



## RESEARCH ARTICLE

# EXPERIENCE OF A MULTIDISCIPLINARY HOSPITAL TEAM THAT MEDICALIZED SIX HOUSEHOLDS AFFECTED BY COVID-19 WITH 835 RESIDENTS DURING THE COVID-19 PANDEMIC

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### ABSTRACT

**Background:** At the beginning of the pandemic in Spain, concern was raised about the need to hospitalize the elderly living in nursing homes affected by coronavirus disease 2019 (COVID-19). A multidisciplinary hospital team was formed in Valladolid (Spain) to medicalize these facilities. **Methods:** 835 elderly residents (70% women and 30% men) of six nursing homes were analyzed. We performed a universal screening by real time-polymerase chain reaction (RT-PCR) of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and a retrospective analysis of the outcomes (incidence, severity, hospital admissions and mortality) at 14, 21 and 28 days after diagnosis. Treatments administered to patients were also analyzed. **Results:** Of the 578 residents with positive RT-PCR, 177 (31%) showed moderate or severe symptoms, 71 (12%) required hospitalization and 103 (18%) died in the 28 days after diagnosis. In the group with negative RT-PCR, the mortality rate was 16%. Patients received more corticosteroids in nursing homes and more lopinavir-ritonavir in the Hospital. Among critically ill patients, no difference in the mortality rate was found between those hospitalized (80%) and those who remained in the nursing home (81%). **Conclusions:** The screening showed that 72% of the elderly had SARS-CoV-2 infection. The mortality rate was similar in the initially positive and negative RT-PCR groups, suggesting that many residents subsequently developed the infection. In our experience, when adequate health care is provided, with sufficiently trained health workers, the life expectancy of elderly people with COVID-19 is not affected by staying in nursing homes, even in severe cases.

### INTRODUCTION

Advanced age, presence of co-morbidities, and living in the same home favored the spread and severity of the COVID-19 in elderly nursing home residents. This population group is, therefore, one of the most at risk of both infection and death due to SARS-CoV-2. In Spain, during the later half of March 2020, the number of people infected with the SARS-CoV-2 increased quickly, which started to impact its healthcare system. It was of concern, at the time, that the elderly could not receive adequate medical care, in the face of the rapid increase in critical patients and the risk of collapse of the health system in the most affected areas of our country. Keeping in mind the health care needs of nursing home

residents in Valladolid (Spain) during the pandemic, the *Hospital Universitario del Río Hortega* (HURH) formed a multidisciplinary team (COVID Nursing Homes Team) to advise and assist in the treatment and care of patients with suspected COVID-19 of these nursing homes (Structure and Function in Annex 1). Our purpose was for these elderly patients to receive adequate care by temporarily turning public and private nursing homes into authentic health facilities. The COVID Team conducted work from March 23 to April 30, 2020, coinciding with the period of maximum incidence and mortality from the novel coronavirus in Spain. During this period, a universal screening for SARS-CoV-2 was performed using real-time polymerase chain reaction (RT-PCR) in all the nursing homes of Valladolid, to design a proper isolation protocols. Only nursing homes that requested help were cared for directly by our Home Hospitalization Team. When our Team began its work, there were no studies defining the pattern of spread and the risk of death by COVID-19 in

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nursing homes. There were also no studies on how best to care for these patients. That is why we decided to analyze the results achieved with our health care strategy, by assessing the incidence, severity and mortality due to COVID-19 of the nursing homes residents where the COVID-19 Home Hospitalization Team intervened. We also looked at whether there were differences in the mortality and treatments, between the elderly who were admitted to the HURH and those who remained in their residences.

## METHODS

In total, 835 residents of six nursing homes of the *Área de Salud Valladolid Oeste-ASVAO* (West Valladolid Health Area) were analyzed in this retrospective study. The median of residents in these facilities was 119 persons (range: from 54 to 192). This cohort consisted of 585 women (70%) and 250 men (30%). The median age was 88 years (IQR: 83-92). The data were collected from the medical records of the nursing homes, hospitals, and primary care centers. The study was approved by the Drug Research and Ethics Committee of the HURH. A sample for analysis of RT-PCR for SARS-CoV-2 was collected by nasopharyngeal swabs to all residents of Valladolid nursing homes to diagnose infection. The rate of survival and the need for hospitalization, for 14, 21 and 28 days after RT-PCR, were analyzed in all the patients. Patients who tested positive in RT-PCR analysis were also evaluated for the presence of COVID-19 clinical symptoms.

