Review article

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Spotting Zika spots: descriptive features of the rash used in 66 published cases

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Summary

Zika virus (ZV) is an important emerging infection. Rash is a key feature, but the summative literature lacks description of the rash beyond 'maculopapular'. Our aim was to identify the cutaneous features described in the published literature. A literature search using defined terms for ZV cases reports and series was performed on the OVID, Clinical Key and University of Dundee's e-library journals databases in December 2016; a later case report was included while the paper was under review. Diagnosis in all cases was via PCR. Exclusion criteria were Zika cases without rash or omitting any description of the rash. Ocular features (conjunctivitis) were not included. In total, 42 publications with 66 cases met the criteria. The most frequent descriptive features included maculopapular (59%), lower limb petechial purpura (11%) and erythematous/red (9%). Pruritus was described in 44% and tenderness in 3%. Lesions were located on the trunk (29%), limbs (5% arms, 11% both arms and legs), face (17%) and extremities (14%) or were diffuse/generalized (12%). There was facial sparing in 3%. Other features were centrifugal spread (6%), palmar and/or plantar involvement (6%), palmoplantar desquamation (2%) and malar erythema with oedema (2%). Mucosal features included gingival bleeding (11%), oral haemorrhagic blisters (8%) and painful blisters/vesicles (4%). Oedema/swelling was described in the upper limbs (5%), lower limbs (5%) and both (3%). Mean rash duration was 6 days (range 3–11 days). The ZV exanthema is most frequently maculopapular, pruritic, sometimes with centrifugal spread from the trunk to extremities. This may include lower limb petechial purpura, palmoplantar lesions, oedema of limb extremities, and gingival bleeding or painful oral bullae. As ZV becomes more prevalent, recognition of the clinical features will enable earlier diagnosis and appropriate testing.

Introduction

Zika virus (ZV) is an important emerging infection. The March 2017 World Health Organisation (WHO) Situation Report[1] recorded 84 countries with evidence of mosquito-borne transmission of ZV, 13 with person-to-person transmission (including returning travellers or their sexual partners), 31 with microcephaly cases and 23 with associated Guillain–Barré syndrome.

Zika virus is a flavivirus spread by the *Aedes* mosquito.[2] As an arthropod-spread infection, it is also known as an arbovirus. Sexual and maternal–fetal transmission has also been reported.[2] ZV was first detected in Uganda in 1947, followed by spreading to the Americas[3] and elsewhere. Figure 1 shows countries with ZV and those at risk based on the March 2017 WHO report.[1] *Aedes aegypti* is the main vector in

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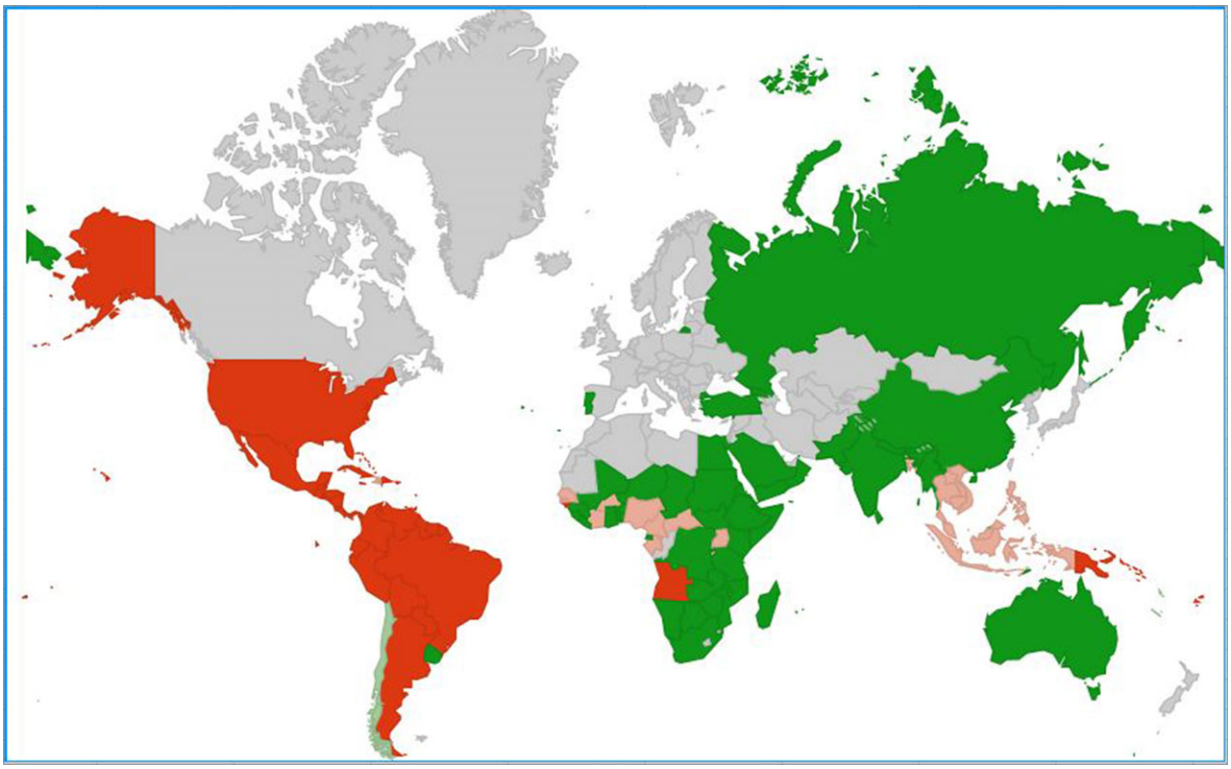

