

**Steckbrief COVID-19 – Clinical characteristics in children and adolescents**  
 updated 20 March 2020- v3

<http://www.kinderkliniken.insel.ch/de/coronavirus/>

<b>Causative agent</b>	SARS-CoV-2 <sup>1</sup>
<b>Receptor</b>	<ul style="list-style-type: none"> <li>• Angiotensin-Converting Enzyme 2 (ACE2 receptor)<sup>2</sup></li> <li>• convalescent sera from SARS-1 patients block SARS-CoV-2 entry via ACE2<sup>3</sup></li> </ul>
<b>Transmission</b>	<ul style="list-style-type: none"> <li>• droplet; contact; (aerosol?)</li> <li>• ½ life in aerosol ~1 hour, ½ life on plastic/steel 6-8 hours<sup>4,5</sup></li> <li>• viral transmission can start 1-2 days <u>before</u> the onset of symptoms («serial interval» &lt; incubation period<sup>6</sup>; recovery of virus from NPA before onset of symptoms (<a href="#">Woelfel R, medRxiv</a>)<sup>7</sup></li> <li>• viral RNA in NPA from children until 6-22 days after disease onset<sup>8,9</sup><a href="#">[Xu]</a></li> <li>• viral RNA in feces from day ~5 to &gt; 4 weeks after disease onset<sup>9-11</sup><a href="#">[Xu]</a></li> <li>• viral load in NPA <u>does not</u> correlate with severity of COVID-19<sup>12</sup><a href="#">[Xu]</a></li> <li>• <a href="#">CDC</a> recommends two consecutive negative RT-PCR tests within &gt;24h before discontinuing isolation in hospitalized patients</li> </ul>
<b>Incubation period</b>	4-6 days (range, 1 to >14 days)
<b>Epidemiology</b>	<ul style="list-style-type: none"> <li>• basic reproduction rate R<sub>0</sub> 2.2 (90% CI, 1.4-3.8)<sup>13,14</sup></li> <li>• high risk for «superspreader events» (dispersion parameter k↓)<sup>14</sup></li> <li>• age &lt;15 years: 0.9% of all cases (<a href="#">China CDC Weekly</a>)<sup>15,16</sup></li> <li>• transmission to children mainly within families<sup>9,11,17,18</sup></li> <li>• mortality in symptomatic cases (adjusted case fatality rate) age 0-9 years, 0%; age 10-19 years, 0.25%; all ages, 1.5% (<a href="#">Riou J, medRxiv</a>)</li> </ul>
<b>Clinical manifestations</b>	<ul style="list-style-type: none"> <li>• common: asymptomatic<sup>19,20</sup></li> <li>• common: fever <u>~40%</u>, median duration 3 days<sup>18</sup>, low-grade<sup>9,15,17-19,21,22</sup></li> <li>• common: cough <u>~50%</u><sup>9,18,19,22</sup></li> <li>• common: pharyngitis <u>~40%</u><sup>18</sup></li> <li>• common: mild diarrhea<sup>9,11,15,20</sup></li> <li>• <u>infrequent</u>: rhinorrhea<sup>18</sup>, <u>wheezing</u><sup>9,15,17,20,22</sup></li> <li>• infrequent: malaise, headache, myalgias</li> <li>• co-infections reported (e.g. Influenza A/B, <i>M. pneumoniae</i>)<sup>19</sup></li> </ul>
<b>Laboratory findings</b>	<p><u>CBC differential, CRP, chemistry generally uncharacteristic</u><sup>18,23</sup></p> <ul style="list-style-type: none"> <li>• leucopenia, lymphopenia and thrombocytopenia uncommon<sup>9,23</sup></li> <li>• CRP/PCT normal to moderately elevated<sup>9,18,19,22</sup></li> <li>• IL-6↑, D-Dimers↑ marker for severe disease in adults?<sup>24</sup></li> </ul>