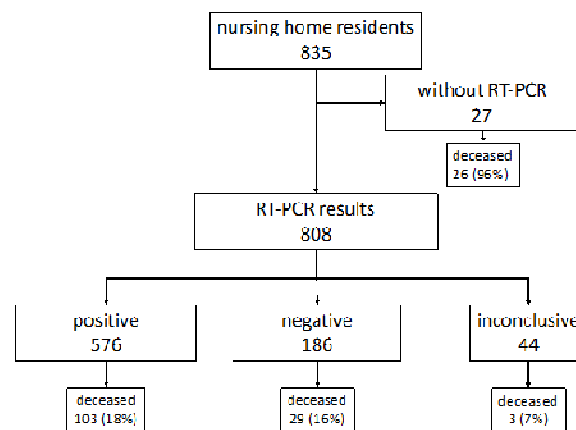
**The disease severity was evaluated using accessible clinical criteria that did not require transfer to a hospital center, thereby, defining four subgroups of patients:**

- **Asymptomatic:** without changes in baseline vital signs
- **Mild:** fever < 38°C and/or baseline oximetry between 90% and 92%, without relevant deterioration of the general health or neurological status.
- **Moderate:** one of the following symptoms or signs: fever ≥ 38°C, baseline oximetry < 90%, general health deterioration, neurological deterioration.
- **Severe:** two or more of the following symptoms or signs: fever ≥ 38°C, baseline oximetry < 90%, general health deterioration, neurological deterioration.

The two groups of treatments commonly administered in COVID-19 patients were also recorded: The supposedly specific drugs as hydroxychloroquine, with or without azithromycin, and antiretrovirals of the lopinavir-ritonavir type. The support treatments such as oxygen therapy, anticoagulants or low-molecular-weight heparins, corticosteroids and other broad-spectrum antibiotics. The results of categorical variables are expressed as percentages, whereas those of continuous variables are expressed as medians and interquartile ranges (IQR). The proportions were compared using the Chi-squared test and the Mann-Whitney U Test was used for comparing the continuous variables. The differences with  $p < 0.05$  were considered significant.

## RESULTS

On the day 28, one hundred and sixty-one elders had died. The mortality rate was 19%. The mortality rate ranged from 6% to 29% in the six nursing homes assisted by our Home Hospitalization Team (Table 1).



**Figure 1. Distribution of RT-PCR results and 28-day mortality of the nursing home residents**

The RT-PCR results of SARS-CoV-2 for 27 residents were not available; most of them died before the screening (Figure 1). Of the remaining 808, RT-PCR was positive for 578 (72%), negative for 186 (23%), and inconclusive for 44 (5%). The percentage of residents who tested positive for RT-PCR in the six nursing homes ranged from 48% to 98%. The group of 578 people whose infection was confirmed by RT-PCR, consisted of 396 (69%) women and 182 (31%) men. The median age was 87.5 years (IQR: 83-92). The 14-day mortality rate was 12% (71) which increased to 17% (98) at 21 days and to 18% (103) at 28 days. Throughout the study period, 128 (22%) residents showed severe symptoms, 49 (9%) had moderate symptoms and 401 (69%) had mild or no symptoms (asymptomatic). The most frequently administered treatments were broad-spectrum antibiotics (53%), azithromycin (39%), anticoagulants or low-molecular-weight heparin (32%), oxygen therapy (26%) and corticoids (18%); hydroxychloroquine and lopinavir-ritonavir were administered in less than 10% cases (Table 2). Over the period studied, 71 (12%) residents with RT-PCR positive were admitted to the Hospital. In patients with moderate to severe symptoms, there were hardly any statistically significant differences in treatments received between those admitted to the Hospital and those who remained in nursing homes. The elderly admitted to the Hospital received more treatments with lopinavir-ritonavir (8% vs 0%;  $p < 0.002$ ), against those who remained in the nursing homes received more corticosteroids (53% vs. 27%;  $p < 0.001$ ) (Table 3). The mortality rate of the patients with positive RT-PCR in various nursing homes ranged from 5% to 38% (Table 4). Overall, no significant differences in mortality were found between men (19%) and women (18%) in this group ( $p < 0.720$ ). However, significant differences in age were indeed found because patients who had died (89 years; IQR: 86-93) had a median age two years older than those who were still alive on day 28 (87 years; IQR: 82-91;  $p < 0.001$ ). The likelihood of dying among patients with severe symptoms was similar between those referred to the hospital (44/55, 80%) and those who remained in the nursing homes (57/70, 81%) ( $p < 0.840$ ). In addition, the 28-day mortality in the group of patients with negative RT-PCR (16%) did not significantly differ from those of residents with positive RT-PCR (18%) ( $p < 0.47$ ).

