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ORIGINAL STUDY

Increasing Incidence and Unusual Presentations of Chickenpox Infection in the Post Coronavirus Disease 2019 Era in Egypt

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Abstract

Background: The current study aimed to analyze the incidence and clinical presentations of patients with chicken pox in the post coronavirus disease 2019 (COVID-19) era. Additionally, the management protocols of these patients were highlighted.

Patients and methods: This prospective cohort included 70 patients of Chickenpox diagnosed and managed in a tertiary referral center over a 2-month duration. Patients' symptoms, complications, treatment, as well as outcomes, were documented and analyzed.

Results: A sharp increase in the incidence of chickenpox was observed in our institute compared with the same season in the previous years. Unusual presentations were also reported including older age of presentation, second attacks of chickenpox infection after previous infection, increased severity of disease, genital pruritus, genital pustular lesions with inflammatory edema, and dysuria.

Conclusion: Increased incidence, as well as unusual clinical presentations have been observed in our tertiary referral center in the post-COVID-19 era. This may be due to increased transmission among population after discontinuation of social distancing and curfew. Additionally, immunologic drift has been observed after exposure to the COVID-19 virus, and it may be responsible for increased susceptibility to infections. Proper diagnosis and management, as well as vaccination and public awareness are essential for lowering the incidence of complications and improving the disease outcome.

Keywords: Chickenpox, Complications, Coronavirus disease 2019, Genital pruritis, Varicella zoster virus

1. Introduction

Chickenpox is caused by varicella-zoster virus (VZV). It is common and has high infection rates. Nearly all persons get infected by VZV in mid-adulthood unless vaccinated (Chan et al., 2014). VZV is a human alpha-herpes virus. Infection leads to chickenpox mainly in children, while it may remain latent and cause herpes zoster later in life (Gershon et al., 2015).

Chickenpox is common in children (4–10 years), and results in a vesicular skin rash, primarily on the face, chest, and back. It is usually accompanied by fever and pharyngitis which usually last for 5–7

days. Complications include pneumonia, brain inflammation, and bacterial skin infections. In temperate countries, most cases occur during the winter and spring (Freer and Pistello, 2018).

Despite being self-limited, chickenpox can have significant health-related consequences in the form of multiple family members' affection, hospital visits, and school and work absences (De Wals et al., 2001). According to the Centers for Disease Control and Prevention (CDC), before the vaccine became available in the US in 1995, there were an estimated 4 million cases of chickenpox each year, resulting in about 10 000 hospitalizations and 100 deaths annually. Since then, the incidence of chickenpox has

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declined dramatically. In 2019, there were only 4,296 reported cases in the US (Chauhan et al., 2023).

The novel coronavirus, named severe acute respiratory syndrome coronavirus 2, emerged in Wuhan, Hubei province, China, in late 2019 and has since spread worldwide (Li et al., 2020). Considering that severe acute respiratory syndrome coronavirus 2 is primarily transmitted through respiratory droplets and contact (World Health Organization, 2020), there were behaviors to decrease the spread of coronavirus disease 2019 (COVID-19) and other common infectious diseases (West et al., 2020). These measures such as wearing masks, sanitary hygiene, and avoiding crowded places may have effectively decreased the incidence of other droplet-transmitted and contact-transmitted diseases (Lin et al., 2020).

Notably, the number of patients with respiratory tract infections (other than COVID-19) decreased during COVID-19 due to these measures and nationwide curfew (Abdelhafiz et al., 2020). But, in the post COVID-19 era after limiting these measures and lifting nationwide curfew with opening of schools and gardens again and returning to ordinary works, outbreaks of many infectious diseases mainly of viral origin were observed. Additionally, some changes in clinical presentations were also reported (West et al., 2020).

The current study aimed to analyze the incidence and clinical presentations of patients with chickenpox in the post COVID-19 era. Additionally, the management protocols of these patients were highlighted.

2. Patients and methods

This prospective cohort study was conducted in a tertiary referral center [removed for blind peer review] over a 2-month duration (March – May 2023). The study included 70 patients with polymerase chain reaction (PCR)-confirmed diagnoses of chickenpox during the study period.

Patients of all ages and both sexes were included in the study. The diagnosis of chickenpox was made based on the classic clinical presentation of centripetal polymorphic skin and mucous membrane eruptions. Diagnosis was confirmed by PCR testing of the vesicular swab for VZV in all patients ($n = 70$). Patients with other forms of skin eruptions (centrifugal pattern or monomorphic rash) as well as patients with negative PCR results were excluded from the study.

