



Continuous positive airway pressure-treated patients' behaviours during the COVID-19 crisis

To the Editor:

Obstructive sleep apnoea (OSA) is one of the most prevalent chronic diseases, affecting nearly one billion people worldwide [1]. Continuous positive airway pressure (CPAP) is the first-line therapy for OSA [2], and is currently used by over one million people throughout France. A focus on the OSA population during the COVID-19 outbreak is of particular interest for the following two main reasons. 1) OSA is a multi-morbid disease with up to 70% of patients being obese [3] and exhibiting a high prevalence of cardiometabolic comorbidities. Such a clinical context is expected to be associated with a higher risk of severe forms of COVID-19 and a higher mortality rate [4]. 2) CPAP treatment is considered a high-risk aerosol-generating procedure potentially facilitating viral dispersion into the environment and transmission of infection [5–7]. As a result, CPAP-treated patients have often received contradictory information regarding their individual level of risk during the pandemic and ambiguous instructions as to whether to continue or stop CPAP. The objective of the current study was to describe CPAP-treated patients' beliefs and attitudes during the COVID-19 health crisis, to find out which healthcare workers had informed and supported them, and to identify changes in their CPAP treatment behaviours.

A cross-sectional online survey was sent by a non-profit organisation dedicated to quality of care and education in sleep apnoea ("Alliance apnées") and a consortium of healthcare providers (Agiradom, Bastide, Elivie, Isis, La Poste (ASTEN), SOS Oxygène, Vitalaire), to ~110 000 CPAP-treated patients. The survey was filled out anonymously, and access to the data was restricted to study investigators only. The survey was conducted between 27 April and 17 May 2020, close to the end of lockdown and during the rapid decline in the burden of COVID-19 in France [8]. The survey contained questions on age, gender, geographic location (departments (counties in France)), family unit, and self-reported OSA severity (mild, moderate or severe). The survey questionnaire consisted of items on attitudes regarding CPAP treatment including discontinuation and changes in life habits, in particular sleeping arrangements. Participants also reported whether they had been diagnosed with COVID-19 by healthcare professionals with or without a confirmatory PCR test. Participants with a COVID-19 diagnosis also reported on existing chronic health conditions, body mass index (BMI), and number of persons inside the family unit infected before or after the CPAP-treated patient. Descriptive statistics, Chi-squared tests and Wilcoxon tests were conducted for comparisons.

A total of 15306 individuals from 93 metropolitan departments, covering most of France, with differing burdens of COVID-19 outbreak participated in the study. The data were analysable for 13994 individuals (figure 1). Patients self-reported moderate (20.7%) to severe (46%) OSA, with 99.3% of included subjects being treated with CPAP and 0.7% with oral appliances. The overall population was predominately male (67.1%) with 22.6% aged 51–60 years and 61.9% older than 60 years. 464 (3.3%) indicated suspected or proven (53 out of 464, 11.4%) COVID-19 infection. During the COVID-19 outbreak only a small percentage (15.2%) of CPAP-treated patients received specific advice regarding the COVID-19 outbreak and CPAP



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The #COVID19 pandemic has had limited impact on CPAP use by obstructive sleep apnoea patients. Mainly only those with suspected or proven COVID-19 stopped CPAP use, sometimes without a physician's advice, and were more likely to move to a separate bedroom. <https://bit.ly/2RxQDZO>

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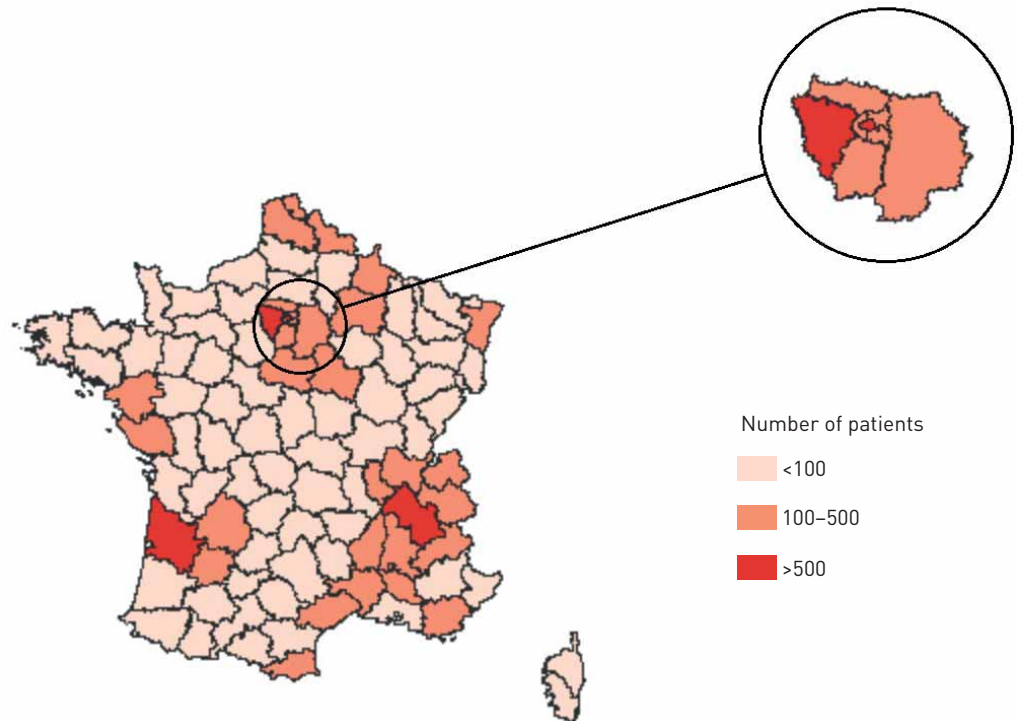


