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Predictors of Fatal Outcomes among Pediatric Patients Hospitalized for Rocky Mountain Spotted Fever, Sonora, Mexico, 2004–2024

Appendix

Appendix Table 1. Clinical features, vital signs, and complications during hospital admission for children with Rocky Mountain spotted fever, Sonora Mexico (2004 - 2024)

Characteristic	No. cases	Fatal cases	Nonfatal cases	Total	p value†
Median no. days from symptom onset to admission (IQR)	500	6.0 (4.0–7.0)	5.0 (3.0–7.0)	5.0 (3.0–7.0)	0.001‡
Signs and symptoms on admission					
Fever	500	99 (100)	401 (100)	500 (100)	NA
Malaise	465				
Before onset of fever		20 (22)	61 (16)	81 (17)	0.32
After onset of fever		31 (34)	153 (41)	184 (40)	
Began simultaneously with fever		41 (45)	159 (43)	200 (43)	
Headache	500	88 (89)	350 (87)	438 (88)	0.74
Vomiting	500	69 (70)	200 (50)	269 (54)	<0.001
Arthralgia	500	77 (78)	282 (70)	359 (72)	0.17
Myalgia	499	81 (83)	302 (75)	383 (77)	0.14
Conjunctivitis	499	14 (14)	47 (12)	61 (12)	0.5
Diarrhea	500	59 (60)	181 (45)	240 (48)	0.01
Exanthema	500	98 (99)	379 (95)	477 (95)	0.06
On feet	499	87 (88)	297 (74)	484 (77)	0.003
On palms	500	89 (90)	315 (79)	404 (81)	
Petechial rash	500	88 (89)	293 (73)	381 (76)	<0.001
Hemorrhage (from any site)	492	65 (68)	97 (24)	162 (33)	<0.001
From gingival tissues	492	19 (20)	24 (6.1)	43 (8.7)	<0.001
Epistaxis	492	23 (24)	46 (12)	69 (14)	0.003
Hematemesis	492	23 (24)	19 (4.8)	42 (8.5)	<0.001
Melena	492	13 (14)	10 (2.5)	23 (4.7)	<0.001
From genitourinary tract	492	14 (15)	14 (3.5)	28 (5.7)	<0.001
Other	492	22 (23)	14 (3.5)	36 (7.3)	<0.001
Intubation on admission	500	65 (66)	67 (17)	132 (26)	<0.001
Respiratory distress	500	39 (39)	39 (9.7)	78 (16)	<0.001
Mental status on admission	499				
No alteration		23 (23)	285 (71)	308 (62)	<0.001
Confused/disoriented/lethargic		71 (72)	112 (28)	183 (37)	
Seizing		5 (5.1)	3 (0.8)	8 (1.6)	
Vital signs					
Median temperature, °C (IQR)	465	37.4 (36.3–38.2)	37.6 (36.9–38.4)	37.5 (36.8–38.4)	0.04
Median heart rate, bpm (IQR)	472	120 (106–142)	120 (105–138)	120 (105–140)	0.48
Median respiratory rate, rpm (IQR)	477	28 (24–38)	26 (22–32)	26 (22–32)	0.007
Median oxygen saturation, % (IQR)	483	96.0 (86.5–98.0)	97.0 (96.0–98.0)	97.0 (95.0–98.0)	<0.001
Edema	500	75 (76)	202 (50)	277 (55)	<0.001
Eye edema	500	65 (66)	134 (33)	199 (40)	<0.001
Wrist edema	500	63 (64)	143 (36)	206 (41)	<0.001
Ankle edema	500	67 (68)	162 (40)	229 (46)	<0.001
Abdominal pain	500	62 (63)	222 (55)	284 (57)	0.21
Hepatomegaly	500	55 (56)	131 (33)	186 (37)	<0.001