## DISCUSSION

COVID-19 spread rapidly causing high mortality in nursing homes, thereby raising an alarm worldwide<sup>1</sup>

**Table 1. Percentage of mortality in 6 nursing homes as a function of the RT-PCR result**

	without RT-PCR result	positive RT-PCR	negative or inconclusive RT-PCR	total
nursing home 1	8%	2%	1%	11%
nursing home 2	0%	19%	0%	19%
nursing home 3	0%	10%	19%	29%
nursing home 4	14%	11%	1%	26%
nursing home 5	0%	5%	1%	6%
nursing home 6	0%	21%	7%	28%
total	3%	11%	5%	19%

**Table 2. Details of the RT-PCR confirmed 578 infected residents**

Sex male female	182 (31%) 396 (69%)		
age (years)			
median	87.5		
(IQR)	(83 – 92)		
treatment			
anticoagulation / heparin	186 (32%)		
oxygen	148 (26%)		
azithromycin	223 (39%)		
other antibiotics	304 (53%)		
corticoids	102 (18%)		
hydroxychloroquine	40 (7%)		
lopinavir-ritonavir	6 (1%)		
	day 14	day 21	day 28
Clinical status			
asymptomatic	318 (57%)	309 (53%)	307 (53%)
mild	87 (15%)	94 (16%)	94 (16%)
moderate	54 (10%)	50 (9%)	49 (9%)
severe	100 (18%)	125 (22%)	128 (22%)
hospitalization			
yes	56 (10%)	70 (12%)	71 (12%)
no	522 (90%)	508 (88%)	507 (88%)
death			
yes	71 (12%)	98 (17%)	103 (18%)
no	507 (88%)	479 (83%)	473 (82%)

**Table 3. Treatments administered depending on the patient’s place of care**

	nursing home	hospital	P
anticoagulation / heparin	66/113 (58%)	36/63 (57%)	0.871
oxygen	71/111 (64%)	42/62 (68%)	0.617
Azithromycin	79/113 (70%)	46/63 (73%)	0.663
other antibiotics	85/113 (75%)	45/62 (73%)	0.702
Corticoids	60/113 (53%)	17/63 (27%)	0.001
Hydroxychloroquine	18 /113 (16%)	16/63 (25%)	0.127
lopinavir-ritonavir	0/113 (0%)	5/63 (8%)	0.002

Estimates show that by the time the first patient with symptoms is detected in a nursing home, the infection rate may already go up to 50% among the residents <sup>ii</sup>because these nursing homes are designed to facilitate coexistence between residents, among other reasons <sup>iii</sup>. Another major problem reported is that confinement can cause loss of physical and mental faculties among the elderly <sup>iv</sup>, which are often already decreased. To mitigate these problems in our health area (ASVAO), the HURH established a multidisciplinary medical support and advisory team to provide care for COVID-19 patients, in their own environment, and to allowing them to communication with their family members. Public and private residences were temporarily converted by our Team into medicalized centers of first intervention against pandemic. The presence of infection was confirmed by RT-PCR in 72% residents of nursing homes assisted by our Team, and throughout the study period the mortality rate was 19% in all the residents and 18% in those with confirmed infection. Our mortality data was lower than in other published series where all serious ill residents were admitted to hospitals <sup>v vi</sup>. The effectiveness of our health care strategy for residents in their

own nursing homes, assisted by our COVID Home Hospitalization Team, appears to be proven. The 16% of residents with negative RT-PCR also died, which lead us to suspect that some tests were false negatives and/or that many of these residents were subsequently infected. A more comprehensive follow-up in one of the centers, where 54% residents initially tested positive by RT-PCR, showed that approximately one in two of the residents who initially tested negative showed evidence of contagion (by RT-PCR and/or antibody testing) within four weeks. Previously published studies show similar results <sup>vii viii</sup> and suggest that an isolation strategy proposed solely based on symptoms, without actual data on infection by RT-PCR, is not effective. We found, like other authors <sup>ix</sup>, that in some cases the clinical deterioration was very fast, two out of three deaths occurred in the first two weeks of follow-up (12%). However, 69% of those infected remained virtually asymptomatic. These striking facts contrast with the feeling, which prevailed in the early days of the pandemic, of death sentence for all infected elders who were not referred to a hospital. Controversy and political debate over whether all the elderly infected with COVID-19 should be hospitalized, continues today.

