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Laura M. Jamieson, MSc
Nicole E. Didyk, MD
McMaster University, Hamilton
Ontario, Canada

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Co-Occurring Dehydration and Cognitive Impairment During COVID-19 in Long-Term Care Patients



To the Editor:

COVID-19 is associated with high morbidity and mortality in nursing home (NH) residents.^{1–3} Although most of the literature on COVID-19 has focused on the pathogenesis and management of hypoxic respiratory failure from pneumonia, less well described are geriatric complications such as dehydration, delirium, and falls. The objective of this study was to describe the frequency of dehydration and intravenous hydration during COVID-19 in NH residents and examine its interaction with delirium, dementia, and other complications.

Methods

The study setting was a 514-bed NH in New York City. Subjects were all symptomatic NH residents with a positive COVID-19 PCR or antibody test between March 1 and June 1, 2020. We reviewed medical, nursing, and other clinical notes to ascertain illness and treatment characteristics up to 30 days after symptom onset. Dehydration was defined as any blood urea nitrogen (BUN)–creatinine ratio greater than 20.⁴ Free water deficit⁴ was calculated in those with sodium (Na) > 145 mmol/L.

We compared the occurrence of delirium, falls, hospitalization, and death between residents with dehydration and those without using chi-square tests. We quantified the association between dehydration and cognitive impairment from dementia and/or delirium using multivariable logistic regression, using SPSS version 24 (IBM, Inc). Institutional review board approval was obtained from the NH and affiliated medical school.

Results

Among 314 NH residents with symptomatic COVID-19, the most common symptoms documented were fever (79%), cough (59%), loss of appetite (43%), and shortness of breath (28%) (Table 1). Among 261 residents with COVID-19 who had BUN and creatinine measured, the mean maximum BUN-creatinine ratio was 23.9 (SD = 9.2, range 4.6–58.5), and 154 (59%) had dehydration

Table 1

Features of COVID-19 in Nursing Home Residents Between Symptom Onset and 30-Day Follow-Up

Features (n = 314 Except Where Indicated)	n (%) or Mean (SD)
Symptoms, n (%)	
Fever ≥ 99°F	250 (79.6)
Cough	187 (59.6)
Loss of appetite	133 (42.4)
Shortness of breath	86 (27.4)
Diarrhea	25 (8.0)
Vomiting	20 (6.4)
Sore throat	18 (5.7)
Headache	12 (3.8)
Geriatric syndromes, n (%)	
Delirium	105 (33.4)
Fall (≥1)	82 (26.0)
Weight loss (≥5%)	76 (24.2)
Pressure sore (≥1 stage 2 or greater)	36 (11.4)
Dehydration* (BUN-creatinine ratio >20), n (%)	154 (59.0)
Free-water deficit [†] (L), mean (SD)	2.92 (1.67)
IV fluids received (any), n (%)	163 (51.9)
Duration of IV fluids (d), mean (SD)	4.9 (4.3)
Hospital transfer, n (%)	289 (9.2)
Mortality [‡] , n (%)	38 (13.7)

*Among those with laboratory values available (n = 261).

[†]Free water deficit = fraction total body water (male = 0.5; female = 0.45) × weight (in kilograms) × [sodium/140 – 1]; only calculated for n = 39 with BUN-creatinine ratio > 20, Na level > 145, and available weight.

[‡]Among those with known vital status (n = 279).

according to a threshold of 20. Among those who had Na measured, 45 residents (18.2%) had Na levels >145 mmol/L and the calculated average free-water deficit was 2.92 L (SD = 1.67; range 0.93–6.86).

The relative risk of dehydration in residents with either moderate-severe cognitive impairment or COVID-19–associated delirium was 1.37 relative to residents with neither [95% confidence interval (CI) 1.11–1.59; *P* = .003]. This relationship remained significant after adjusting for demographic and clinical characteristics. Intravenous (IV) fluids were provided to 113 residents in the nursing home for an average of 4.9 days (SD = 4.3; range 1–31). Along with 50 who received IV fluids in the hospital prior to admission to the nursing home, the total number who received IV fluids during their COVID-19 illness was 163 (51.9%).

