



המרכז הרפואלי
הלל יפה
סניף תל אביב



Novel Coronavirus 2019 Pediatric Aspects

Michal Stein MD



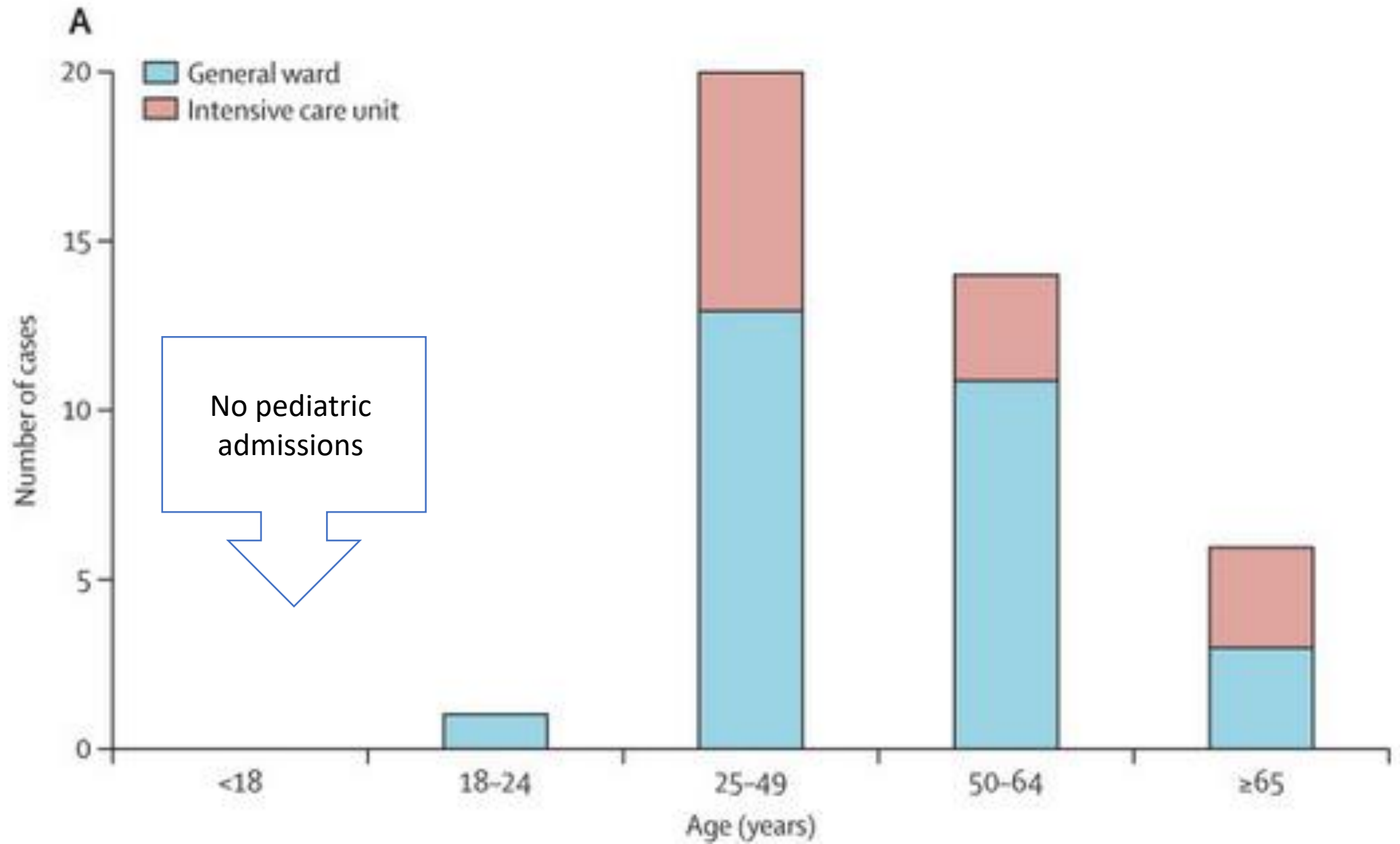
THE LANCET

January 24, 2020

Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China

Chaolin Huang, Yeming Wang*, Xingwang Li*, Lili Ren*, Jianping Zhao*, Yi Hu*, Li Zhang, Guohui Fan, Jiuyang Xu, Xiaoying Gu, Zhenshun Cheng, Ting Yu, Jiaan Xia, Yuan Wei, Wenjuan Wu, Xuelei Xie, Wen Yin, Hui Li, Min Liu, Yan Xiao, Hong Gao, Li Guo, Jungang Xie, Guangfa Wang, Rongmeng Jiang, Zhancheng Gao, Qi Jin, Jianwei Wang†, Bin Cao†*