FIGURE 1 Distribution throughout France of obstructive sleep apnoea patients on continuous positive airway pressure treatment who responded to the online survey. The inset is the Paris region. The departments (counties) with the largest numbers of patients include other large agglomerations: Bordeaux in the south-west and Lyon in the south-east.

usage. Information mainly came from homecare providers (84.9%) and respiratory physician prescribers (6.6%). Only 11.8% had benefited from teleconsultations with respiratory physicians during the crisis.

During the COVID-19 health crisis, 590 (4.4%) have stopped CPAP treatment. Discontinuing CPAP treatment followed a physician's request ($n=21$, 3.8%) after confirmation or suspicion of COVID-19 infection (15 patients) and during hospitalisation for COVID-19 infection (six patients). 174 (31.5%) patients stopped their treatment without medical advice, as a precaution and on their own initiative because they were experiencing symptoms evoking COVID-19 (73 patients) or were free of symptoms but were not willing to risk contamination of household members (101 patients). 64.7% of respondents ticked the answer "other", with some adding a free text explanation. Of patients discontinuing CPAP, 33% and 42%, respectively, of those stopping at their own initiative were living either alone or with one or more persons.

Regarding sleeping arrangements, only 4.5% have started to sleep in separate rooms since the beginning of the outbreak, 69.8% were still sleeping in the same room and 14.5% continued their previous behaviour of sleeping in two separate rooms.

The CPAP-treated subgroup infected with COVID-19 (median BMI $30.7 \text{ kg}\cdot\text{m}^{-2}$ (interquartile range $27\text{--}35 \text{ kg}\cdot\text{m}^{-2}$); type 2 diabetes: 14%; hypertension: 38%; asthma: 15.6%) reported essentially moderate disease with only 24 (5.2%) requiring hospitalisation, including six intensive care unit (ICU) admissions. A higher percentage of infected patients discontinued CPAP (21.8 *versus* 4% infected *versus* non-infected patients, respectively, $p<0.01$). To minimise risks to household members, a higher percentage of infected patients moved to a separate bedroom (17.7 *versus* 4.2%, infected *versus* non-infected patients respectively, $p<0.01$). The rate of household members infected after diagnosis in a CPAP-treated patient was similar to the rate of contamination before diagnosis in the CPAP-treated patient.

This survey is the first to assess knowledge, attitudes and behaviours of CPAP-treated patients in response to the COVID-19 pandemic. The prevalence rate of CPAP-treated patients with suspected or proven infection with COVID-19 was 3.3%. This is equivalent to the proportion of the French population infected during the same period of time [8]. The burden of COVID-19 marginally affected CPAP treatment and behaviours with only 4.4% and 4.5% of patients discontinuing CPAP or starting to sleep in separate

rooms, respectively. These percentages went up to ~20% in cases of suspected or proven COVID-19 infection suggesting that the CPAP associated risk for household members was unknown or underappreciated. An acknowledged recommendation in this situation is not only self-isolation, but also implementation by homecare providers of non-vented CPAP masks with a viral filter, reducing the spread significantly during CPAP treatment [5–7].

We found that 28 out of 464 (6%) of CPAP-treated patients with suspected or proven infection were hospitalised, which again is consistent with the 3.9% and 8%, respectively, reported in a representative male French population in the range of 50–59 and 60–69 years [8]. Once hospitalised, on average in France for the same subgroups, 33% and 37% of patients entered ICU [8], compared with six out of 28 (21.4%) in our survey. Overall, our data do not suggest any obvious increase in risk associated with sleep apnoea. The majority of survey responders were regular CPAP users and a large majority continued treatment during the COVID-19 outbreak potentially limiting the negative impact of untreated OSA. However, there is a possibility of bias as subgroups with long-lasting hospitalisations or early death were not included in the survey. The percentage of survey responders was low and we cannot exclude a selection bias; nevertheless the responding population was nearly 14 000. Moreover, in the open text replies nearly 65% of those who stopped reported the usual reasons leading to CPAP discontinuation outside a pandemic period, *i.e.* psychological reasons, discomfort and side-effects. These potential limitations to the representativeness of the sample must be addressed by designing exhaustive sampling methods of administrative databases combining OSA diagnosis and hospitalisations for COVID-19.

This large national survey highlights the limited impact of the COVID-19 pandemic on CPAP user behaviours; in agreement with limited changes in CPAP adherence objectively assessed by telemonitoring and probably related to sleep habits during lockdown [9]. Such a health crisis underlines the importance of coordinating management and patient education among all caregivers involved in CPAP long-term home treatment.

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