



Research Paper

Clinical and Epidemiological Aspects of an Outbreak of Chicken Pox in an Educational Institution

Dr Maninder Pal Singh Pardal¹, Dr Sukhmeet Minhas², Dr T Basavaraj³

¹Professor, Department of Community Medicine, Armed Forces Medical College, Pune 411040

²Professor, Department of Community Medicine, Armed Forces Medical College, Pune 411040

³Junior Resident (Third Year) Department of Community Medicine, Armed Forces Medical College, Pune 411040

Corresponding Author: Dr Maninder Pal Singh Pardal

ABSTRACT

Introduction

Chicken pox is a highly infectious and transmissible disease caused by Varicella Zoster Virus (VZV) an alpha herpes virus. The lifetime risk of acquiring varicella is over 95%. The present study deals with an outbreak of chicken pox in an educational institution in Western India. Our study comprises of thirty nine cases of chicken pox which occurred from first week of Jan 2016 to last week of Mar 2016.

Methodology

A cross sectional study design was conducted in an educational institution where the outbreak had occurred and cases were categorised based on validated criteria.

Results

Out of total 39 cases that occurred, 27 and 12 were among students and teachers respectively. Mean age of students was 20.69 and that of teachers was 23.85. Among students, 44.44% had mild, 37.03% had moderate and 18.51% had severe symptoms. The overall incidence was 6.5.

Recommendations

Record keeping will help in determining whether an outbreak has occurred or not. The option of immunizing students against varicella, at the time of admission to educational institutions, may be the best possible. Decisive actions at the onset of cases in terms of preventive measures play an important role in controlling the outbreak.

Keywords: Varicella, outbreak, educational institution

Received 15 June, 2021; Revised: 28 June, 2021; Accepted 30 June, 2021 © The author(s) 2021.

Published with open access at www.questjournals.org

I. INTRODUCTION

Chicken pox is a highly infectious disease caused by Varicella Zoster Virus (VZV) an alpha herpes virus. The transmission is airborne via respiratory droplets or from shedding of infectious virions from vesicles on the skin. Chicken pox is experienced by almost every child or young adult. The lifetime risk of acquiring varicella is over 95%.^[1,2]

The present study deals with an outbreak of chicken pox in an educational institution in Western India. Our study comprises of thirty nine cases of chicken pox which occurred from first week of Jan 2016 to last week of Mar 2016. We have discussed the detailed epidemiological investigation of the outbreak and relevant findings in our study.

II. MATERIALS AND METHODS

Case definitions which were used for a case of chicken pox have already been validated by various workers in their studies.^[3,4] The criteria for mild, moderate and severe case of chicken pox was based on the severity of clinical presentation.^[5]

Study design and study population

A cross sectional study design was formulated. The study setting was the campus of the educational institution where the outbreak had occurred. The study was carried out from Jan 2016 to Mar 2016. Sociodemographic data, immunization history pertaining to chicken pox and history of symptomatology pertaining to chicken pox was obtained using a self-administered questionnaire. Coding of the questionnaires was carried out to ensure confidentiality.

Ethical approval

Since the study was conducted as part of epidemiological investigation of an outbreak, ethical approval was not mandatory.

Analysis

Descriptive analysis of the study population including the demographic information, past history of infections, symptomatology pertaining to chicken pox, and immunization pertaining to chicken pox were conducted.

III. RESULTS

Sociodemographic profile: Out of thirty nine cases of chicken pox, twenty seven cases were among students, while the remaining twelve cases were among the teaching faculty and other staff of the educational institution. Mean age of the students was 20.69 years (standard deviation 1.43 years, minimum 18 years and maximum 25 years). Mean age of the staff of the educational institution was 23.85 years (standard deviation 6.75 years, minimum 19 years and maximum 43 years). Overall age wise distribution of all the thirty nine cases of chicken pox is tabulated in table one. All the cases among students and staff of the educational institution were males.