In bivariate associations, dehydration was significantly associated with higher risk of falling (relative risk 1.65, 95% CI 1.06–2.58; *P* = .022) and death (relative risk 2.39, 95% CI 1.09–5.25; *P* = .022). Overall, 90.8% of residents with COVID-19 were managed in the NH and 9.2% were transferred to the hospital. Mortality within 30 days was 13.7%.

Discussion

In this study, 59% of NH residents with symptomatic COVID-19 experienced dehydration. Dehydration was much more common in this group than in a prepandemic NH cohort who had urinary, skin, and respiratory infections, in which 9.1% experienced dehydration.⁵ Reasons for the greater incidence of dehydration with COVID-19 include (1) higher and more persistent fever, a known risk factor for dehydration in NH residents,⁶ and (2) difficulty maintaining oral hydration, even with human assistance, from acute declines in alertness and strength. Dehydration was clinically significant as demonstrated by the frequent requirement for IV fluids and the association between dehydration and increased falls and death.

Almost all cases of COVID-19 in this study were managed in the NH, including those with dehydration. Prior work has suggested that NH residents with infection may be better managed in the NH than in the hospital when consistent with goals of care, with fewer pressure sores, and lower mortality.⁷ Overall 30-day mortality in

this sample was 13.7%, which is lower than the range in other NH COVID-19 pandemic reports.^{8,9} Study results are consistent with a recent study in which protocolized medical care of COVID-19 in the NH setting was associated with better outcomes.⁸ Care pathways for infection and dehydration are available as part of such programs as Interventions to Reduce Acute Care Transfers (INTERACT).¹⁰

Limitations of this study are the single site and the fact that not all residents had laboratory values during the follow-up period. In addition, the BUN-creatinine ratio can be affected by factors such as renal insufficiency, which was present in 23% of our study sample. Nevertheless, our study suggests that nursing facilities should be prepared to administer IV fluids in approximately one-half of COVID-19-affected residents. Given the continued risk of COVID-19 in skilled nursing facilities, it is imperative to identify interventions consistent with goals of care that may lead to better outcomes.

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Kenneth S. Boockvar, MD, MS
The New Jewish Home
New York, NY, USA

Icahn School of Medicine at Mount Sinai
New York, NY, USA

James J. Peters VA Medical Center
Bronx, NY, USA

Wingyun Mak, PhD, Orah R. Burack, MA
The New Jewish Home
New York, NY, USA

Benjamin E. Canter, BA
Department of Occupational Therapy
Boston University
Boston, MA, USA

Joann P. Reinhardt, PhD, Ruth Spinner, MD, Jeffrey Farber, MD
The New Jewish Home
New York, NY, USA

Icahn School of Medicine at Mount Sinai
New York, NY, USA

Himali Weerahandi, MD, MPH
Division of General Internal Medicine and Clinical Innovation
Department of Medicine, NYU Grossman School of Medicine
New York, NY, USA

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Two Canadian Provincial Initiatives During the COVID-19 Pandemic and Their Impact on Nursing Home Staffing



To the Editor:

During the first wave of the COVID-19 pandemic, Québec was the hardest hit province in Canada with close to half the deaths due to the virus in the entire country. The vast majority of those deaths occurred in long-term care institutions, or nursing homes. If these facilities had been chronically understaffed, as the pandemic progressed, low staffing levels became an even bigger problem as many workers left or became sick.¹ For this reason, in April of 2020, Premier Legault of Québec requested the help of the army to increase the numbers of workers in nursing homes and the federal government agreed.² The military filed a report stating that they had observed staff shortages, lack of PPEs, and improper infection control in many facilities.³ Premier Legault acknowledged that he was not surprised by these findings. Staff shortages were a known weakness of the extended care system; however, the government had failed to act prior to the pandemic.

In addition to inadequate staffing levels, many personal support workers were not full-time employees at one facility and had to work in multiple homes in order to make ends meet. If Québec seemed oblivious to the threat of virus transmission between facilities, British Columbia understood the possible consequences of worker migration. In March of 2020, Dr Henry, the provincial health officer of British Columbia, put forward 2 provincial orders, one banning staff from working at more than 1 facility and the other requiring nursing home operators to turn over staff rosters.⁴ She declared that the government would take control of personal support workers. This meant that for 6 months personal support workers would get equal pay and would be hired full-time in one facility. This limited working options, but workers were

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