Figure 1 Map of Zika virus situation in countries categorized 1–4 based on World Health Organization situation report.[1] ■ Category 1: Area with new introduction or re-introduction with ongoing transmission; ■ category 2: area either with evidence of virus circulation before 2015 or area with ongoing transmission that is no longer in the new or re-introduction phase, but where there is no evidence of interrupted transmission; ■ category 3: area with interrupted transmission and with potential for future transmission; ■ category 4: area with established competent vector but no known documented past or current transmission. *Note the entire countries are marked, not the individual subregions e.g. Zika virus has not been reported in Alaska. [Colour figure can be viewed at wileyonlinelibrary.com]

tropical regions. *Aedes albopictus,* an invasive species to Europe, may carry ZV, so there is a risk of ZV becoming established in Europe. *Aedes albopictus* originated in Southeast Asia and has spread through eggs transmitted in used tyres and bamboo plants, further helped by climate change.[4] *A. albopictus* was first reported in Albania in 1979, and has now been reported to be reproducing as far north as Germany.[4,5] The WHO[6] recently evaluated Europe to be at low to moderate risk for ZV.

Zika virus can be diagnosed by reverse-transcription (RT)-PCR testing or serological testing of ZV antibodies. Public Health England[7] advises that RNA detected in any sample is sufficient to diagnose infection, but a negative result does not exclude previous infection. RT-PCR can be performed on serum, urine, saliva, semen and amniotic fluid.[7] Antibody testing is complicated by crossreactivity with other flaviviruses and by previous infection or immunization.[8] Therefore, testing for antibodies to dengue, chikungunya and other endemic arboviruses is also required. Table 1[9] summarises the possible differential diagnoses. If ZV IgM is detected, then it usually indicates ZV infection.[7] IgG plus IgM usually indicate ZV infection as ZV IgM is frequently undetectable in those with previous dengue.[7] ZV IgG without IgM is difficult to interpret, and may indicate ZV infection, cross-reactivity or nonspecific reactivity[7].

Zika virus is a spreading problem in both developing and developed countries. It may present in travellers, migrants and refugees. Dermatologists should be prepared to recognize cases: a rash is a key feature of ZV infection, but the summative literature is lacking description of the rash beyond 'maculopapular'. Singh *et al.*[10] and Anderson *et al.*[11] have summarized features from a few articles.

The aim of the current study was to perform a broad review and summarize the cutaneous clinical features described in published case reports and case series of ZV. Other already recognized features of ZV include fever, nonpurulent conjunctivitis, arthralgia, myalgia, headache and malaise.[2]

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Table 1 Causes of rash and fever – tropical and cosmopolitan infections.