Age group	Number (%)
<20 years	06 (15.38)
20-25 years	30 (76.92)
25-30 years	01 (02.56)
30-35 years	01 (02.56)
35-40 years	00 (00.00)
>40 years	01 (02.56)
Total	39 (100)

Table 1: Overall age wise distribution of thirty nine cases of chicken pox

Clinical profile: In all the cases, the rash initially appeared on the face and limbs, before spreading to other parts of the body. Since all the cases were adults, they were hospitalized for more effective monitoring, as chicken pox is known to be severe among young adults.^[5,6,7,8]

Out of twenty seven cases among students, twelve (44.44%) had mild symptoms, ten (37.03%) had moderate symptoms and five (18.51%) had severe symptoms. Out of twelve staff five (41.66%) had mild symptoms, four (33.33%) had moderate symptoms and three (25%) had severe symptoms.

All the thirty nine cases had typical symptoms of chicken pox as regards fever, onset and progression of rash. Two cases (5.12%) out of thirty nine cases (one each among students and staff) had evidence of pneumonia, which resolved in one week after appropriate treatment. There were no other complications or fatalities in this outbreak.

Epidemiological findings: None of the cases among students and staff of the educational institution had received even a single dose of the chicken pox vaccine. The index cases was a 20 years old student who had just returned from the term break in first week of Jan 2016. The index case was asymptomatic before returning from the term break. There was no history of contact of this index case with any infected person.

History of frequent daily contact amongst all the cases including students and staff was elicited during the course of their day to day classes and other activities. All the cases among students were from two adjacent blocks of the hostel. All cases among the staff of the educational institution were residing in the on-campus accommodation which was provided to them.

Week wise epidemic curve is presented in figure one. All the cases had occurred within one incubation period of the previous case with which they could have had contact. Data pertaining to incidence of chicken pox for the institution for previous years was not available due to poor record keeping. The strength of students in the teaching institution was around four thousand and two hundred; and that of the staff was around one thousand

and eight hundred. Hence, the incidence among the works out to 6.42 per thousand; and 6.66 per thousand among the students and staff respectively. The overall incidence works out to 6.5. Since there was clear cut evidence of clustering in time and space as shown in figure one, the incident was investigated as an outbreak of chicken pox and managed accordingly.

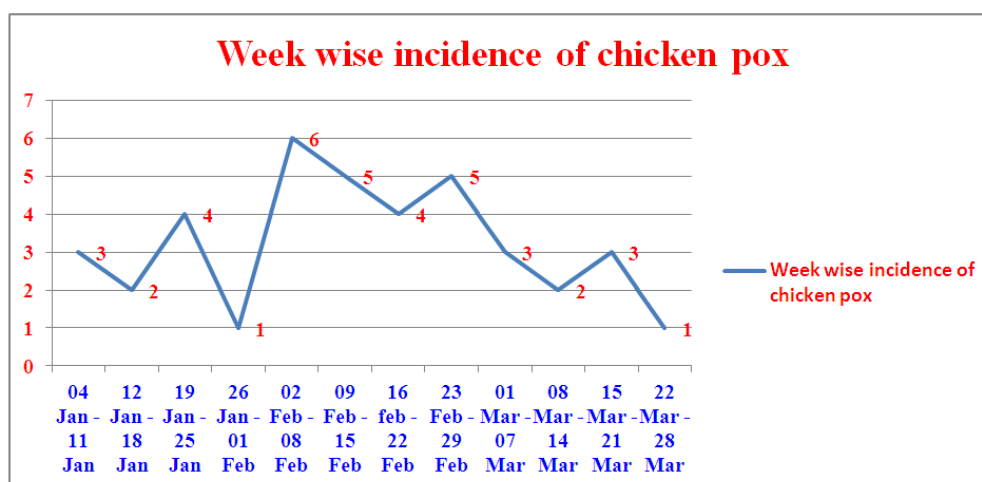


Figure 1: Week wise incidence of chicken pox

On further investigation it was observed that the recommended floor space of 5 sq m per capita was not available in the student’s hostel, which had led to overcrowded conditions; and facilitated transmission of the infection.^[9] The overcrowding was due to increased intake of students, without a commensurate increase in hostel capacity.