By Jan 2, 2020, 41 admitted hospital patients were identified



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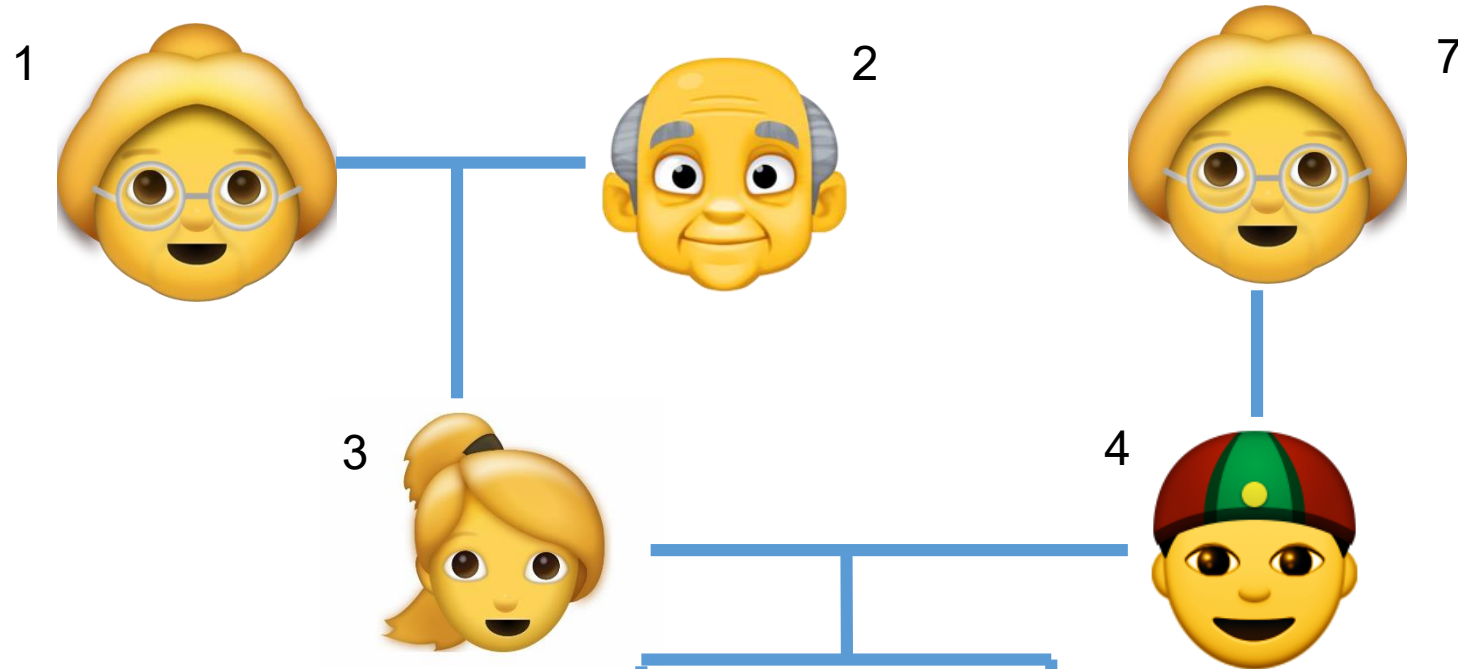
January 24, 2020

A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster

Jasper Fuk-Woo Chan, Shuofeng Yuan*, Kin-Hang Kok*, Kelvin Kai-Wang To*, Hin Chu*, Jin Yang, Fanfan Xing, Jieling Liu, Cyril Chik-Yan Yip, Rosana Wing-Shan Poon, Hoi-Wah Tsoi, Simon Kam-Fai Lo, Kwok-Hung Chan, Vincent Kwok-Man Poon, Wan-Mui Chan, Jonathan Daniel Ip, Jian-Piao Cai, Vincent Chi-Chung Cheng, Honglin Chen, Christopher Kim-Ming Hui, Kwok-Yung Yuen*

- Family cluster (5+1) of nCoV in Hong Kong Shenzhen Hospital

Familial nCoV cluster



	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 7
Relationship	Mother of patient 3	Father of patient 3	Daughter of patients 1 and 2	Son-in-law of patients 1 and 2	Grandson of patients 1 and 2	Mother of patient 4 in Shenzhen
Age (years)	65	66	37	36	10	63
Sex	Female	Male	Female	Male	Male	Female
Occupation	Retired	Retired	Office worker	Architect	Student	Retired
Chronic medical illness	Hypertension; benign intracranial tumour treated by gamma knife	Hypertension	None	Chronic sinusitis	None	Diabetes
Interval between symptom onset and arrival at Wuhan (days)	5 (hospital exposure)	6	4 (hospital exposure)	3	NA	NA
Interval between admission to hospital and symptom onset (days)	7	6	9	10	NA	7
Presenting symptoms and signs
Fever	+	+	+	+	-	+
Cough	+(dry)	+(dry)	-	+(productive)	-	+(dry)
Generalised weakness	+	+	-	-	-	+
Nasal congestion	-	-	+	-	-	-
Rhinorrhoea	-	-	-	+	-	-
Sneezing	-	-	-	+	-	-
Sore throat	-	-	+	-	-	-
Pleuritic chest pain	-	-	+	-	-	-
Diarrhoea	-	-	+ (3 days, 5-6 times per day)	+ (4 days, 7-8 times per day)	-	-
Body temperature (°C)	39.0	39.0	36.2	36.5	36.5	39.0
Oximetry saturation (%)	94%	96%	NA	NA	NA	NA