Organism/disease	Rash (% cases)	Distribution	Vector/exposure risk	Associated features
Dengue	M, MP, PP (50%)	Tropical, subtropical, worldwide	*Aedes* mosquito, urban and rural	Myalgia, haemorrhage, shock
Zika	MP	Africa, Asia, Oceania, Latin America, North America	*Aedes* mosquito, urban and rural, MTC, sexual, blood transfusion	Congenital Zika virus syndrome, Guillain–Barré syndrome
Chikungunya	M, MP (50%)	Tropical, subtropical African and Asia, Caribbean, South America	*Aedes* mosquito, urban and rural	Polyarthralgia, arthritis
African tick typhus	MP, PP, V (46%)	Sub-Saharan Africa	Ticks, rural/wilderness	Eschar common, headache
Mediterranean spotted fever	MP, PP (90%)	Mediterranean and sub-Saharan Africa, India	Ticks, urban, suburban	Eschar common
Rocky Mountain spotted fever	MP, PP (90%)	USA, Central and South America	Ticks, rural/wilderness	Eschar rare
Scrub typhus: *Orientia tsutsugamushi*	M, MP (35–90%)	Asia, Pacific Islands	Larvae of trombiculid mites (chiggers), rural	Eschar common
Typhoid fever: *Salmonella typhi/paratyphi*	M (rose spots) (20%)	Wherever risk of faecal contamination of water	Faecal–oral, poor sanitation	Prolonged fever, splenomegaly, GI, perforation and haemorrhage, encephalopathy
Leptospirosis	M, MP, PP (20%)	Worldwide	Exposure to rat/rodent urine (fresh water)	Conjunctivitis, myalgia, jaundice
Schistosomiasis	U (Katayama fever)	Africa, Asia, South America, Caribbean	Freshwater snails	Eosinophilia, pulmonary infiltrates
Yellow fever	PP	Central and South America, Africa	Mosquito-borne, urban, rural	Jaundice, neurological involvement
Lassa fever	MP, PP	West Africa	Unknown, ?monkey bites, rural/wilderness	Pharyngitis, retrosternal pain, encephalitis, haemorrhage
Ebola/Marburg	MP, PP	West/Central Africa	*Culex*, mosquitoes, urban	Abdominal pain, diarrhoea and vomiting, haemorrhage
South American haemorrhagic fevers	PP	South America	Human	–
West Nile virus	MP	Africa, USA	Human	Encephalitis
Measles	MP	Worldwide	Human	Cough, conjunctivitis, Koplik spots
Varicella zoster virus	MP, V	Worldwide	Human	Coryza, pneumonitis
Epstein–Barr virus	MP, PP	Worldwide	Human	Pharyngitis, lymphadenopathy, splenomegaly
Cytomegalovirus	MP	Worldwide	Human	Pharyngitis, lymphadenopathy, splenomegaly
Toxoplasmosis	MP	Worldwide	Cats	Lymphadenopathy
Human immunodeficiency virus	MP	Worldwide	Sexual, IVDU, vertical transmission	Pharyngitis, lymphadenopathy, splenomegaly
Rubella	MP	Worldwide	Human	Coryza, arthralgia
Staphylococcus aureus	PP, E	Worldwide	Human, IVDU	Shock, heart murmur
Streptococcus pyogenes	E	Worldwide	Human	Pharyngitis, cellulitis, shock
Neisseria meningitides	PP	Worldwide	Human	Shock, meningitis
Neisseria gonorrhoeae	PP	Worldwide	Sexual	Septic arthritis
Syphilis: *Treponema pallidum*	MP, PP, Pu, V	Worldwide	Sexual	Genital ulceration

E, erythrodermic; GI, gastrointestinal; IVDU, intravenous drug use; M, macular, MP, maculopapular; MTC; mother-to-child; PP, petechial/purpuric; Pu, pustular, U, urticarial; V, vesicular. The % values given for frequency of rash in particular infections are derived from case series. Adapted from Sharma H *et al.*[9] with permission from Elsevier (licence code: 4280360114492; Crown Copyright 2017, published by Elsevier Ltd).

Methods

A literature search, using defined terms of 'Zika virus AND rash OR exanthema OR lesions', was performed on journal articles in the OVID, Clinical Key and the University of Dundee's e-library databases. The search was carried out in December 2016. A further case report identified after this

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date was included while the paper was under review. Zika cases without rash or omitting any description of the rash were excluded. Zika diagnosis had to be made using PCR. PCR tests were usually RT-PCR, but also quantitative reverse transcription PCR (RT-qPCR) and real-time reverse transcription PCR (rtRT-PCR). Cases diagnosed only with antibodies (IgM and/or IgG) were excluded, unless ZV was identified by PCR in person-to-person transmission where the subject would not have been able to acquire another flavivirus (e.g. PCR-detected ZV in a sexual partner who had stayed in an unaffected country and in the returning partner who had travelled but had IgM and/or IgG only, or PCR-detected ZV in a mother with IgG and/or IgM and a PCR-positive fetus).