Relevant laboratory findings :

All parameters of complete blood count of all the cases of chicken pox were within normal limits. X Ray chest was carried out in two (5.12%) of cases which revealed evidence of pneumonia. Other investigations like Varicella zoster IgG and IgM and detection of Varicella zoster DNA were not carried out due to resource constraints. Diagnosis of all the cases was essentially clinical, as all the cases had presented with typical symptoms.

The outbreak was promptly brought under control, by isolation of all cases, strict daily surveillance of all possible/probable contacts of cases for any symptoms suggestive of chicken pox. Besides, head to foot sleeping arrangement to mitigate the effect of overcrowding, adequate natural and artificial ventilation; and regular disinfection of the hostel premises using a disinfectant suitable for domestic use were also ensured. All the students and staff were also advised to use a cloth mask during the course of their interaction in the campus; and the mask should be washed, sun dried and ironed daily.

IV. DISCUSSION

Lopez et al reported twenty nine outbreaks of varicella involving two hundred and sixty two cases in elementary, middle, and high schools from 2012 to 2015.^[10]

Kshatri et al reported 30 chickenpox outbreaks affecting four hundred and twenty one 421cases in the state of Odisha, in which the history of varicella zoster virus (VZV) vaccination of the cases was absent or could not be assessed/documentated. They also reported similar outbreaks in rural areas of north, west and other parts of India. The workers opined that since chickenpox vaccination is not covered in the universal immunisation programme, a section of the population remains susceptible to varicella zoster infection, particularly during outbreaks.^[11]

Arunkumar et al reported several outbreaks of chicken pox students from various countries. They reported attack rates of chickenpox among staff and student nurses as 0.78 and 1.54 per 100 person-years, respectively. Our study is at variance from the above study as we observed a lower incidence of 6.42 and 6.66 per thousand among students and staff respectively.^[12]

Deoshatwar et al reported an outbreak of 9 cases of chicken pox among college students and faculty. They reported eight cases out of eight hundred students giving an incidence of 10 per thousand; and one case out of three hundred faculty giving an incidence of 3.33 per thousand. The incidence pertaining to students reported in our present study is lower than that reported by Deoshatwar et al. The incidence pertaining to staff reported in our present study is higher than that reported by Deoshatwar et al. However, the overall incidence of chicken

pox reported by Deoshatwar et al is 8.18 per thousand, which is higher than the overall incidence of 6.5 per thousand observed by us.^[13]

Venkatiraman et al reported a high overall incidence of 7.2 per thousand among staff and students of a hospital; with the highest incidence of 32.2 being reported among 17 to 24 year old students.^[14]

Meyers et al reported 110 cases of chicken pox from 2016 to 2017 among six thousand staff and forty thousand students, giving a low overall incidence of 2.39 per thousand.^[15]

Limitations

Our study had several limitations. Firstly, recall bias of self-reported history of clinical disease and immunization cannot be ruled out. Secondly, we had no confirmatory laboratory data. However, since all cases had typical symptoms of chicken pox; and active case surveillance was carried out the effect of this limitation was minimized.

V. CONCLUSION AND RECOMMENDATIONS

Our study describes a substantially circulated, adult varicella epidemic lasting for nearly a quarter of a year, in a large educational institution. Record keeping will help in determining whether an outbreak has occurred or not. Students were most affected, but staff were also affected. We have demonstrated that a significant proportion of young adults are susceptible to varicella virus; and hence they are at risk of acquiring the disease during the course of their higher education. Besides, they may also serve as potential source for transmission posing a risk to their immunocompromised colleagues and staff. Hence, the option of immunization of young adults against varicella, at the time of admission to various educational institutions, may be the best possible option in our country needs to be explored. This will help in reducing the cohort of susceptible young adults in the campuses and will also be more cost effective in the long run.

The workers recommend larger studies be carried out in this regard, to formulate appropriate vaccination policy for young adults as well as for paediatric age group. We also recommend that appropriate infection prevention and control strategies as have been discussed above be considered for control of varicella outbreaks. Decisive actions at the onset of cases in terms of preventive measures play an important role in controlling the outbreak.