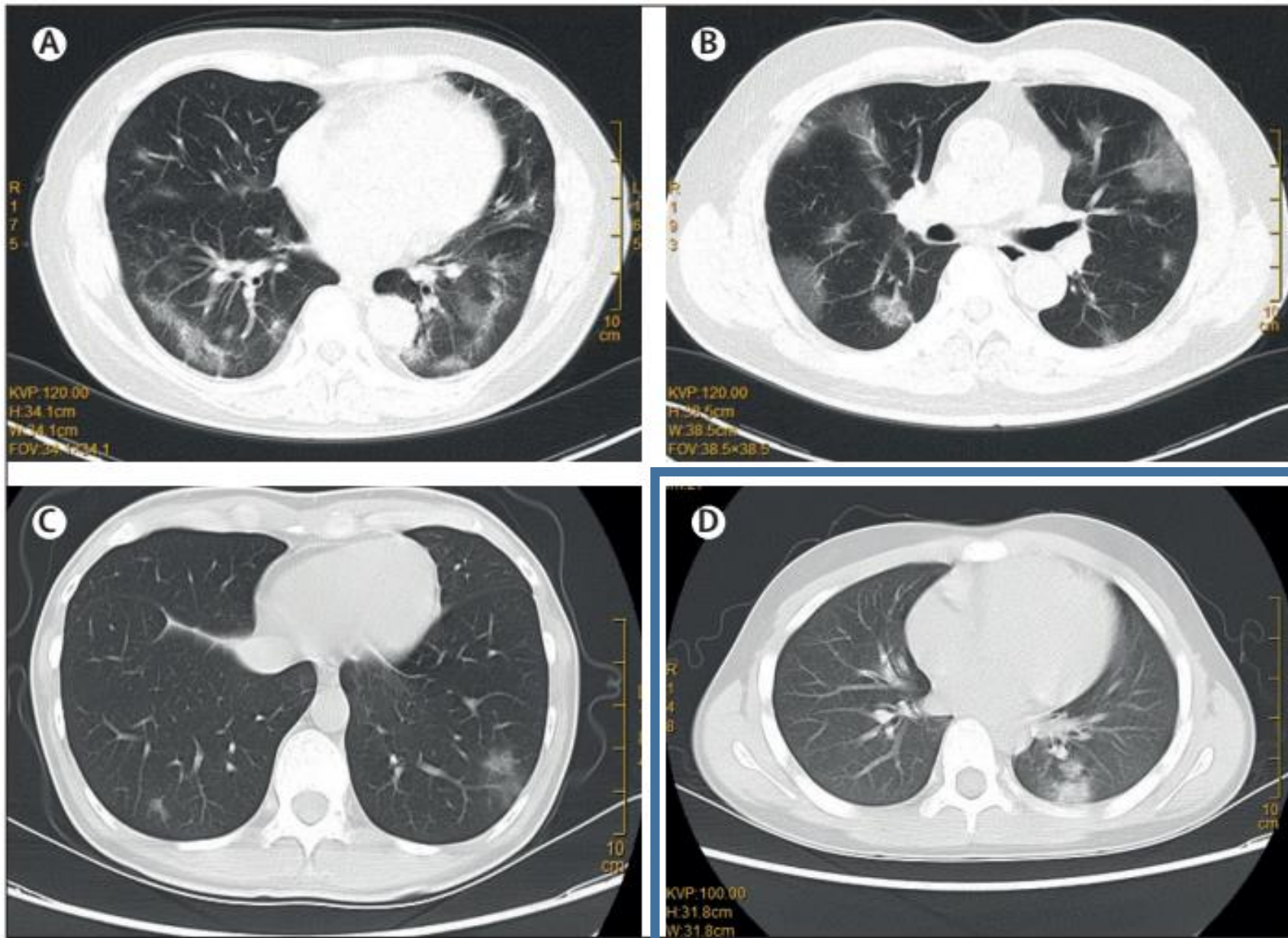


Figure 2: Representative images of the thoracic CT scans showing multifocal ground-glass changes in the lungs of patient 1 (A), patient 2 (B), patient 3 (C), and patient 5 (D)



Diagnosis, treatment, and prevention of 2019 novel coronavirus infection in children: experts' consensus statement

