Case report

Sporadic summer outbreak of SHAPU in even years: Does the pattern match with the usual autumn outbreak?

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\textbf{ABSTRACT}

\textbf{Purpose:} Seasonal Hyperacute Panuveitis (SHAPU), is a mysterious blinding disease seen only in Nepal with a higher prevalence among children usually seen in autumn every alternate odd year since 1975. This report highlights the sporadic summer outbreak in the even years with atypical presentation.

\textbf{Observations:} Three patients were diagnosed as SHAPU in the summer (May) of 2020. All of them noted the presence of white moths (Gazalina species) in their environment with or without direct physical contact. The clinical patterns were severe in nature including corneal melting. Two out of three patients (66.6\%) developed phthisis bulbi and lost their vision.

\textbf{Conclusions and importance:} White moth has been associated as a risk factor for SHAPU. Despite the known natural history of appearance after monsoon of every odd year, the few unhatched eggs of the moths may hatch under the favorable circumstances in the summer of the even years and may lead to the sporadic outbreak of SHAPU. Though less in numbers, the clinical presentation of such sporadic SHAPU cases may be atypical with less favorable outcome.

\section{1. Introduction}

Seasonal Hyperacute Panuveitis (SHAPU) is still an enigma, reported only from Nepal since 1975. Malla et al. described it as endophthalmitis probably caused by Tussock moth in 1978.\textsuperscript{1} Later it was studied in detail by Upadhyay et al. and named as Seasonal Hyperacute Panuveitis (SHAPU).\textsuperscript{2,3} The first outbreak was noted in 1975.\textsuperscript{4} Similar cases appeared again after two years in 1977 with identical presentation and outcome. Both outbreaks began in September and lasted until January of the next year.\textsuperscript{5} Since then, SHAPU has maintained a definitive cyclic and seasonal pattern of outbreak every odd year i.e. 1975,1977,1979,1981 and so on. Similarly, as expected, the last outbreak occurred during Aug–Dec 2019. Few sporadic cases of SHAPU have been reported during even years-like those of 2008 and 2010.\textsuperscript{6,7} However, their pattern and clinical profile has not been described till date. The white moths have been proven as the potential risk factors for SHAPU causation\textsuperscript{8} and their population increases during autumn of odd years.

We present a case series of 3 SHAPU patients who presented in May of 2020 (a sporadic summer outbreak in even year) with unusual presentation pattern and less favorable outcome. The outbreak occurred after sudden unexpected increase in moth population in that particular geographical area. The written consent was obtained from all the cases and the manuscript adheres with the tenets of Declaration of Helsinki.

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2. Case report

Three cases of SHAPU presented in May of 2020 at Himalaya Eye Hospital, Pokhara, Nepal. The last major SHAPU outbreak had affected around 50 eyes of 50 cases between August to December 2019. After the successful management of those cases, another outbreak was expected in 2021. But unexpectedly, we encountered 3 cases which fulfilled the definition criteria of SHAPU in the same geographical location with similar circumstantial risk factors. The occurrence of these cases matched with the sudden transient increase in the population of white moths with black striations (Gazalina species) in those areas (Fig. 1). However, they differed from the usual autumn presentation cases by occurring in mid-summer with different clinical picture and markedly poor prognosis in majority of cases.

2.1. Case 1

A 21 year immunocompetent female, from Pokhara –17 presented on May 2020 with sudden onset of redness, watering and diminution of vision of her right eye for two days. She had history of exposure to huge numbers of white moths outside her house without direct contact. On examination, vision in her right eye was Hand Movement (HM) with accurate projection of rays and 6/6,N6 in left eye. She had clear cornea with +4 cells in the anterior chamber and 1mm height cream colored mobile hypopyon (Fig. 2A). The iris details and pupillary view was obscured by the thick exudates clumping over them. Fundus details could not be appreciated. However, the left eye was normal.

Intraocular pressure with air puff non-contact tonometer showed 8 and 11 mm Hg in right & left eye respectively. The ultrasound (USG) B-scan of the affected eye showed dense vitritis with flat retina (Fig. 2B). Her systemic examination was unremarkable and routine blood investigations were normal. With these findings, she was diagnosed as a case of right eye SHAPU. She was immediately treated with hourly topical antibiotics and steroids with cycloplegics agents. Her vitreous tap showed no bacterial growth. She received 2 doses of intravitreal injections (Vancomycin 1mg/0.1ml + Cefazidime (2.25 mg/0.1 ml), + Dexamethasone (0.4 mg/0.1 ml) and subconjunctival injections (Gentamicin 40 mg/0.4 ml + Dexamethasone 4 mg/0.4 ml) followed by hourly topical antibiotics (Tobramycin) and steroids with cycloplegics agent. The vitreous aspirates were negative for stain and culture but the conjunctival swab showed gram positive cocci. The ocular status did not improve. Rather his cornea gradually started melting from centre to periphery (Fig. 3C). The topical steroids were tapered and hourly topical antibiotics with lubricants were continued. His corneal status deteriorated and the vitreous status in ultrasound (USG) B Scan also did not show signs of improvement. Pars plana vitrectomy was planned but could not be performed due to media haziness secondary to corneal thinning and edema. A repeat vitreous aspirate and intravitreal injection was done after 72 hours. The repeat vitreous aspirate again showed no growth. The child denied perception of light and developed phthisis bulbi with corneal vascularization and scar (Fig. 3D) by the end of 1 month which has hitherto not been reported in SHAPU cases.