Characteristic	No. cases	Fatal cases	Nonfatal cases	Total	p value†
Ecchymosis	498	53 (54)	60 (15)	113 (23)	<0.001
Confusion	499	76 (78)	134 (33)	210 (42)	<0.001
Seizures	500	36 (36)	26 (6.5)	62 (12)	<0.001
Encephalitis	500	20 (20)	22 (5.5)	42 (8.4)	<0.001
Coma	500	24 (24)	14 (3.5)	38 (7.6)	<0.001
Pneumonia	500	13 (13)	43 (11)	56 (11)	0.48
Pulmonary edema	500	18 (18)	26 (6.5)	44 (8.8)	<0.001
Hypovolemia	500	51 (52)	72 (18)	123 (25)	<0.001
Shock	500	79 (80)	135 (34)	214 (43)	<0.001
Hypotensive	500	41 (41)	48 (12)	89 (18)	<0.001
Septic		26 (26)	85 (21)	111 (22)	
Mixed		12 (12)	2 (0.5)	14 (2.8)	

*Values are no. (%) except as indicated. Bold font indicates statistical significance by Bonferroni correction (p<0.001) except as indicated. bpm, beats per minute; rpm, respirations per minute.

†Based on Fisher exact test, Pearson Chi-Square or Kruskal Wallis ANOVA.

‡Statistically significant (p<0.05)

Appendix Table 2. Abnormal laboratory findings at time of hospitalization in hospitalized children with Rocky Mountain spotted fever, Sonora, Mexico

Indicator	No. cases	Fatal cases	Nonfatal cases	Total	p value†
Abnormal hemoglobin	497	39 (41)	150 (37)	189 (38)	0.561
Abnormal hematocrit	494	61 (64)	242 (61)	303 (61)	0.559
Abnormal leukocytes	498	71 (73)	179 (45)	250 (50)	<0.001
Abnormal lymphocytes	475	70 (78)	221 (57)	291 (61)	<0.001
Abnormal neutrophils	477	72 (77)	143 (37)	215 (45)	<0.001
Abnormal neutrophil-to-lymphocyte ratio, >6	471	55 (63)	157 (41)	212 (45)	<0.001
Abnormal platelets	497	95 (98)	326 (82)	421 (85)	<0.001
Abnormal serum procalcitonin	337	71 (100)	258 (97)	329 (98)	0.212
Abnormal prothrombin time	488	93 (97)	322 (82)	415 (85)	<0.001
Abnormal partial thromboplastin time	486	86 (90)	243 (62)	329 (68)	<0.001
Abnormal aspartate aminotransferase	488	93 (99)	354 (90)	447 (92)	0.002
Abnormal alanine aminotransferase	487	91 (97)	305 (78)	396 (81)	<0.001
Abnormal lactate dehydrogenase	384	77 (96)	272 (89)	349 (91)	0.079
Abnormal serum sodium level	492	79 (81)	320 (81)	399 (81)	>0.99
Abnormal serum creatinine	451	79 (88)	161 (45)	240 (53)	<0.001
Abnormal serum albumin	416	72 (91)	226 (67)	298 (72)	<0.001
Abnormal serum total protein	417	63 (81)	200 (59)	263 (63)	<0.001

*Values are no. (%). Bold font indicates statistical significance by Bonferroni correction (p<0.001)

†Based on Fisher exact test or Kruskal-Wallis ANOVA.

Appendix Table 3. Clinical features, vital signs, and complications during hospitalization in children that survived Rocky Mountain spotted fever infection, Sonora Mexico (2004 - 2024)