Kunling Shen¹ · Yonghong Yang² · Tianyou Wang³ · Dongchi Zhao⁴ · Yi Jiang⁵ · Runming Jin⁶ · Yuejie Zheng⁷ · Baoping Xu¹ · Zhengde Xie² · Likai Lin⁸ · Yunxiao Shang⁹ · Xiaoxia Lu¹⁰ · Sainan Shu¹¹ · Yan Bai⁶ · Jikui Deng¹² · Min Lu¹³ · Leping Ye¹⁴ · Xuefeng Wang¹⁵ · Yongyan Wang¹⁶ · Liwei Gao¹ · China National Clinical Research Center for Respiratory Diseases · National Center for Children's Health, Beijing, China · Group of Respiriology, Chinese Pediatric Society, Chinese Medical Association · Chinese Medical Doctor Association Committee on Respiriology Pediatrics · China Medicine Education Association Committee on Pediatrics · Chinese Research Hospital Association Committee on Pediatrics · Chinese Non-government Medical Institutions Association Committee on Pediatrics · China Association of Traditional Chinese Medicine, Committee on Children's Health and Medicine Research · China News of Drug Information Association, Committee on Children's Safety Medication · Global Pediatric Pulmonology Alliance

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- Close contact with symptomatic cases and asymptomatic cases with silent infection are the main transmission routes of 2019-nCoV infection in children

BY Jan 30

- 9692 confirmed cases and 15,238 suspected cases have been reported in China.
- Among the confirmed cases, 1527 were severe cases
- 213 dead

~ 0.3%

- **Twenty-eight confirmed cases** aged from 1 month to 17 years had been reported in China

- Thus far, all pediatric cases with laboratory-confirmed 2019-nCoV infection were mild cases, and no deaths had been reported

Clinical manifestations

Incubation period 1-14 days

- Mostly 3-8 days

age of disease onset ranged from 1.5 m to 17 y

- most of whom had a close contact with infected cases or were family cluster cases

- 
- might appear asymptomatic

- 
- fever, dry cough, and fatigue

- 
- URI
- nasal congestion and running nose

- 
- GI
- abdominal discomfort/ pain, nausea, vomiting, diarrhea

- Most infected children have mild clinical manifestations

no fever or symptoms of pneumonia with a good prognosis

- Most of them recover within 1–2 weeks after disease onset

- Few may progress to lower respiratory infections

Jan 30 20

No newborns delivered by 2019-nCoV infected mothers have been detected positive;

no newborn cases have been reported yet.

Feb 5 20

תינוק נדבק בקורונה. חשש בסין: "הנגיף עובר ברחם"

תינוק בן יומו שנולד בבית חולים בעיר ווהאן, שבה התפרץ נגיף הקורונה, נדבק בוירוס. רופאים חוששים שהוא נדבק מאמו עוד כשהיה ברחם. 490 מת

Why the New Coronavirus (Mostly) Spares Children

So far, very few young children seem to be falling ill. The pattern was seen in outbreaks of SARS and MERS, too.



Human Coronavirus in Hospitalized Children With Respiratory Tract Infections: A 9-Year Population-Based Study From Norway ^{FREE}

Inger Heimdal, Nina Moe, Sidsel Krokstad, Andreas Christensen, Lars Høsøien Skanke, Svein Arne Nordbø, Henrik Døllner ✉

The Journal of Infectious Diseases, Volume 219, Issue 8, 15 April 2019, Pages 1198–1206,

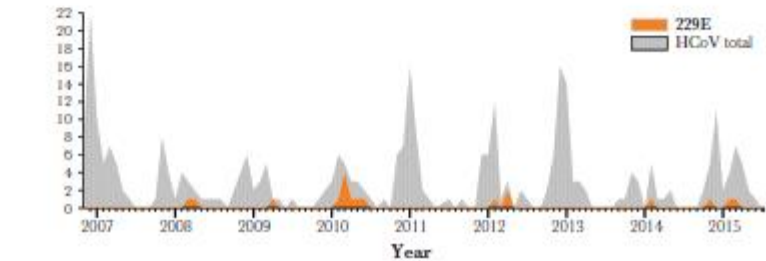
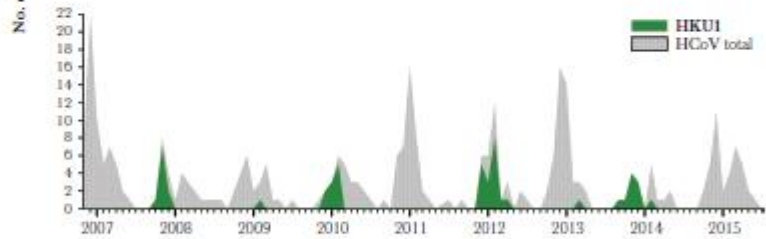
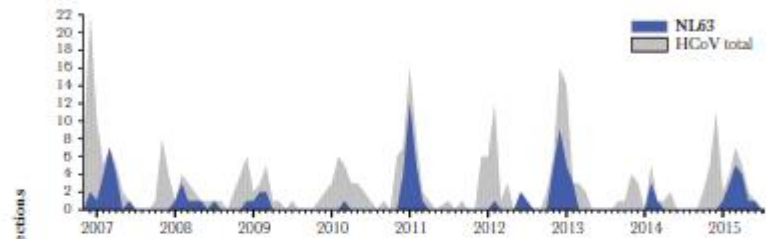
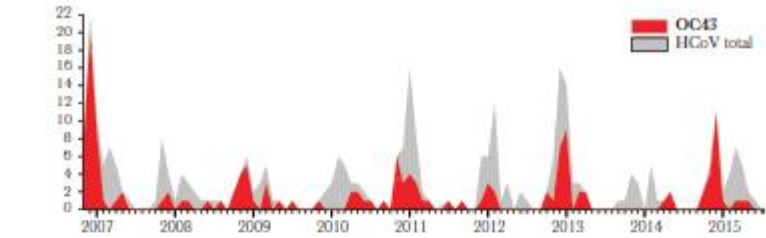
9 years
200-15