The identified case reports and series were read by one data collector (JSD). The publication and paragraphs describing the rash were copied into a data collection file. The descriptive words for each publication were entered into a spreadsheet (Excel; Microsoft Corp., Redmond, WA, USA). Analogous terms were grouped (e.g. generalized, diffuse and disseminated) before tallying the descriptive features. Features were noted regarding lesion appearance, distribution, sensation, oral mucosal and oedema/swelling. Data on the duration of the rash were collected if mentioned. Conjunctivitis is a well-recognized feature, so ocular mucosal features were not included.

Results

Publications and cases

In total, 50 publications describing the rash were identified, and of these, 8 (reporting 15 cases) that did not meet the diagnostic criteria were excluded. The remaining 42 publications (see Data S1 online) described 66 cases. As far as could be determined, there were no duplicate reports. Mean age of the patients was 46 years (range 15–81 years). There were 26 males, 34 females and 6 not specified. There were four sexually transmitted cases and one possible transmission by monkey bite. Twenty countries/regions were reported as the source of the infection, including two patients who had travelled to multiple at-risk zones. Table 2 summarizes the demographic information.

Clinical features and duration

The descriptive rash features (Table 3) included maculopapular (59%), lower limb petechial purpura (11%), erythematous/red (9%), macular (3%), papular (3%) and blanching (3%). The distribution (Table 3) included trunk/torso (29%), face (17%), extremities (14%), diffuse/generalized/disseminated (12%), limbs/arms and legs (11%), centrifugal spread (6%), palmar and/or plantar involvement (6%), abdomen (5%), back (5%), arms (5%), facial sparing (3%) and neck (3%). The sensation-related descriptions included pruritic/itchy (44%) and specified tender rash (3%). There was oedema of the hands and/or wrists (5%), oedema/swelling of the feet/ankles/lower limbs (5%), oedema of the hands and feet (3%) and malar/facial oedema (2%) (Table 3). Mucosal features (Table 3) included gingival bleeding (11%), oral haemorrhagic blisters (8%), painful blisters/vesicles (4%) and mucosal bleeding (3%). Although data were not collected on ocular features, there was one case of uveitis reported.[12] ZV infection may trigger an exacerbation of other dermatoses.[13] The mean duration of the rash, available from 10 cases, was 6 days (range 3–11 days).

Discussion

The WHO[2] describes the features of ZV as being similar to those of dengue, and they include fever, cutaneous rash, nonpurulent conjunctivitis, arthralgia, myalgia, headache and malaise. ZV-infected individuals are often asymptomatic (19% symptomatic reported by Duffy *et al.*,[14] 26% by Musso *et al.*[15]). Duffy *et al.*[14] described 31 cases, using different diagnostic criteria, with symptoms, of which 90% had a rash, 65% fever, 65% arthralgia or arthritis, 55% nonpurulent conjunctivitis, 48% myalgia, 45% headache, 39% retro-orbital pain, 19% oedema and 10% vomiting. Mean duration of rash was 6 days (range 2–14 days).[2] The incubation period is unknown, but is thought to be a few days.[2] Associated complications include Guillain–Barré syndrome and microcephaly through maternal–fetal transmission.[2] We found a similar mean duration and range for rash. The incubation period was not clear in the case reports/case series that we identified.

This study found that the most frequently described ZV exanthema feature is a maculopapular pruritic rash, sometimes with centrifugal spread from the trunk to the extremities. This may include palmoplantar lesions, oedema of the limb extremities, and gingival bleeding or painful oral bullae. Pruritus was specified in 44%. Purpura with thrombocytopenia was observed as a later complication of the initial ZV symptoms.[16–18]

Singh *et al.*[10] and Anderson *et al.*[11] referenced 4 and 10 sources, respectively. We found 6% palmoplantar lesions; however, Singh *et al.*[10] reported no palmoplantar involvement. They did not describe oral

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Table 2 Demographic data of the cases.