<b>Microbiology</b>	<ul style="list-style-type: none"> <li>• RT-PCR from NPA (<a href="#">ifik</a>, private laboratories and NAVI HUG Geneva)</li> <li>• seroconversion ~1 week after onset of symptoms (<a href="#">Woelfel R, medRxiv</a>)</li> <li>• serum IgM/IgG tests under development, <u>not</u> routinely available<sup>25</sup></li> </ul>
<b>Radiology</b>	<ul style="list-style-type: none"> <li>• conventional CXR: normal or non-specific findings</li> <li>• chest CT: unilateral or bilateral, uni- or multifocal, peripheral, commonly subpleural lesions; focal lesions typically with central consolidation and halo sign or ground glass opacities (GGOs)<sup>18,19,22,26</sup></li> <li>• <u>no</u> pleural effusion<sup>19,26</sup><a href="#">[Xu]</a></li> <li>• <u>no</u> hilar lymphadenopathy<sup>19,26</sup><a href="#">[Xu]</a></li> </ul>
<b>Clinical course</b>	<ul style="list-style-type: none"> <li>• common: asymptomatic (reported all ages<sup>8,9,17</sup>)</li> <li>• common: upper respiratory tract infection (children an healthy adults)<sup>9,18</sup></li> <li>• common: pneumonia (absent, mild or moderate clinical disease)<sup>18,19,22,27</sup></li> <li>• very rare: progressive lung disease requiring mechanical ventilation (3/171 [1.8%] reported by Lu<sup>18</sup>)<sup>11,18,22</sup></li> <li>• currently 2 fatal cases reported<sup>18,28</sup></li> </ul>
<b>Clinical course - immunodeficiency</b>	<ul style="list-style-type: none"> <li>• severe disease appears to be rare</li> <li>• no case series or risk estimates are currently available</li> <li>• the case of a 8-year-old with ALL, neutropenia and progressive lung disease has been <a href="#">reported</a></li> <li>• mortality in adults with cancer is elevated<sup>29</sup></li> </ul>
<b>Clinical course - pregnancy</b>	<ul style="list-style-type: none"> <li>• infections reported mainly in 3rd trimester; characteristic complications have not been reported to date<sup>30,31</sup></li> <li>• no evidence for vertical transmission and fetal infection<sup>31-33</sup></li> </ul>
<b>Clinical course - neonates</b>	<ul style="list-style-type: none"> <li>• asymptomatic infection in neonates (including normal chest CT) has been reported<sup>11,19,32</sup></li> <li>• complicated perinatal/postnatal courses among <u>non-infected neonates</u> of COVID-19 infected mothers have been reported<sup>34</sup></li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• mainly supportive</li> <li>• currently no evidence from clinical trials available</li> <li>• drugs with antiviral activity against SARS-CoV-2 in vitro: remdesivir (nucleoside analog)<sup>35,36</sup>, lopinavir/ritonavir (Kaletra®)<sup>36</sup>, darunavir/ritonavir, chloroquine/hydroxychloroquine (Plaquenil®)<sup>37</sup></li> <li>• immunomodulation with tocilizumab (Actemra®, anti-IL6 mAb) reported</li> <li>• ACE2/viral entry blocker (TMPRSS2 inhibitors, e.g. Nafamostat) effective in vitro<sup>3,38</sup></li> <li>• <u>recommendations not to use NSAID (e.g. ibuprofen; upregulation of ACE2 receptor expression?) currently lack a firm scientific basis</u></li> </ul>
<b>Prevention</b>	<ul style="list-style-type: none"> <li>• Inpatients: precautions according to <a href="#">Swissnoso/PIGS</a></li> <li>• Outpatients: precautions according to <a href="#">BAG</a>, <a href="#">KAZA</a></li> <li>• Neonates: no separation of well mother/child pairs (<a href="#">Swissnoso/PIGS</a>, <a href="#">SGGG</a>, <a href="#">WHO</a>); management IMC/NICU according to local infection control policy</li> <li>• <b>IMPORTANT: scheduled routine immunizations in children ≤ 2 years of age should not be postponed</b> (<a href="#">EKIF/BAG/SGP</a>)</li> </ul>

Team Kinderinfektiologie (Pediatric Infectious Disease)

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