- 3458 episodes of RTIs in hospitalized children and 373 controls

fifth most
common viruses

- HCoVs were detected in 9.1% (313 of 3458) of the episodes in the patient group,
- the fifth most common viruses after HRV (58.2%), RSV (29.3%), HEV (11.3%), and PIV type 1–4 (9.1%).

- 39.3% (123 of 313) of the children with a positive HCoV infection were outpatients



All HCoV subtypes were primarily detected in winter, from November through March

studies in both the US and Europe, report the highest detection rates in the winter and spring season

in Asia: may peak during all seasons

Table 2. Virus Detections and Codetected Viruses in Human Coronaviruses (HCoV)-Positive Nasopharyngeal Aspirates from Children with Respiratory Tract Infections From 2006 to 2015

	HCoV Detections, Total and Subtypes, No. (%)				
	Total HCoV (N = 313)	OC43 (n = 146)	NL63 (n = 101)	HKU1 (n = 50)	229E (n = 18)
Respiratory viruses					
Rhinovirus	78 (25.0)	35 (24.0)	21 (20.8)	16 (32.0)	7 (38.9)
Respiratory syncytical virus	73 (23.4)	33 (22.7)	28 (27.8)	10 (20.0)	2 (11.2)
Enterovirus	52 (16.7)	23 (15.8)	14 (13.9)	12 (24.0)	4 (22.3)
Human bocavirus	35 (11.2)	17 (11.7)	10 (10.0)	6 (12.0)	2 (11.2)
Parainfluenza virus types 1–4	31 (10.0)	12 (8.3)	9 (9.0)	7 (14.0)	3 (16.7)
Human parechovirus	22 (7.1)	9 (6.2)	7 (7.0)	5 (10.0)	1 (5.6)
Adenovirus	20 (6.4)	13 (9.0)	4 (4.0)	2 (4.0)	1 (5.6)
Human metapneumovirus	15 (4.8)	6 (4.2)	2 (2.0)	6 (12.0)	1 (5.6)
Influenzavirus A/B	8 (2.6)	3 (2.1)	5 (5.0)		
No. of detections					
Single HCoV detection	100 (32)	50 (34.3)	32 (31.7)	12 (24.0)	6 (33.4)
HCoV + 1 codetection	132 (42.2)	60 (41.1)	45 (44.6)	22 (44.0)	6 (33.4)
HCoV + ≥2 codetections	81 (25.9)	36 (24.7)	24 (23.8)	16 (32.0)	6 (33.4)



Codetections occurred in 68.1% of the patients and 68.4% of the controls

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it was **not more likely** for a single HCoV to be detected in the patient group compared to the control group (OR = 1.02, *P* = .96)

A high genomic load of HCoV was independently associated with RTIs (OR = 3.12, P = .016), adjusted for the codetection of severe RTI-causing viruses, age, gender, and high-risk conditions