Patient	Reference*	Case number within reference†	Age	Sex	Diagnostic test	Country of suspected infection (or route of sexual transmission)	Country in which patient presented
1	1	–	43	M	RT-PCR blood, urine, saliva, semen	Brazil	South Korea
2	2	1	Mid-20s	M	rtRT-PCR serum	Bora Bora (French Polynesia)	Japan
3		2	30s	F	rtRT-PCR urine	Bora Bora (French Polynesia)	Japan
4	3	1	30s	F	rtRT-PCR serum, saliva and breast milk	French Polynesia	French Polynesia
5		2	40s	F	rtRT-PCR serum, urine and breast milk	French Polynesia	French Polynesia
6	4	–	52	F	PCR serum	Indonesia	Australia
7	5	–	NS	F	RT-PCR blood, urine, nasopharyngeal fluid	Thailand	Canada
8	6	1	24	F	RT-PCR urine and saliva	Vaginal/oral sexual transmission	France
9		2	46	M	RT-PCR urine and semen	Brazil	France
10	7	–	47	F	RT-PCR urine	Brazil	Brazil
11	8	–	51	F	rtRT-PCR serum	Guatemala or El Salvador	Switzerland
12	9	1	60	F	PCR	Suriname	Netherlands
13		2	40	F	PCR	Suriname	Netherlands
14		3	54	M	PCR	Suriname	Netherlands
15		4	47	M	PCR	Suriname	Netherlands
16		5	53	F	PCR	Suriname	Netherlands
17	10‡	–	38	M	RT-PCR serum with BLAST analysis	Brazil	Brazil
18	11	–	Not specified	F	rtRT-PCR urine	Dominican Republic (vaginal/oral sexual transmission; partner had returned from DR)	USA, Maryland
19	12	1	49	F	PCR with BLAST analysis	Cook Islands	Australia
20	13	–	68	M	rtRT-PCR serum and semen	Cook Islands	UK
21	14	–	26	F	qRT-PCR serum, whole blood, urine, saliva, vaginal swab	Honduras	USA
22	15	–	34	M	RT-PCR serum and urine	Venezuela	China
23	16	–	39	M	RT-PCR	Brazil	Brazil
24	17	–	40s	M	rtRT-PCR urine	Thailand	Japan
25	18	–	26	M	Real-time PCR serum	Puerto Rico	USA
26	19	–	62	M	RT-PCR serum	Honduras	Venezuela
27	20	1	62	M	RT-PCR (positive in partner's urine; patient IgM- and IgG-positive)	Martinique, Caribbean	France
28		2	60	F	RT-PCR serum and urine	Martinique (possible sexual transmission likely from timeline, but had also been to Martinique)	France
29	21	1	20s	F	rtRT-PCR serum and urine	Country NS	USA
30		2	20s	M	rtRT-PCR urine	Country NS (vaginal sexual transmission)	USA
31	22	1	NS	M	RT-PCR (positive in partner's serum; partner had not travelled)	Carribbean	USA
32		2	NS	F	RT-PCR from serum	Country NS (vaginal sexual transmission)	USA
33		3	NS	M	RT-PCR (positive in partner's serum; patient IgM-positive)	Central America	USA
34	23	–	Early 30s	F	rtRT-PCR serum	French Polynesia	Italy