REFERENCES

- [1]. Vyse AJ, Gay NJ, Hesketh LM, Capner PM, Miller E. Seroprevalence of antibody to varicella zoster virus in England and Wales in children and young adults. *Epidemiol. Infect.* (2004), 132, 1129–1134. DOI: 10.1017/S0950268804003140.
- [2]. Bhawe, SY. Controversies in chicken–poximmunization. *Indian J Pediatr* 70, 503–507(2003). <https://doi.org/10.1007/BF02723143>.
- [3]. Saleh N and Moghazy BA. Seasonal variation and trend of chicken pox in the southern region of Saudi Arabia (2007–2012). *J Egypt Public Health Assoc* 89:143–147 DOI: 10.1097/01.EPX.0000456619.36915.df.
- [4]. Park K, Park's Textbook of Preventive Medicine: Chickenpox, 23rd edition. Jabalpur; m/s Banarasidas Bhanot; 2015, p.149-152.
- [5]. Sungur G, Hazirolan D, Duran S, Satana B, Arikan I, Duman S. The effect of clinical severity and eyelid rash on ocular involvement in primary varicella infection. *Eur J Ophthalmol.* 2009 Nov-Dec;19(6):905-8.
- [6]. Meylan P, Vollenweider P, Gianinazzi F, Monti M. Varicella pneumonia [Article in French]. *Praxis (Bern 1994)*. 2008 Sep 24;97(19):1037-43. doi: 10.1024/1661-8157.97.19.1037.
- [7]. Hanssen JL, Schakel GJ, Fontilus-Rohoman JM, Eeftinck Schattenkerk JK.
- [8]. Adults with chickenpox in the tropics. [Article in Dutch]. *Ned Tijdschr Geneesk.* 2015;160:A9623.
- [9]. Balfour HH Jr. Varicella: how and when to start antiviral treatment. [Article in Italian]. *Minerva Pediatr.* 1993 Mar;45(3):107-12.
- [10]. Col R Bhalwar. Prospective Study on the Morbidity Profile of Recruits over one year in three large Regimental Training Centres. *MJAFI*, 2004, Vol. 60, No. 2, 113-116.
- [11]. Lopez AS, LaClair B, Buttery V, Zhang Y, Rosen J, Taggart E, Robinson S, Davis M, Waters C, Thomas CA, Rodriguez C, Thomas E, Tuttle J, Brantley T, Perella D, Rosario MD, and Marin M. Varicella Outbreak Surveillance in Schools in Sentinel Jurisdictions, 2012–2015. *Journal of the Pediatric Infectious Diseases Society* 2019;8(2):122–127.
- [12]. J.S. Kshatri, J. Turuk, J. Sabat, S. Subhadra, L.M. Ho1, S. Rath, S.K. Palo, D. Bhattacharya, B. Dwibedi and S. Pati. Epidemiology of viral disease outbreaks in Odisha, India (2010–2019). *Epidemiology and Infection* 148, e162, 1–10. <https://doi.org/10.1017/S0950268820001594>.
- [13]. Arunkumar G, Vandana KE, and Sathiakumar N. Prevalence of Measles, Mumps, Rubella and Varicella. Susceptibility among Health Science Students in a University in India. *Am J Ind Med.* 2013 January ; 56(1): 58–64. doi:10.1002/ajim.22046.
- [14]. Deoshatwar AR, Bondre VP, Tandale BV. Chickenpox and measles clusters among college students in Pune, Maharashtra. *VirusDis.* (July–September 2017) 28(3):337–340. DOI 10.1007/s13337-017-0395-3.
- [15]. Venkatiraman AR, John TJ. The epidemiology of varicella in staff and students of a hospital in the tropics. *Int J Epidemiol.* 1984 Dec;13(4):502-5. doi: 10.1093/ije/13.4.502.
- [16]. Meyers J, Logaraj M, Ramraj B, Narasimhan P, MacIntyre CR. Epidemic Varicella Zoster Virus among University Students, India. *Emerging Infectious Diseases.* www.cdc.gov/eid. Vol. 24, No. 2, February 2018. DOI: <https://doi.org/10.3201/eid2402.170659>.