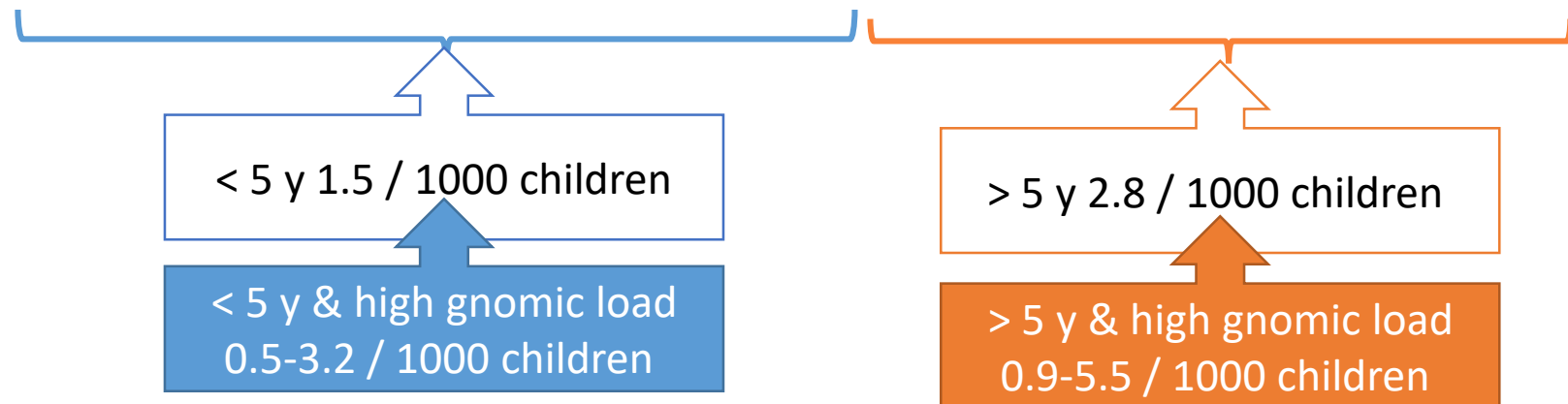
Table 3. Relationship Between HCoV and RTI, Comparing Children With RTI (n = 313) and Asymptomatic Controls (n = 38)

	Univariate analysis			Adjusted analysis		
	OR	(95% CI)	P value	OR	(95% CI)	P value
HCoV viral load						
Ct value <28	2.59	(1.21–5.54)	.010	3.12	(1.24–7.86)	.016
Ct value >28 (reference)						
Season						
Aug–Oct	0.39	(0.08–2.04)	NS			
Nov–Jan	1.33	(0.36–4.88)	NS			
Feb–Apr	0.98	(0.26–3.68)	NS			
May–Jul (reference)						
Codetection severe virus ^a	3.43	(1.37–8.56)	.004	3.35	(1.14–9.85)	.028
Age						
0–2 y	16.52	(6.13–44.5)	<.001	15.32	(5.15–45.5)	<.001
2–5 y	1.92	(0.83–4.45)	NS	1.59	(0.60–4.17)	NS
> 5 y (reference)						
Female	5.50	(1.91–15.9)	<.001	4.62	(1.49–14.3)	.008
High-risk condition ^b	2.50	(1.01–6.21)	.036	4.61	(1.58–13.5)	.005

Total of 60.7% 190/313 OF THE HCoV pos were hospitalized >24 H


Table 4. Hospitalization^a Incidence Rates in Children With LRTI and HCoV Detection, by Age and Season

Season	Hospitalization per 1000 Children with LRTI, by Age				
	0–11 mo	12–23 mo	24–59 mo	5–16 y	0–59 mo
2006–2007	5.5	3.6	1.0	0.1	2.5
2007–2008	1.8		0.2		0.5
2008–2009	2.7	2.8		0.2	1.2
2009–2010	1.7	2.0	0.1		0.8
2010–2011	1.7	2.5	0.6	0.1	1.1
2011–2012	1.5	4.3	0.2		1.3
2012–2013	4.6	3.9	1.3	0.1	2.4
2013–2014	0.9	0.5	0.5		0.6
2014–2015	4.9	4.8	2.4	0.1	3.2
Mean (95% CI)	2.8 (1.7–3.9)	2.7 (1.7–3.7)	0.7 (0.2–1.2)	0.1 (0.0–0.1)	1.5 (0.9–2.1)



MINI-SYMPOSIUM: SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

Epidemiology of severe acute respiratory syndrome (SARS): adults and children

Nan-Shan Zhong¹, Gary W.K. Wong²  

Only 6% of all SARS cases from Hong Kong were < 18 years of age

Almost all infected children had close contact with an infected adult in the same household

many children were attending schools up until they were admitted

patients were non-infectious while incubating

Young children had much milder disease and they usually recovered uneventfully

- Compared to 17% case fatality rate in adults

small proportion of adolescent patients, however, may develop more severe disease similar to the disease in adults

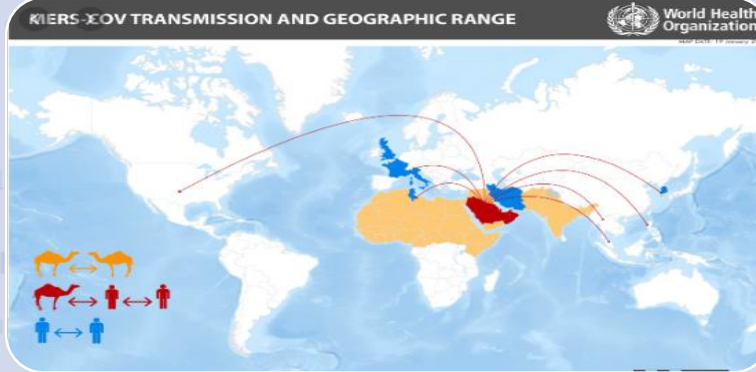
In Hong Kong there were five pregnant women infected with SARS but none of the neonates was found to have evidence of infection after the delivery