**Table 4. Hospitalization and mortality rate in the group of patients with positive RT-PCR**

	hospitalization	death
nursing home 1	10%	5%
nursing home 2	8%	19%
nursing home 3	19%	27%
nursing home 4	10%	16%
nursing home 5	4%	6%
nursing home 6	24%	38%
total	12%	18%

Until now, there were no studies comparing a strategy of medicalization of nursing homes with the referral to acute hospitals of all the affected elders. The differences in mortality rate between the six nursing homes, both globally and in the group of residents with positive RT-PCR, suggest that the COVID Home Hospitalization Team intervened in the different centers at different periods of viral spread dynamics, that is, at the initial stages in some cases and when most residents were already infected in others. The only differences in the treatments that were administered, in patients with moderate-severe symptoms, were found in the increased use of corticosteroids in nursing homes and those with a more specific profile in the Hospital. In both cases, the efficacy of these drugs was initially controversial<sup>x</sup>. A recent reported study by the Oxford University<sup>xi</sup> revealed an important role for corticosteroids in the COVID-19 disease, this might explain the good outcome we obtained in the treatment of our patients with mild to moderate symptoms<sup>xii</sup>. Our research has some limitations, the main one is that we have only analyzed the survival of the elderly during the period when our Team acted, we do not collect data from the deceased before and after our work in the centers.

The mortality rate we found in severe cases that remain in their facilities has been very high (81%), but no higher than in cases where they were hospitalized (80%). It should be noted that the median age of the deceased was 89 years, so most were probably dependent, although we do not have the percentages of valid and dependent residents in the nursing homes before the pandemic. We have also not collected data on comorbidities, prior symptoms and chronic treatments of these elder lies. However, our clinical evaluation strategy with feasible data to obtain in non-hospital centers, has been effective in discerning cases with high risk of fatal development, regardless of whether they were admitted to the hospital or remained in their nursing homes. Except in one facility, we do not collect data from new RT-PCR analyses and antibody tests, although these were performed in cases of inconclusive initial result and in those elderly people with RT-PCR negative who had suspicious symptoms in follow-up. Two members of the COVID Home Hospitalization Team were infected, one required hospital admission for severe symptoms, fortunately it has recovered and is already working. However, we have not assessed the percentage of staff in the residences infected with the virus. The assessment of all this data, as well as overall mortality during the pandemic, is a commitment that Health Authorities must meet and that our project cannot replace. The sole purpose of this study is to evaluate the effectiveness of our experience in nursing homes, which consisted of medicalizing them to administer adequate healthcare to those affected by COVID-19 in these facilities. Studies of SARS-CoV-2 transmission dynamics over the post-pandemic period anticipate a new re growth of the virus in the immediate future<sup>xiii</sup>

### Annex 1. Structure and Functions of the COVID-Nursing Homes Team

The COVID Team consisted of healthcare professionals from various medical specialties, ranging from preventive medicine through home hospitalization/ palliative care to primary care, who voluntarily joined the team, and was coordinated with social services. This Team made it possible to provide comprehensive care to elderly nursing home residents and to minimize unnecessary transfers to the hospital. The COVID Advisory Team members was responsible for advising these centers and facilitating coordination with other social resources to correctly conduct isolation, hygiene, and disinfection measures. A universal screening for SARS-CoV-2 infection was performed by RT-PCR on all nursing home residents to correctly isolate positive cases. For this purpose, samples with nasopharyngeal swabs were collected from all the residents in each nursing home on the same day. This Team also managed the supply of parenteral treatments, oxygen therapy equipment and analytical controls for patients who remained in nursing homes. The COVID Home Hospitalization Team members complemented the work of caregivers in the centers that requested for this help. In these cases, the most critically ill patients were treated directly by this Team, with daily reviews and control and registration of treatments, which included parenteral medication and oxygen therapy if required. The relatives of these patients were also informed on their status over telephone daily. When needed, the patients were transferred to the hospital.

Keeping patients in the nursing homes with our home hospitalization strategy, helps to prevent the dreaded saturation and the risk of collapse of the healthcare system. We hope this strategy can be useful in planning changes in Health Care that some authors claim<sup>xiv</sup>. Based on our experience, when providing adequate healthcare, with sufficiently trained health workers, the life expectancy of elderly people with COVID-19 is not affected by remaining in nursing homes, even in severe cases. In fact, the risks of contagion from transfer to the hospital are limited by keeping people in their environment, while avoiding the iatrogenesis of hospitalization in vulnerable patients.

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