Characteristics	No. case-patients	Discharged with sequelae, n = 64	Discharged at baseline health, n = 336	p value†‡
# days from symptom onset to initial presentation for care (IQR)	400	6.0 (4.0–7.5)	5.0 (3.0–6.0)	<0.001‡
# days from symptom onset to doxycycline administration (IQR)	399	6.0 (4.9–7.9)	5.0 (3.0–6.8)	<0.001‡
Signs and symptoms on admission				
Fever	400	64 (100)	336 (100)	NA
Malaise	372			
Before onset of fever		7 (12)	54 (17)	0.54
After onset of fever		27 (45)	126 (40)	
Began simultaneously with fever		26 (43)	132 (42)	
Headache	400	51 (80)	298 (89)	0.06
Vomiting	400	31 (48)	168 (50)	0.89
Arthralgia	400	55 (86)	226 (67)	0.003
Myalgia	400	56 (88)	245 (73)	0.01
Conjunctivitis	399	10 (16)	37 (11)	0.29
Diarrhea	400	30 (47)	150 (45)	0.79
Exanthema	400	63 (98)	315 (94)	0.23
On feet	399	58 (91)	238 (71)	<0.001
On palms	400	60 (94)	254 (76)	<0.001
Petechial rash	400	60 (94)	232 (69)	<0.001
Hemorrhage (from any site)	395	27 (43)	70 (21)	<0.001
From gingival tissues	395	7 (11)	17 (5)	0.08
Epistaxis	395	10 (16)	36 (11)	0.28
Hematemesis	395	9 (14)	10 (3)	<0.001
Melena	395	5 (8)	5 (2)	0.01
From genitourinary tract	395	6 (10)	8 (2)	0.01
Other	395	6 (10)	8 (2)	0.01
Clinical features				
Intubation on admission	400	35 (55)	32 (10)	<0.001
Respiratory distress	400	17 (27)	22 (7)	<0.001
Temperature, °C (IQR)	378	37.6 (36.8–38.6)	37.6 (36.9–38.4)	0.94
Heart rate, bpm (IQR)	384	124 (110–140)	120 (104–138)	0.05
Respiratory rate, rpm (IQR)	384	28 (22–36)	25 (22–30)	0.02
Oxygen saturation, % (IQR)	390	97.0 (93.0–98.0)	98.0 (96.0–98.0)	0.006
Edema	400	58 (91)	144 (43)	<0.001
Eye edema	400	48 (75)	86 (26)	<0.001
Wrist edema	400	52 (81)	91 (27)	<0.001
Ankle edema	400	51 (80)	111 (33)	<0.001
Abdominal pain	400	47 (73)	174 (52)	0.002
Hepatomegaly	400	39 (61)	92 (27)	<0.001
Ecchymosis	398	27 (42)	33 (10)	<0.001
Confusion	400	46 (72)	88 (26)	<0.001
Seizures	400	13 (20)	13 (4)	<0.001
Encephalitis	400	15 (23)	7 (2)	<0.001
Coma	400	7 (11)	7 (2)	0.003
Pneumonia	400	25 (39)	18 (5)	<0.001
Pulmonary edema	400	11 (17)	15 (5)	<0.001
Hypovolemia	400	32 (50)	40 (12)	<0.001
Shock	400	46 (72)	89 (26)	<0.001

*Values are no. (%) except as indicated. Bold font indicates statistical significance by Bonferroni correction ($p < 0.001$) except as indicated. bpm, beats per minute; IQR, interquartile range; rpm, respirations per minute.