A total of 57 out of 70 (81.4%) patients in the current work presented to our outpatient clinic and were diagnosed in the early stages of the disease.

On the other hand, 13 (18.6%) patients were referred to our institute from other centers for management. Indications of referral included uncertain diagnosis ($n = 2$), protracted clinical course without adequate treatment response ($n = 4$), and presence of complications ($n = 7$).

The authors of this work adopted the recent guidelines for chickenpox treatment (Dildora, 2023) in patients who were primarily managed in our institute ($n = 57$). Symptomatic treatment was the mainstay. Antipyretics were prescribed for all patients in the form of oral paracetamol: a dose of paracetamol is the same for all routes of administration in adults over 50 kg (i.e. 1 g up to four times a day), with a minimum of 4 h between each administration. The oral dose of paracetamol for children aged 1 month to 18 years is: 15 mg/kg per dose, to a maximum of 1 g per dose, every 4–6 h, with a maximum of 60 mg/kg daily, without exceeding 4 g daily. The duration of paracetamol treatment was 3–5 days, or until fever subsided. Antipruritic in the form of a topical combination of calamine and paraffin liquid twice daily for patients with severe pruritis ($n = 22$). Patients were instructed to use this topical treatment as long as pruritis persisted.

Topical antiseptic (potassium permanganate 1:8000) was also applied twice daily for all patients. Systemic antibiotics were prescribed for all patients above 10 years age ($n = 34$) in the form of azithromycin: 500 mg capsule daily for 5 days. Systemic antiviral was prescribed also to all above 10 years old patients, Adults and children who weigh over 88 pounds (40 kg)—800 mg four times a day for 5 days. The usual recommended doses for the pediatric population range from 5 mg/kg to 20 mg/kg of body weight every 8 h with a 1 h infusion for the acyclovir i.v. dosing for five days or till all lesions crusted with no new lesions.

On the other hand, of the 13 patients who were referred from other centers, nine patients received systemic antibiotics and only four patients received systemic antiviral treatment before their referral.

Follow up visits were scheduled on a weekly basis until complete resolution of symptoms. Patients' history, clinical presentations, as well as complications were documented, tabulated, and analyzed. Furthermore, information regarding disease burden, family member infection, school or work absence, and awareness about the availability of vaccine were also documented.

3. Results

Seventy patients with chicken pox were included in the current study in the post COVID era. Diagnosis was confirmed by PCR in all patients. Patients'

demographic, behavioral, and clinical characteristics are shown in Table 1. Regarding the COVID status in the patients, 53 patients had a definite diagnosis of COVID-19 infection by PCR testing, while 15 patients had history of probable COVID infection diagnosed clinically and radiologically. On the other hand, the remaining two patients did not have clear history of COVID-19 infection.

Forty-three out of 70 cases were children and 27 were adults. Thirty (42.8%) patients were males and 40 (57.1%) were females. Mean age was 9.57 years (range 6 month–70 years). As a source of infection, we reported very highly infectious attacks with very aggressive behavior, especially in adults. Our study included only primary cases who reported on follow up many secondary cases (623 patients) in their families (but not included in our study). Parents had varied educational and socioeconomic backgrounds.

Patients reported first occurrence of fever (78.5%), asthenia (90%), headache (31.4%), odynophagia (61.4%), pharyngitis (50%), and itching (100%) before the appearance of skin lesions (Table 2). The appearance of lesions was in the form of vesicles (100%), pustules (84.2%), umbilicated pustules (68.5%), crusted/necrotic lesions (47.1%), mucosal ulcerations (91.4%) and scalp folliculitis (41.4%). The distribution of lesions was on trunk (100%), face (100%), Genitalia (95.7%), scalp (94.3%), mouth (87.1%), lower limb (78.5%), upper limb (24.2%) and palm and sole (32.9%) (Fig. 1).

Table 1. Demographic and socioeconomic parameters of primary cases.

Parameter	Frequency	(%)
Age		
Children (<18 years)	43	61.4
Adults (>18 years)	27	38.6
Sex		
Male	30	46.9
Female	40	53.1
Mean duration of symptoms (days)	4.8 ± 0.97	
Source history		
70 primary cases		
Unknown	18	25.7
School	17	24.3
Relatives	23	32.9
Neighborhood	7	10
Day care centers	5	7.1
623 Secondary cases		
Socioeconomic class		
Poor	6	8.5
Middle class	34	48.6
Upper class	30	42.9
Educational status of parents		
Uneducated	3	4.2
School level	40	57.1
College level	20	28.6
Working	7	10

Table 2. Symptoms and signs among the study population.

