Detectable severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in human breast milk of a mildly symptomatic patient with coronavirus disease 2019 (COVID-19)

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Abstract

SARS-CoV-2 is a novel coronavirus and causative pathogen to the pandemic illness COVID-19. Although RNA has been detected in various clinical samples, no reports to date have documented SARS-CoV-2 in human milk. This case report describes an actively breastfeeding patient with COVID-19 infection with detectable viral RNA in human milk.

Keywords: SARS-CoV-2, COVID-19, Human milk, breastfeeding

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has emerged as the virus causing coronavirus disease 2019 (COVID-19) following an outbreak of the novel pathogen in a seafood market in Wuhan, China, in late 2019 [1]. With over four million confirmed cases worldwide to date, the World Health Organisation (WHO) has declared COVID-19 a global pandemic [2]. The precise transmission dynamics of SARS-CoV-2 remain uncertain but human-to-human transmission through respiratory droplets is the presumed leading mechanism [3]. There are other proposed routes of transmission, given detection of viral shedding in serum and faecal specimens although no confirmed cases of transmission through these routes have been established [4]. To date, SARS-CoV-2 has not been detected in human milk. We report a case of detectable SARS-CoV-2 RNA in a woman with mild symptoms of COVID-19.

Case Report

A forty-year old female with no significant medical problems returned to Australia with her eight-month old son in early March 2020 from a COVID-19 endemic region after a two-month stay. Three days following her return, she developed a sore throat, myalgias, a minimally productive cough and fevers up to 38.9 degrees Celsius. A combined oro/nasopharyngeal swab was performed, exhibiting detectable RNA for SARS-COV-2 on real time polymerase chain reaction (RT-PCR) testing.

The patient was recalled to hospital for further management along with her son who was still breastfed until the day of maternal symptom onset. On presentation to hospital, she had a normal respiratory examination and did not require supplemental oxygen. Initial investigations demonstrated a white cell count of 5 x 10^9/L with reactive lymphocytes and a C-reactive protein of 0.6mg/L (normal limits: 0-8 mg/L). Routine biochemistry including liver function tests and lactate dehydrogenase were within normal limits. Radiological imaging was not performed due to the patient's clinical stability.

On admission to hospital, the infant, with no previously known medical problems underwent nasopharyngeal testing given mild coryzal symptoms and a non-productive cough beginning one day following his mother's symptom onset. His nasopharyngeal swab was also positive for SARS-COV-2 on RT-PCR testing. Both patients had daily nasopharyngeal samples collected to monitor viral shedding on RT-PCR. Samples of the mother's human milk and stool samples from the infant were also collected and analyzed throughout their hospital stay. The results of these samples on RT-PCR testing for SARS-CoV-2 RNA targeting the envelope protein gene (E-gene) are depicted in Figure 1. The mother's serum, urine and saliva were also tested for SARS-Cov-2. None of these samples had detectable RNA.

Prior to hospitalisation and onset of maternal symptoms, the infant was breastfed up to three times per day in addition to small meals in-between. Breastfeeding was discontinued by the mother once she developed symptoms due to concerns of COVID-19 transmission to the infant. The first sampling of human milk occurred five days following maternal symptom onset with no episodes of breastfeeding in those five days prior to collection of the sample. During collection of the first human milk sample, the patient was not using a facemask given resolution of her respiratory symptoms. Self-expression of human milk occurred after breast decontamination with soap and water as well as appropriate hand hygiene. Human milk was expressed directly into a sterile specimen container. Upon confirmed COVID-

19 infection in the infant, breastfeeding was resumed with nil adverse effects. Subsequent samples of self-expressed human milk collected for analysis were obtained prior to breastfeeding in an attempt to reduce contamination from the infant's oropharynx. Specific recommendations on cleaning of the breast were not imposed during collection of subsequent specimens. The mother remained diligent with hand hygiene prior to human milk expression. An additional six samples of human milk were collected with one further sample demonstrating detectable SARS-COV-2 RNA (Figure 1).

Faecal samples from the infant were also collected from the third day of admission. These samples continued to have detectable RNA sixty-six days following infant symptom onset (Figure 1). After resolution of respiratory symptoms and documented viral clearance from the nasopharynx of both patients, they were discharged from hospital after an uneventful fifteen-day stay.