†Based on Fisher exact test, Pearson Chi-Square or Kruskal Wallis ANOVA

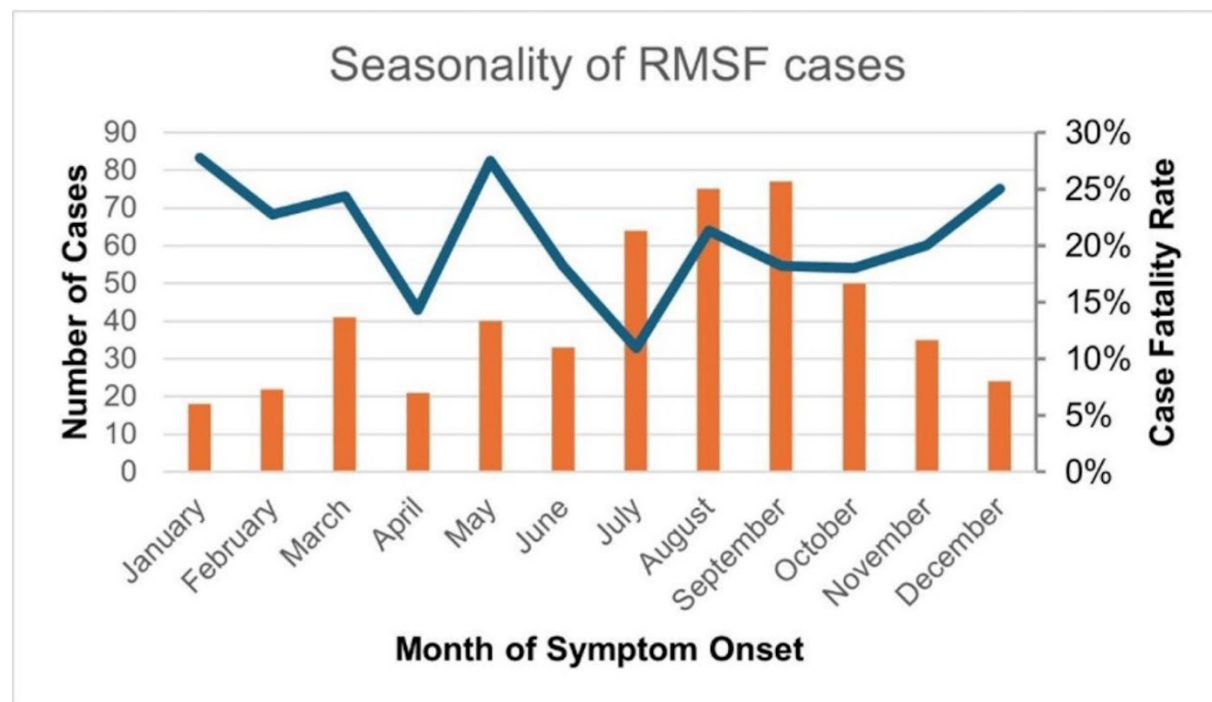
‡Statistically significant ($p < 0.05$)

Appendix Table 4. Laboratory findings at time of hospitalization in hospitalized children that survived infection with Rocky Mountain spotted fever, Sonora, Mexico (2004 - 2024)

Indicator	No. patients	Discharged with sequelae, n = 64	Discharged at baseline health, n = 336	p value†
Hemoglobin, g/dL	400	11.3 (9.95–12.1)	11.6 (10.4–12.6)	0.04
Hematocrit, %	398	32.5 (28.0–35.3)	34.0 (30.8–37.1)	0.006
Blood leukocytes, × 10 ³ cells/μL	400	9.3 (6.7–15.4)	8.1 (5.7–12.1)	0.04
Absolute lymphocyte count, × 10 ³ cells/μL	384	1.2 (0.6–2.0)	1.1 (0.8–2.0)	0.49
Absolute neutrophil count, × 10 ³ cells/μL	383	7.0 (5.0–12.5)	5.7 (3.9–8.7)	0.03
Neutrophil-to-lymphocyte ratio	383	5.1 (3.5–11.1)	5.0 (2.9–8.5)	0.18
Platelets, × 10 ³ cells/μL	399	22 (15–33)	72 (35–133)	<0.001
Serum procalcitonin, ng/mL	270	9 (3–17)	4 (1–10)	0.001
Prothrombin time, sec	391	15.1 (13.9–17.1)	15.1 (13.9–16.0)	0.76
Partial thromboplastin time, sec	389	40 (35–46)	38 (32–42)	0.02
Aspartate aminotransferase, U/L	393	158 (117–221)	104 (57–165)	<0.001
Alanine aminotransferase, U/L	392	68 (45–93)	53 (31–81)	0.002
Lactate dehydrogenase, U/L	304	889 (798–1211)	709 (515–956)	<0.001
Serum sodium level, mEq/L	394	132 (127–135)	133 (130–136)	0.16
Serum creatinine, mg/dL	360	0.6 (0.4–1.2)	0.5 (0.4–0.6)	0.01
Serum albumin, g/dL	336	2.8 (2.6–3.0)	3.3 (2.9–4.0)	<0.001
Serum total protein, mg/dL	338	5.2 (4.7–5.5)	5.9 (5.2–6.5)	<0.001

*Values are no. (interquartile range) except as indicated. Bold font indicates statistical significance by Bonferroni correction ($p < 0.001$).

†Based on Fisher exact test or Kruskal Wallis ANOVA



Appendix Figure. Seasonality of RMSF infections in the Sonora pediatric population served by HIES (2004–2024).