Middle East Respiratory Syndrome Disease in Children

Memish, Ziad A. MD, FRCP^{*}; Al-Tawfiq, Jaffar A MD[†]; Assiri, Abdullah
Sami MD[‡]; Albarrak, Ali MD[§]; Flemban, Hesham MD[¶]; Alhakeem,
Alsubaie, Sarah MD^{††}; Al-Rabeeah, Abdullah A. MD, FRCS^{‡‡} Aut

The Pediatric Infectious Disease Journal: September 2014 - Volu



لَا إِلَهَ إِلَّا اللَّهُ مُحَمَّدٌ رَسُوْلُهُ



Up to April 24,
2014:

254 cases

93 deaths

KSA:

287 cases

85 deaths

*הסתירה במקור

Sample Source	Age	Gender	Symptoms	Comorbidity	Signs	Sample Type	MERS-CoV PCR Test	Viral Load Ct Value	Imaging	Intensive Care	Treatment Outcome	Follow Up
1 Hospital inpatient	2	Male	Fever, respiratory distress	Cystic fibrosis	Chest: bilateral fine crepitation, ex. ronchi	NPS	+	&H1N136	Bilateral diffused infiltrate	+	Death	Death after 2 months
2 Hospital inpatient	14	Female	Fever	Down's syndrome	s/p VSD Severe MR PHTN	NPS	+	37	Bilateral diffused infiltrate	No	Discharged home	Well 6 months later
3 Family contact	7	Female	Asymptomatic	None	None	N+T	+	37	ND	No	No	Well 4 months later
4 Family contact	15	Female	Asymptomatic	None	None	NPS	+	35	ND	No	No	Well 6 months later
5 Family contact	14	Male	Asymptomatic	None	None	NPS	+	34	ND	No	No	Well 6 months later
6 Family contact	12	Female	Asymptomatic	None	None	NPS	+	35	ND	No	No	Well 6 months later
7 Family contact	16	Male	Asymptomatic	None	None	NPS	+	36	ND	No	No	Well 6 months later
8 Family contact	7	Female	Asymptomatic	None	None	NPS	+	37	ND	No	No	Well 4 months later
9 Family contact	3	Female	Asymptomatic	None	None	NPS	+	38	ND	No	No	Well 4 months later
10 Contact	13	Female	Asymptomatic	None	None	NPS	+	34	ND	No	No	Well 1 month later
11 Family contact	14	Female	Asymptomatic	None	None	NPS	+	36	ND	No	No	Well 3 months later

NPS, Nasopharyngeal swab; N+T, nasal and tracheal aspirate; ND, not done.

Clinical, Demographic and Laboratory Characteristics of 6 Pediatric MERS-CoV Infections Reported From KSA

Sep 12 –Dec 13

11 pediatric patients tested positive for MERS-CoV

2 patients were symptomatic
9 cases were asymptomatic

median age of patients was 13 (range 2–16) years
8 females and 3 males (2.7:1 ratio)

Screening for Middle East respiratory syndrome coronavirus infection in hospital patients and their healthcare worker and family contacts: a prospective descriptive study

Z. A. Memish^{1,†}, J. A. Al-Tawfiq^{2,3,†}, H. Q. Makhdoom^{4,†}, A. A. Al-Rabeeh¹, A. Assiri¹, R. F. Alhakeem¹, F. A. AlRabiah⁵, S. Al Hajjar⁵, A. Albarrak⁶, H. Flemban⁷, H. Balkhy⁸, M. Barry⁹, S. Alhassan¹⁰, S. Alsubaie¹¹ and A. Zumla^{1,12,13,†}