2.2. Case 2

The second case was a 5 year old healthy boy from Pokhara-8 who was presented by his parents on May 2020 complaining of redness, photophobia and a smaller appearance of the right eye for 3 days (Fig. 3A). His presenting visual acuity was PL (Perception of Light) in the right eye and 6/6, N6 in the left eye. Slit lamp examination revealed edematous cornea, +4 cells with 2 mm of creamy hypopyon in the right eye. The detail of lens, vitreous and retina was obscured but USG B scan revealed homogeneous hyperechogenicity in the vitreous cavity, suggestive of dense vitritis and attached retina (Fig. 3B). The left was normal. Intraocular pressure was 6 and 12 mmHg each. On specific inquiry, the parents mentioned the presence of white moths outside the house. However, there was no direct contact. The child was diagnosed to have SHAPU in his right eye.

He was immediately treated with vitreous tap for diagnostic purpose followed by intravitreal injections (Vancomycin (1 mg/0.1 ml) + Cefazidime (2.25 mg/0.1 ml) + Dexamethasone (0.4 mg/0.1 ml) and subconjunctival injections (Gentamicin 40 mg/0.4 ml + Dexamethasone 4 mg/0.4 ml) followed by hourly topical antibiotics (Tobramycin) and steroids with cycloplegics agent. The vitreous aspirates were negative for stain and culture but the conjunctival swab showed gram positive cocci. The ocular status did not improve. Rather his cornea gradually started melting from centre to periphery (Fig. 3C). The topical steroids were tapered and hourly topical antibiotics with lubricants were continued. His corneal status deteriorated and the vitreous status in ultrasound (USG) B Scan also did not show signs of improvement. Pars plana vitrectomy was planned but could not be performed due to media haziness secondary to corneal thinning and edema. A repeat vitreous aspirate and intravitreal injection was done after 72 hours. The repeat vitreous aspirate again showed no growth. The child denied perception of light and developed phthisis bulbi with corneal vascularization and scar (Fig. 3D) by the end of 1 month which has hitherto not been reported in SHAPU cases.

2.3. Case 3

Third case was a 2 year old healthy boy brought to hospital by his father from Tanahun, 45 km away from Pokhara on May 29, 2020. He complained that the child developed sudden redness and watering of his right eye for 5 days. He was already on some antibiotic eye drops obtained from the local health post. The father revealed that few white moths were present inside their room and plenty outside the house prior to the disease onset and the history of direct contact of moth was present.

On presentation, the vision in the right eye was perception of light and in the left eye was 6/6. The right eye had hazy cornea, with an intense reaction in the anterior chamber along with whitish hypopyon of 1mm and leukocoria (Fig. 4A). The further details of that eye could not be evaluated. USG B scan showed homogeneous hyperechogenicity in the posterior vitreous cavity with shallow inferior retinal detachment (Fig. 4B). His left eye was normal. Amidst, the fear of SARS-CoV-2 in the country, the father refused the consent for vitreous tap with intravitreal injections and pars plana vitrectomy for the management. The child received hourly topical antibiotics, steroids and cycloplegics agent. The child lost to follow up for 2 months due to COVID-19 related lockdown in Nepal. They followed up in the first week of August 2020 but by that time, the child was found to have phthisical eye with no perception of light.
3. Discussion

SHAPU, is known to be the most destructive form of intraocular inflammation among children reported mainly from Nepal till date.\textsuperscript{2,4} SHAPU outbreaks have seasonal preferences and majority of the cases have been reported to occur during the period of the end of monsoon.
emergence of adult moth or butterfly to the outer environment thus optimum environmental condition the pupal case is broken up for the butterfly caterpillar undergoes metamorphosis and eventually under they have complete life cycles with four distinct stages like egg, caterpillar, pupa or chrysalis. Inside the pupa or chrysalis, the moth or butterfly transforms itself into the pupal stage in mid June to July end next year. The caterpillar transforms itself into the pupal stage in mid June to July end before the adult moth emerges.