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Table 2. continued

Patient	Reference*	Case number within reference†	Age	Sex	Diagnostic test	Country of suspected infection (or route of sexual transmission)	Country in which patient presented
35	24	–	31	F	rtRT-PCR serum	Tahiti	Norway
36	25	1	38	F	RT-PCR urine	Guadeloupe	Guadeloupe
37		2	58	F	RT-PCR urine and plasma	Guadeloupe	Guadeloupe
38		3	15	F	RT-PCR urine and plasma	Guadeloupe	Guadeloupe
39		4	74	F	RT-PCR urine	Guadeloupe	Guadeloupe
40		5	46	F	RT-PCR urine	Guadeloupe	Guadeloupe
41		6	36	M	RT-PCR urine	Guadeloupe	Guadeloupe
42		7	46	M	RT-PCR urine	Guadeloupe	Guadeloupe
43	26	–	45	M	rtRT-PCR semen and urine	Brazil	UK
44	27	–	54	F	PCR urine and blood	Suriname	Netherlands
45	28	1	26	F	PCR urine	Martinique, Caribbean	Martinique, Caribbean
46		2	21	M	PCR urine	Martinique, Caribbean	Martinique, Caribbean
47	29	1	62	F	RT-PCR and rtRT-PCR urine	Brazil	Portugal
48		2	57	M	RT-PCR and rtRT-PCR urine	Brazil	Portugal
49	30	–	81	M	RT-PCR CSF	New Caledonia, Vanuatu, Solomon Islands, but also travelled to New Zealand (not identified as active for ZV)	France
50	31	–	Early 40s	M	rtRT-PCR urine, plasma, semen and saliva	Haiti	Italy
51	32	–	20s	F	rtRT-PCR plasma, urine and saliva	Dominican Republic	Italy
52	33	–	27	F	RT-qPCR serum and breast milk	New Caledonia	New Caledonia
53	34	–	27	M	PCR (identified flavivirus on nasopharyngeal swab, then sequence identified Zika virus)	Indonesia (proposed monkey bite transmission)	Australia
54	35	–	37	M	rtRT-PCR urine with BLAST analysis	Maldives	Finland
55	36	–	27	F	RT-qPCR amniotic fluid	Brazil	Brazil
56	37	–	Early 30s	M	rtRT-PCR urine, saliva and semen	Haiti	Italy
57	38	–	27	F	rtRT-PCR blood, endocervical swab, cervical mucus	Guadeloupe	Guadeloupe
58	39	–	25	F	IgG in patient; RT-PCR of fetal autopsy tissue	Brazil	Slovenia
59	40	1	NS	NS	rtRT-PCR urine and serum	New Caledonia	New Caledonia
60		2	NS	NS	rtRT-PCR urine and serum	New Caledonia	New Caledonia
61		3	NS	NS	rtRT-PCR urine	New Caledonia	New Caledonia
62		4	NS	NS	rtRT-PCR urine and serum	New Caledonia	New Caledonia
63		5	NS	NS	rtRT-PCR urine	New Caledonia	New Caledonia
64		6	NS	NS	rtRT-PCR urine and serum	New Caledonia	New Caledonia
65	41	–	32	F	rtRT-PCR serum, urine, CSF, saliva, vaginal swab	Dominican Republic	Italy
66	42	–	68	F	RT-PCR	Venezuela	Venezuela

BLAST, Basic Local Alignment Search Tool; CSF, cerebrospinal fluid; NS, not specified. qRT-PCR, quantitative reverse transcription PCR; RT-PCR; reverse-transcription PCR; rtRT-PCR, real-time reverse transcription PCR. *References are provided in Data S1 online; †if > 1 case (note that some cases within one reference were excluded as they did not meet our criteria); ‡patient was human immunodeficiency virus-positive.

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Table 3 Characteristics of the Zika virus rash in 66 cases.

Characteristic	*n*	%*
Description		
Maculopapular	39	59
Petechial purpura on lower limbs	7	11
Erythematous/red	6	9
Macular	2	3
Papular	2	3
Blanching	2	3
Subcutaneous haematomas on arms and legs	1	2
Mottled flat rash, later papular	1	2
Malar erythema	1	2
Distribution		
Trunk/torso	19	29
Face	11	17
Extremities	9	14
Diffuse/generalized/disseminated	8	12
Limbs, arms and legs	7	11
Palmar and/or plantar involvement	4	6
Centrifugal spread	4	6
Arms	3	5
Abdomen	3	5
Back	3	5
Neck	2	3
Facial sparing	2	3
Palmoplantar desquamation	1	2
Hands	1	2
Upper arms	1	2
Upper extremities	1	2
Legs	0	0
Sparing of head	0	0
Sensation		
Pruritic/itchy†	29	44
Slight itch	6	9
Moderate itch	2	3
Intense itch	2	3
Itchy hands	1	2
Specified as nonpruritic	3	5
Specified as tender rash	2	3
Specified as painless	1	2
Oedema		
Of hands and/ or wrists	3	5
Oedema/swelling of feet, ankles, legs	3	5
Of hands and feet	2	3
Malar/facial	1	2
Mucosal features†		
Gingival bleeding	7	11
Mucosal bleeding	2	3
Oral haemorrhagic blisters	5	8
Painful oral vesicles	1	2
Painful oral blisters	1	2
Hyperaemia of hard palate	1	2
Petechiae of hard palate	1	2

*Out of 66 cases; †includes slight/moderate/intense/hand cases below and cases without intensity specified; the table does not include ocular features e.g conjunctivitis and uveitis.

bullae/vesicles (haemorrhagic or not), contrasting with 12% in our results.[10] Anderson *et al.*[11] stated that ZV is usually not pruritic, contrasting with our finding of 44% with pruritus, and they did not describe petechial purpura, oedema or oral mucosal features.[11] Our results summarize the features clinicians should look for in suspected cases of ZV infection (Table 3).