	Chickenpox infections N = 70 [n (%)]
Fever	55 (78.5)
Asthenia	63 (90)
Headaches	22 (31.4)
Odynophagia,	43 (61.4)
Pharyngitis	35 (50)
Itching	70 (100)
Type of lesions:	
Vesicle	70 (100)
Pustule 59 (84%)	59 (84.2)
Umbilicated	48 (68.5)
Crusted/necrotic	33 (47.1)
Mucosal ulceration	64 (91.4)
Folliculitis	29 (41.4)
Location	
Genital	67 (95.7)
Trunk	70 (100)
Upper limb	17 (24.2)
Lower limb	55 (78.5)
Palm and sole	23 (32.9)
Face	70 (100)
Scalp	66 (94.3)
Mouth	61 (87.1)
Second attack chickenpox	5 (7.14)

Interestingly, in 51/70 patients (72.8%), the most distressing symptom was itching, especially genital itching which was an uncommon presenting symptom of chickenpox. Also, there were five patients who gave history of previous chickenpox (second attack), including one elderly patient and notably, four adult patients.

A superimposed bacterial infection was suspected in 23 patients who had crusting lesions associated with inflammatory vulval and/or penile oedema. No bacterial culture was performed but evolution was favorable under antibiotics.

Complications were reported in 30/70 (42.9%) patients (Table 3). The most common was superimposed bacterial infection that was reported in 20 cases 28.6%, while the most serious were pneumonia ($n = 2$) and encephalitis ($n = 1$). Pneumonia was diagnosed by clinical examination and imaging (chest radiography and/or chest computed tomography). Viral encephalitis was diagnosed by CSF culture and PCR. Those three patients required multidisciplinary approach to management, and they received the proper medical treatment after consultation with the pulmonologists and neurologists. Mortality was reported in 1/70 (1.4%) patient in the current series. This was the patient who had viral encephalitis and died from this neurological sequela despite adequate management and care in the neurology department.

In terms of treatment, it was noticed that patients who received systemic treatment early (within 24 h



Fig. 1. A: Wide deep-seated pustules with central umbilication and progressive central necrosis on the trunk (classic presentation). B: Multiple anal and perianal coalescent and vegetating pustules evolving toward ulcerations (atypical presentation). C: Palmar firm deep-seated pustules on an erythematous basis (atypical site). D: Follicular and umbilicated pustules on the frontal scalp. E: Extensive skin eruption in a 5-year-old child. F: Extensive skin eruption in atypical site for chicken pox. G: Extensive skin eruption in an adult. H: Extensive skin eruption in an adult. I: Extensive face skin eruption in an elderly patient. J: Extensive genital skin eruption in an elderly patient.

of skin rash) had best downtime and fewest complications and little clinical presentation. Moreover, patients who presented with serious complications as pneumonia and encephalitis did not receive systemic treatment and were referred to our institute for management of these complications.

There was a significant burden of chicken pox on school (days missed >1 week 88.1%) and on work (days off by adult cases and family members (72.9% of cases)).

We found that 64 (79%) of patients or patients' care givers were unaware of the availability of vaccines. Unnecessary medicine use and poor knowledge about vaccine availability were common in all socioeconomic classes and every educational background.

4. Discussion

The authors of this work noticed an unusual increased incidence of chickenpox cases during the study duration in our tertiary referral center, compared with the same season (March and April) in the previous years. Seventy cases were reported in the current study (only primary cases with exclusion of secondary cases) compared with only 34 reported cases in the same season in the last year. Additionally, in the 5 years before COVID-19 epidemic (2015–2019), the seasonal incidence (March and April) ranged from 26 to 39 (average 32.2).

Similarly, [Kujur et al. \(2022\)](#) reported two outbreaks in two different villages in India, which were

Table 3. Complications, burden of disease and vaccine awareness.

Parameter	Frequency	(%)
Complications		
Yes (total number)	30	42.9
Superadded bacterial infection	23	32.9
Pneumonia	2	2.9
Keratoconjunctivitis	4	5.7
Encephalitis	1	1.4
No	40	57.1
Hospitalization		
Yes	4	5.7
No	66	94.3
School days missed		
<1 week	37	88.1
≥1 week	5	11.9
Days off work taken by family members		
Yes	51	72.9
No	19	27.1
Vaccine awareness		
Knew and vaccinated the child	1	1.4
Did not know about vaccine	64	79.0
Knew but not get vaccinated	5	7.1

not related to each other epidemiologically/geographically, in the post COVID era (March and April, 2022).