Discussion

To our knowledge, this is the first case of detectable SARS-CoV-2 RNA from human milk in a patient with COVID-19. Despite mild clinical symptoms, our patient had detectable virus in human milk in two separate samples taken ten days apart but interspersed with a number of negative results. There have been limited studies examining SARS-CoV-2 presence in human milk, with no peer-reviewed reports to date demonstrating detectable RNA in human milk [5].

Given detectable virus in the first and final samples of human milk with negative interval samples, there is the possibility of contamination of the human milk with SARS-CoV-2 RNA from the infant's oropharynx onto the breast. Breastfeeding was stopped for five days prior to collection of the first sample of expressed human milk, making this unlikely. All samples of human milk were collected prior to feeding to minimize potential contamination from the infant's oropharynx. The risk of environmental contamination as well as contamination from the patient's own oropharynx is possible but unlikely given appropriate hand hygiene and resolution of maternal respiratory symptoms at time of sample collection. As demonstrated in Figure 1, there appeared to be no relationship between RT-PCR cycle threshold (Ct) values from the patient's or infant's oropharyngeal samples with virus detection in human milk.

The infant, whilst demonstrating clearance of viral RNA from the nasopharynx, continued to have detectable RNA in faeces. Current literature regarding SARS-CoV-2 viral shedding in the paediatric population is limited, likely influenced by a smaller cohort and milder symptoms compared to the adult population. Prolonged viral shedding in the gastrointestinal tract despite clearance from the nasopharynx is not uncommon, with one case series of paediatric patients reporting detectable RNA in faeces up to twenty-nine days following symptom onset [6]. The detection of viral RNA in faeces sixty-six days after initial symptom onset found in our report appears to exceed the longest duration found in the literature to date [7].

The lack of detectable virus in the mother's urine and serum is similar to reports in the literature that viral detection in urine is rare and viremia similarly uncommon [4]. Although the maternal oropharyngeal samples had undetectable RNA by day seven of infant symptom onset, the human milk demonstrated detectable RNA at day fifteen. This discordance is also similar to other studies showing

continued RNA shedding in other bodily fluids such as serum or faeces despite a negative respiratory sample [8]. The mechanism by which SARS-CoV-2 viral shedding occurs in breast tissue leading to detectable RNA is however uncertain.

The implications of recoverable RNA in human milk remains unclear. Although SARS-COV-2 RNA was identified in our samples, whether this translates to viable virus or degraded residual nucleic acid could not be ascertained. Whilst contamination of the patient's human milk was considered unlikely, if the detectable RNA in the human milk samples was a result of contamination remains an important finding as it poses a potential and unanticipated source of exposure for an uninfected infant. This emphasizes the importance of appropriate breast hygiene prior to feeding and cleaning of breast pumps if used as per recommendations by the American Academy of Pediatrics [5]. The infant in this report however was already infected at presentation with acquisition likely through overseas travel as well as close contact with the mother through respiratory transmission. Transmission of virus via breastfeeding is uncertain but presumed unlikely.

Given this uncertainty and detectable viral RNA in human milk, the benefits of human milk likely greatly outweigh risks associated with maternal COVID-19 infection, due to conferring protection to other respiratory illnesses [9]. This is in line with current recommendations for breastfed infants to continue human milk consumption during maternal COVID-19 infection [5],[10]. Our patient despite having positive RNA in human milk continued to feed her infant with no adverse outcomes when breastfeeding was resumed. Although we did not test for the presence of SARS-CoV-2 antibodies in the human milk, there have been previous reports of detectable SARS-CoV-1 antibody in human milk of a patient with Severe Acute Respiratory Syndrome (SARS) collected 131 days after onset of illness [11]. Breastfeeding

could therefore provide a protective benefit for SARS-CoV-2 although this remains an area for further research.

Conclusion:

SARS-CoV-2 RNA has been isolated in various clinical samples including the respiratory tract, serum and faeces. This is the first report, to our knowledge, of a patient with detectable RNA in human milk. The significance of this finding is uncertain as detectable RNA in these samples has not been shown to indicate viable virus nor to demonstrate a risk of infection via breast feeding. Our patient, despite having detectable virus in human milk, continued to breastfeed her infant with nil adverse effects.

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Potential conflicts:

All authors have no conflicts of interest to disclose.

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Figure 1

Cycle thresholds (Ct) values for the envelope protein gene (E-gene) target for collected specimens. A single flock swab was used in the mother to collect combined oral and nasopharyngeal samples. A Ct value ≥40 is interpreted as undetectable.

Figure 1