Other infections causing rash and fever are also summarized (Table 1). Paniz-Mondolfi *et al.*[19] have suggested the term 'ChikDenMaZika syndrome' as a mnemonic for cases from South America. There are no clinically foolproof discerning features. Co-infection with more than one arbovirus increases complexity.[19] A thorough travel history of the patient, sexual partners and symptomatic contacts is crucial in guiding investigation.

A recognized limitation of any analysis of pooled cases/case series is the bias for the cases selected for publication. However, this provides a dermatological starting point from which to build.

Conclusion

As ZV becomes more prevalent, recognition of the features of the rash will enable clinicians to consider the diagnosis and test for ZV and its differentials appropriately.

Learning points

- Clinicians should have a higher suspicion of ZV in recent travellers returning from at-risk sites presenting with a rash and other key features such as fever, arthralgia/myalgia and conjunctivitis.
- However, the clinical features alone cannot guarantee a diagnosis of ZV, as other infections can present similarly and should be considered in the diagnostic testing.
- Zika virus transmission can be sexual and maternal–fetal, therefore in a patient presenting with a maculopapular rash consider taking a sexual history and any recent travel locations of their sexual partners, and also ask women about pregnancy.
- If a Zika rash is suspected, look for oedema of the distal limbs, oral bullae and or gingival bleeding, and occasionally palmoplantar involvement. Additionally, look for ocular signs of nonpurulent conjunctivitis as it is an established feature; uveitis has also been described.

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CPD questions

Learning objective

To gain up-to-date knowledge about the signs and symptoms of Zika virus and important history-taking questions in cases.

Question 1

Which of the following oral signs has been observed most frequently with Zika virus?

(a) Haemorrhagic bullae.
(b) Gingival bleeding.
(c) Wickham striae.
(d) Chelitis.
(e) Koplik spots.

Question 2

A 28-year-old woman presents with fever, conjunctivitis and a maculopapular rash. She has not travelled abroad. What feature in her medical history would make you think this could be Zika virus?

(a) Mosquito bites while gardening in her backyard in the UK.
(b) Her husband recently returned from a business trip in Florida.
(c) A monkey bit her while she was working at the zoo.
(d) Her 3-year-old son has seen the GP for conjunctivitis.
(e) She had been riding a polo pony with mange, which had been imported from Brazil by a dealer.

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Question 3

Which of the following clinical features is most common in Zika virus (ZV)?

(a) Maculopapular rash.
(b) Fever.
(c) Arthralgia.
(d) Conjunctivitis.
(e) None of the above; the virus is asymptomatic.

Question 4

Which two mosquitos are known to be vectors for Zika virus?

(a) *Aedes aegypti*, *Aedes triseriatus*.
(b) *Aedes albopictus*, *Aedes koreicus*.
(c) *Aedes koreicus*, *Aedes triseriatus*.
(d) *Aedes albopictus*, *Aedes aegypti*.
(e) *Anopheles plumbeus*, *Aedes albopictus*.

Question 5

A 40-year-old-man with a maculopapular rash has returned from a trip around the world. Which of the countries that he visited is classified by the WHO as having ongoing transmission of Zika virus?

(a) China.
(b) Australia.
(c) Fiji.
(d) Egypt.
(e) Uruguay.

Instructions for answering questions

This learning activity is freely available online at http://www.wileyhealthlearning.com/ced

Users are encouraged to

- Read the article in print or online, paying particular attention to the learning points and any author conflict of interest disclosures
- Reflect on the article
- Register or login online at http://www.wileyhealthlearning.com/ced and answer the CPD questions
- Complete the required evaluation component of the activity

Once the test is passed, you will receive a certificate and the learning activity can be added to your RCP CPD diary as a self-certified entry.

This activity will be available for CPD credit for 2 years following its publication date. At that time, it will be reviewed and potentially updated and extended for an additional period.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Data S1. Additional references for paper in *Clinical and Experimental Dermatology*: Dobson JS, Levell NJ. Spotting Zika spots: descriptive features of the rash used in 66 published cases (https://jdsresources.wordpress.com/).

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