The exact explanation for this sharp increase in incidence is unknown. The authors of this work believe that in the post-COVID-19 era, discontinuing the social distancing and curfew, has led to increased transmission of droplet-transmitted and contact-transmitted infections. Furthermore, this increased incidence may be explained by the immunological drift that occurred in the blood stream due to exposure to COVID-19 virus. Studies have reported a decrease in T lymphocytes, CD4+, and CD8+ T cell counts associated with higher levels of interleukin22R (IL-2R), IL-6, IL-10, and TNF-alpha which may increase the chance of infections (Bhargava et al., 2021).

Seasonal peaks for chickenpox are well known. Interference with the transmission of VZV by high temperatures and in dry seasons has been suggested as a possible reason for this seasonal variation (Lolekha et al., 2001; Khaleel and Abdelhussien, 2013). However, in temperate climates, the peak occurs in winter and spring (Todorova, 2020). In our locality, the peak incidence is usually in March and April. This was similar to Malakar et al. (2017) and Pall and Kumar (2018), who reported the highest number of cases in March and April. Knowledge of this seasonal variability can help in epidemiological studies and actions taken by surveillance teams.

The mean age of patients in the present study (9.57 years) was higher than in many studies (Gupta et al., 2011; Kadri et al., 2017; Kalita, 2016; Larik, 2019; Malakar et al., 2017; Meszner et al., 2017;

Singh et al., 2019). Additionally, 38.6% of patients in the current study (27/70) were adults. Many authors reported that chicken pox is more common in school-aged children due to close interaction in school leading to the clustering of chickenpox infections (Farooq et al., 2022; Kujur et al., 2022). In the present work, school, infected relatives, and neighborhoods contacts were common sources of infection.

Along with the unusual increased incidence, unusual clinical presentations were also reported in the present case series. Interestingly, A second attack of chicken pox occurred in five adults with a history of previous chickenpox infection.

Pruritus was reported in 100% of patients, and genital itching was common (15.7%). To our knowledge, it seems to be unique to report genital pustular lesions which were very itchy and painful with a high incidence of affection (15.7%). Furthermore, this group of patients suffered from dysuria, burning sensation, and urethritis.

Complications in the present work were detected in 42.9% of patients. Among them 3 patients had serious medical conditions: pneumonia ($n = 2$) and encephalitis ($n = 1$). Mortality was reported in one patient. Seo et al. (2005), in a series of 57 adolescent and adult patients with chickenpox, reported 1 (2%) case of keratitis and 1 (2%) case of secondary infection.

Serious complications were also reported in Noronha et al. (2017) study, who studied chickenpox in patients undergoing chemotherapy and reported febrile neutropenia in 25% of patients, and pneumonia in 17% of patients. However, the underlying immunosuppression in those patients may be the cause of increased incidence of complications.

Moreover, the authors of this work believe that proper systemic treatment in the form of antivirals and/or antibiotics, play a role in shortening of the course of infection, and decreasing the incidence and severity of complications. Serious complications and mortality occurred in patients who were referred to our institute from other centers, and were diagnosed late, and did not receive adequate treatment.

Similarly, Balfour et al. in their study on 68 patients with chickenpox, concluded that acyclovir recipients had significantly shortened times to cessation of new lesion formation, maximum number of lesions, and 5% decrease in number of lesions for both total body and chest-box areas.

Most of the patients in the present series were not vaccinated and also were unaware of the availability of the chickenpox vaccine. This factor may have contributed to the increased incidence. Similar findings were documented by Yousaf et al. (2018) and Kujur et al. (2022) who observed outbreaks of

chickenpox among the population who were not vaccinated against VZV.

Consequently, since chickenpox is a vaccine-preventable disease and infection in the post-COVID-19 era is associated with higher transmission, morbidity, and potential mortality, routine vaccination should be considered. Additionally, increased public awareness about the disease and its vaccine may aid in early diagnosis, proper treatment, and lowering the incidence of complications.

4.1. Conclusion

Increased incidence, as well as unusual clinical presentations have been observed in our tertiary referral center in the post-COVID-19 era. This may be due to increased transmission among population after discontinuation of social distancing and curfew. Additionally immunologic drift has been observed after exposure to COVID-19 virus, and it may be responsible for increased susceptibility for infections. Proper diagnosis and management, as well as vaccination and public awareness, are essential for lowering the incidence of complications and improving the disease outcome.

Ethics information

Informed written consents were obtained from all participants and the study was approved by the Mansoura Faculty of Medicine Institutional Research Board (IRB: R.23.06.2217).

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Conflicts of interest

None declared.

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