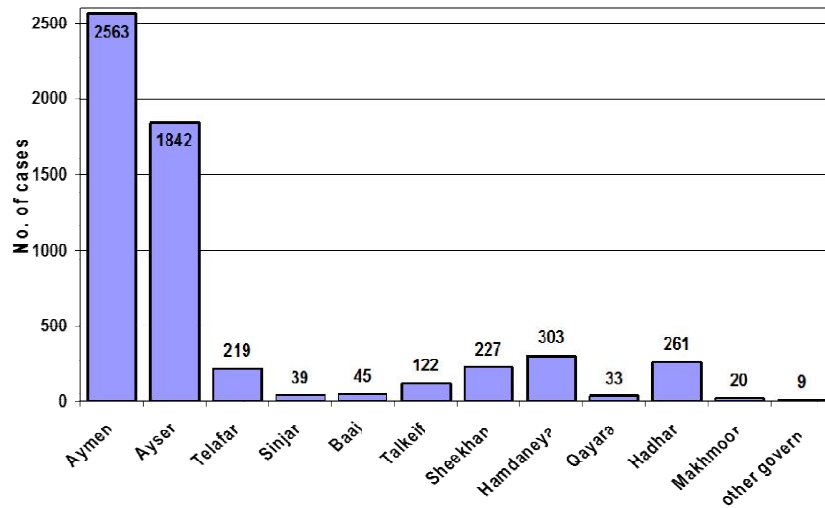


Fig. 6. Chickenpox cases by Nineveh sectors 2015

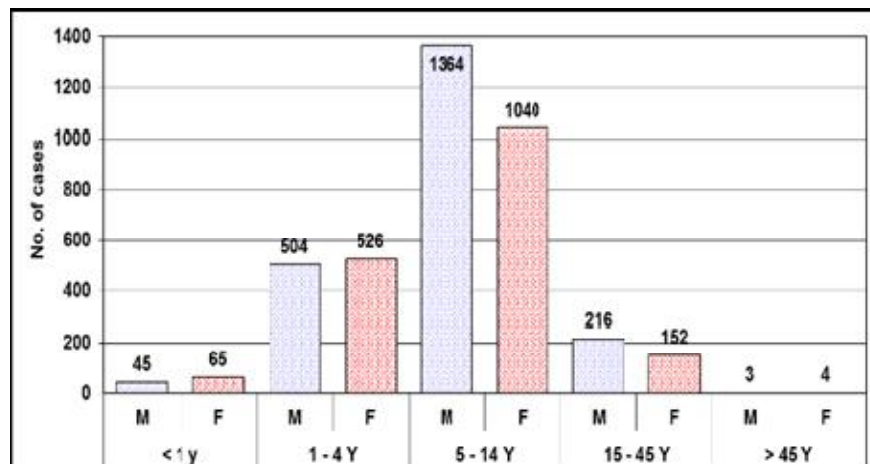


Fig. 7. Chickenpox cases by age groups and genders in Nineveh province 2017



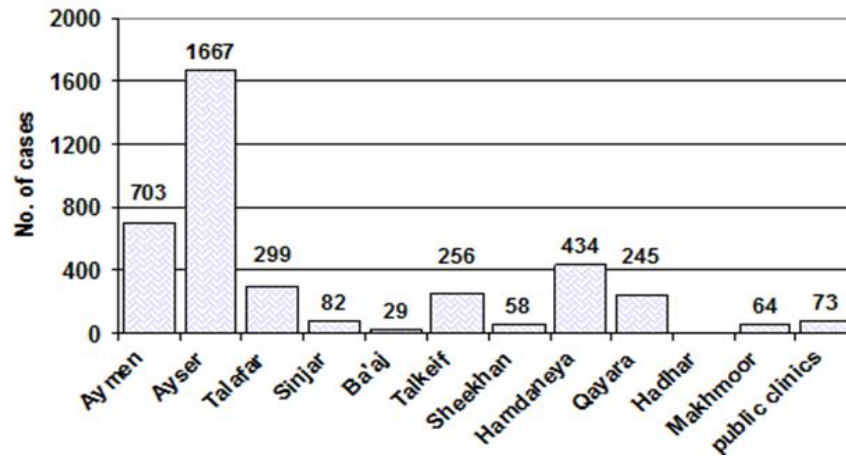


Fig. 8. Chickenpox cases by Nineveh sectors 2017

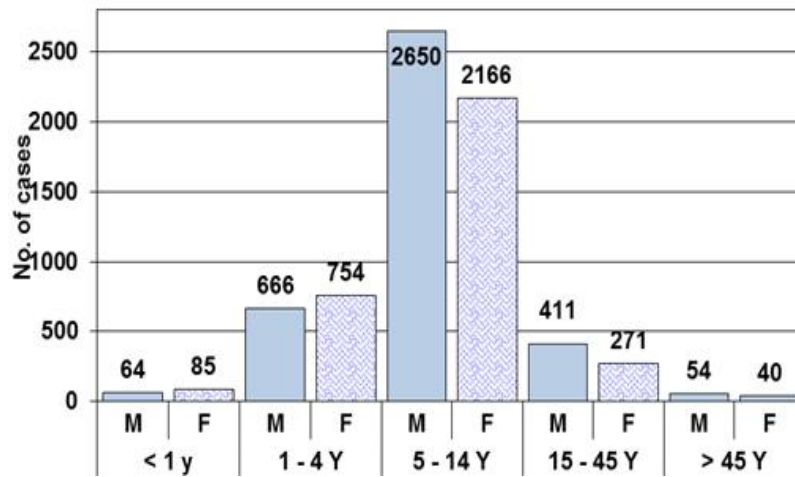


Fig. 9. Chickenpox cases by age groups and genders in Nineveh province 2018

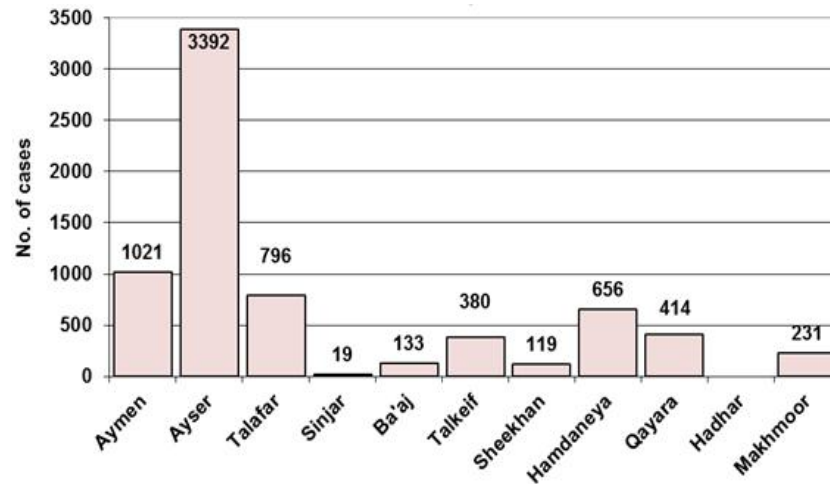


Fig. 10. Chickenpox cases by Nineveh sectors 2018

## 11. CONCLUSION

Chickenpox is remain contagious disease specifically in developing countries. There is a significant increase in the number of infections recorded last decades. Varicella vaccine is still not available in Iraq. Some countries, especially developed countries, adopt the vaccine as a preventive measure to reduce infections and within the national vaccination program. Although chickenpox has less symptoms compared to other viral infections, it is necessary to take consideration by society and public health. Increased number of infections may lead to emerge new mutations that make it difficult to find an appropriate treatment or preventive vaccine.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## ACKNOWLEDGEMENT

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## COMPETING INTERESTS

Author has declared that no competing interests exist.

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