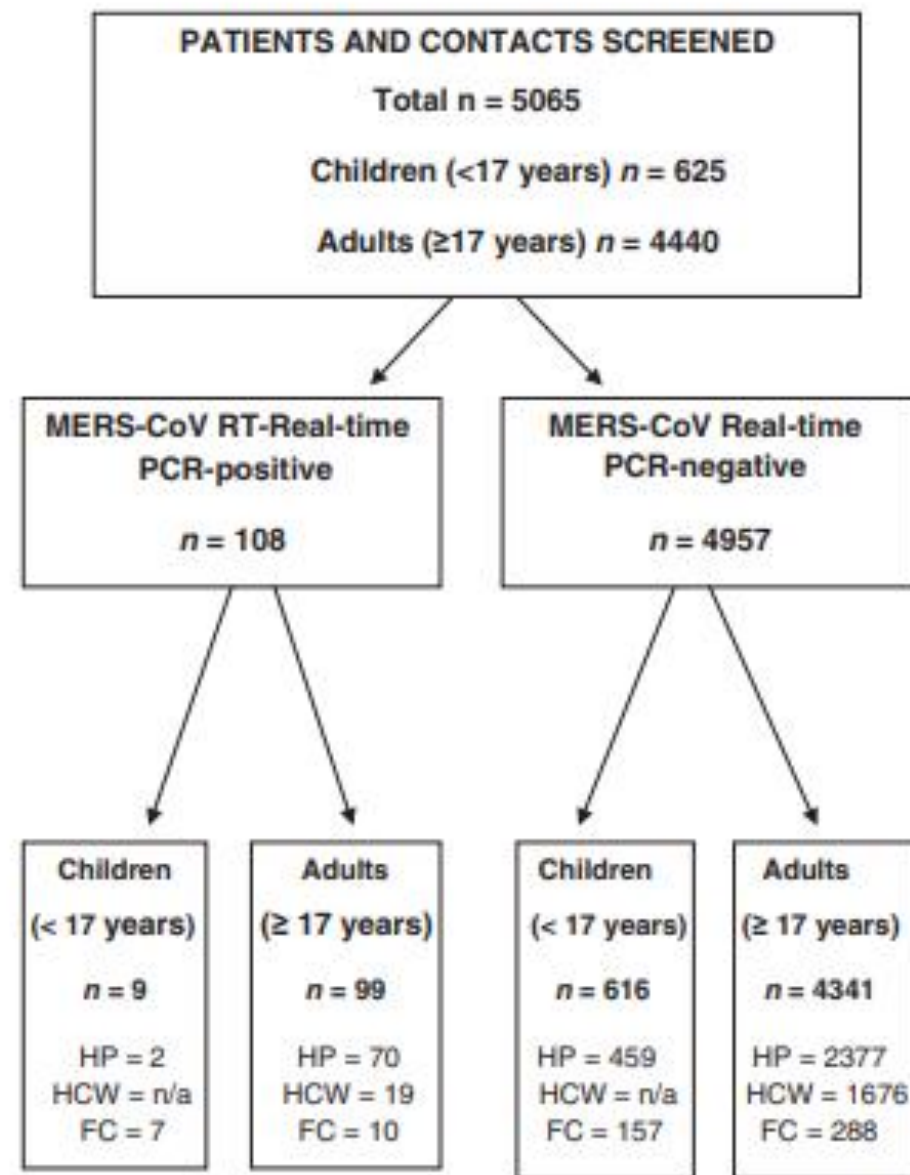


FIG. 1. Flow chart: screening of hospitalized patients and contacts. FC, family contacts; HCW, healthcare workers and their contacts; HP, hospital patients; NA, not applicable.

Screening for Middle East respiratory syndrome coronavirus infection in hospital patients and their healthcare worker and family contacts: a prospective descriptive study

Z. A. Memish^{1,†}, J. A. Al-Tawfiq^{2,3,†}, H. Q. Makhdoom^{4,†}, A. A. Al-Rabeeh¹, A. Assiri¹, S. Al Hajjar⁵, A. Albarrak⁶, H. Flemban⁷, H. Balkhy⁸, M. Barry⁹, S. Alhassan¹⁰, S. Alsu

TABLE 1

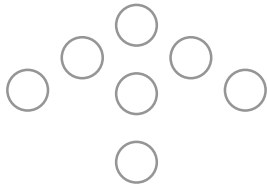
Middle East respiratory syndrome coronavirus (MERS-CoV) screening by referral type and age group

Patients and contacts MERS-CoV real-time PCR	Children (aged <17 years)			Adults (aged >17 years)			All Positive ^a	Total	% Positive ^a
	Positive	Total	% Positive ^a	Positive	Total	% Positive ^a			
Hospital patients	2	461	0.43	70	2441	2.86	72	2908	2.51
HCW contacts	NA	NA	NA	19	1695	1.12	19	1695	1.12
Family contacts	7	164	4.2	10	298	3.36	17	462	3.6
Total	9	625	1.4	99	4440	2.19	108	5065	2.1

[View Table in HTML](#)

HCW, healthcare worker; NA, not applicable.

For children: p-value for positive PCR in hospitalized patients vs. family contacts, 0.0021.



Hospitalized cases



High rate of mild &
a-symptomatic cases

Why the New Coronavirus (Mostly) Spares Children

So far, very few young children seem to be falling ill. The pattern was similar to outbreaks of SARS and MERS, too.



potential risk of death

clinical symptoms milder compared with adults

ARDS & death occurred in children during SARS and MERS epidemics

The image features the text "To be continued..." written in a white, cursive, handwritten-style font. The text is centered and slightly tilted upwards. The background consists of several concentric circles in shades of red, creating a tunnel-like or target-like effect. The circles are darker towards the center and lighter towards the edges. The overall composition is simple and visually striking.

To be
continued...