At the end of the growing phase, caterpillars enter a dormant phase called a pupa or chrysalis. Inside the pupa or chrysalis, the moth or butterfly caterpillar undergoes metamorphosis and eventually under optimum environmental condition the pupal case is broken up for the emergence of adult moth or butterfly to the outer environment thus completing the life cycle. However, some of the un-hatched eggs remain in a dormant stage for a longer period if not parasitized or predated.

Moths may suffer from diseases as a result of parasitization due to fungi and hymenopterons. Eggs which have survived predation may hatch in favorable environmental condition later which after completing their larval stage is changed into the pupal stage and finally emerge as adult moths which are the potential risk factors for SHAPU causation. Mainly caterpillars are parasitized by the hymenopterons (wasps) besides few caterpillars which may also be attacked by the fungus disease. No information is available about this moth being a predator or allergenic species due to the toxin present in them.

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient(s) and their legal guardian.

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We further confirm that any aspect of the work covered in this manuscript, which may involve human patients, has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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Declaration of competing interest

No conflict of interest exists.

References

1. Malla O, ed. Endophthalmitis Probably Caused by Tussock Moth. Report of the Proceedings of the first National Seminar on Prevention of Blindness; 1978.

2. Upadhyay M, Rai N, Ogg J, Shrestha B. Seasonal hyperacute panuveitis of unknown etiology. Am Ophthalmol. 1984;16(1):38–44.

3. Upadhyay MP, Ogg JE, Shrestha B. Seasonal Hyperacute Panuveitis. Uveitis update; 1984:257–262.

4. Upadhyay M, Kharel Sitaula R, Shrestha B, et al. Seasonal hyperacute panuveitis in Nepal: a review over 40 Years of surveillance. Ocul Immunol Inflamm. 2018;1–9.

5. Upadhyay MP, Shrestha BR. SHAPU: forty years on mystery persists. Nepal J Ophthalmol. 2017;9(1):13–16.

6. Manandhar A, Margolis TP, Khanal B. New clinical and laboratory findings of SHAPU. Nepal J Ophthalmol. 2018;10(1):23–31.

7. Manandhar A. Patterns of uveitis and scleritis in Nepal: a tertiary referral center study. Ocul Immunol Inflamm. 2016;1–9.

8. Upadhyay Madan Prasad, Kharel Sitaula Ranju, Manandhar Anu, et al. The risk factors of seasonal hyperacute panuveitis. Ophthalmic Epidemiol. 2020. https://doi.org/10.1080/09286586.2020.1820553.

9. Khatri KC Anadi, Kharel Sitaula Ranju, Joshi Sagun Narayan, Karki Pratap, Sah Ranjit, Paneroselvam Sugi. SHAPU - Seasonal Hyperacute Pan-uveitis. EyeWiki. Am. Acad. Ophthalmol.. 2017 https://doi.org/10.13140/RG.2.2.14458.80321, eyewikiorg/SHAPU.

10. Wills PJ, Anjana M, Nitin M, et al. Population explosions of tiger moth lead to lepidopterism mimicking infectious fever outbreaks. PloS One. 2016;11(4), e0152787.

11. Wills PJ, Anjana M, Nitin M, et al. Population explosions of tiger moth lead to lepidopterism mimicking infectious fever outbreaks. PloS One. 2016;11(4), e0152787.

12. Rahman W, Chaudhry M. Observations on outbreak and biology of oak defoliator, Gazalina chrysolopha Koll. Pakistan J For. 1992;42:134–137.

13. Wagner DL. Caterpillars of Eastern North America: A Guide to Identification and Natural History. Princeton University Press; 2005.

14. Gullan PJ, Cranston PS. The Insects: An Outline of Entomology. John Wiley & Sons; 2014.

15. Goulet H, Mason PG. Review of the nearctic species of leiophron and peristenus (Hymenoptera: Braconidae: Euphorinae) parasitizing lygus (Hemiptera: Miridae: Mirini). ZooKeys. 2006;1323(1):1–118.

16. Kharel R, Karki P, Joshi SN, Sharma AK, Upadhyay MP. Moth hair in cornea in a case of seasonal hyperacute panuveitis. Indian J Ophthalmol. 2020;68(5):930.

17. Manandhar A. Seasonal hyperacute panuveitis: an update. Curr Opin Ophthalmol. 2011;22(6):496–501.

18. Smits SL, Manandhar A, van Loenen FB, et al. High prevalence of anelloviruses in vitreous fluid of children with seasonal hyperacute panuveitis. J Infect Dis. 2012;205(12):1877–1884.