

# The impact of COVID-19 preventive lockdowns on the prevalence of benign paroxysmal positional vertigo

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## Abstract

### Introduction

The implementation of preventive lockdowns worldwide due to the COVID-19 pandemic has radically altered our daily lives. We have observed an increase in vertigo consultations during this period, mainly benign paroxysmal positional vertigo.

### Objective

To determine the impact of preventive lockdown on the prevalence and characteristics of benign paroxysmal positional vertigo.

### Methods

We did a retrospective study. All patients with benign paroxysmal positional vertigo during July and August 2020 who visited the clinic in Red de Salud UC Christus, Santiago, Chile, were included. Demographic data, clinical characteristics, need for repositioning maneuvers, and medical history was compared with patients seen in July and August 2019. Cases secondary to trauma and with incomplete records were excluded.

### Results

During July and August 2020, 99 patients consulted with a medical history compatible with benign paroxysmal positional vertigo, average age 54.5 years, 68.9% were female. Repositioning maneuvers were required in 40.2% of cases. Of 28 patients with vitamin D levels, 27 showed deficiency/insufficiency. In 2019, for July and August, 54 patients were seen in the clinic with an average

age of 61.7 years, and 83.3% were female. Repositioning maneuvers were required in 79.6%, and of the nine patients with vitamin D levels, seven presented deficiency/insufficiency. Statistically significant differences were observed regarding age, sex, and need for repositioning maneuvers.

### Conclusions

A high prevalence of benign paroxysmal positional vertigo was observed during preventive lockdown for COVID-19 in our clinic. Patients were generally younger, and although it was more frequent in women, the incidence by sex was not as striking as in the previous year.

## Main messages

- The lockdown measures imposed due to the pandemic caused by COVID-19 have favored the occurrence of factors that trigger benign paroxysmal positional vertigo, such as reduced exposure to sunlight, an important source of vitamin D, and emotional stress.
- This article reports a high prevalence of consultations for benign paroxysmal positional vertigo during two months of COVID-19 preventive lockdown.
- This article is the first to address the relationship between the COVID-19 pandemic and benign paroxysmal positional vertigo at the time of writing.
- This article has limitations intrinsic to a retrospective study: not all patients had vitamin D levels, nor was a stress or mood survey conducted because of the pandemic we are experiencing.
- In addition, the study periods were short and in a single center; likely, the proportion of patients who consulted for benign paroxysmal positional vertigo is underestimated.

## Introduction

The pandemic due to the new coronavirus 2019 (COVID-19) disease has radically altered our daily lives. This pathology is caused by the SARS-CoV-2 virus and has a high potential for interhuman transmission<sup>1</sup>. As of October 7, 2020, 35,659,007 cases have been confirmed worldwide, with 1,044,269 deaths<sup>2</sup>. Given the high transmissibility, most affected countries have implemented preventive lockdowns at some point in this pandemic to control the infection rate. In Chile, the constitutional state of emergency was declared on March 18, 2020, approximately six months from the time of writing this manuscript<sup>3</sup>. This has led to important restrictions regarding home isolation, the establishment of night curfews, and the promotion of social distancing, all in line with the recommendations of the Pan American Organization and the World Health Organization<sup>4</sup>.

With these measures, people are confined to their homes, with limited exposure to sunlight. An important source of vitamin D for most humans is synthesized from skin exposure to sunlight<sup>5</sup>; therefore, it could be thought that this preventive lockdown could cause vitamin D deficiency. This deficiency has been associated with multiple pathologies, including the development and recurrence of benign paroxysmal positional vertigo<sup>6</sup>. The otoliths, made of calcium carbonate, are located in the utricle and saccule. The most accepted theory of the pathophysiology of benign paroxysmal positional vertigo describes a detachment of these otoliths that then migrate towards the semicircular canals causing recurrent vertigo attacks. Since vitamin D is involved in calcium hemostasis, it has been implicated in benign paroxysmal positional vertigo.

In addition, a significant impact on mental health has been observed in lockdowns. A recent review on this subject describes increased levels of stress, avoidance behaviors, and anxiety due to the COVID-19 lockdowns. It is suggested that the psychological impact of lockdowns is broad, substantial, and could be long-lasting<sup>7</sup>. This factor assumes great importance, as emotional stress has been considered a possible trigger for benign paroxysmal positional vertigo<sup>8</sup>. It has been observed that major life events (e.g., work, partner, emotional) are more frequent within the first 12 months before the onset of benign paroxysmal positional vertigo<sup>8</sup>.

Since the beginning of this pandemic, we restricted access to the Otorhinolaryngology clinics at our center as a preventive measure. Even so, we observed a large number of consultations for vertigo. This study aimed to evaluate the impact of the preventive lockdown on the prevalence and characteristics of patients with benign paroxysmal positional vertigo.

## Methods

A retrospective, descriptive study was carried out on all patients with clinical symptoms compatible with benign paroxysmal positional vertigo during July and August 2020 at the UC Christus Healthcare Center associated with the Pontificia Universidad Católica de Chile. During the period studied, 111 patients were seen for benign paroxysmal positional vertigo, of which 16 were excluded (four for presenting a post-traumatic etiology and 12 for presenting incomplete

clinical records), obtaining a final sample size of 99 patients. In addition, the records of patients seen during 2019 in the same time period were reviewed, 63 cases, of which nine were excluded (two for post-traumatic etiology and seven with incomplete clinical records), obtaining a sample size of 54 patients. Demographic data, clinical characteristics, repositioning maneuvers, associated medical history, and vitamin D levels were reviewed. These data were obtained from the patients' clinical records. Vitamin D deficiency was defined as less than or equal to 20 nanograms per milliliter, and insufficiency as 21 to 30 nanograms per milliliter.

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM software). The alpha of all statistical tests was set at  $\alpha = 0.05$ . Shapiro-Wilk test was performed for all data and then for 2019 and 2020 separately. The data is normally distributed. The comparison of quantitative variables was performed using Student's t-tests and categorical variables, with Chi-square test. The ethics committee approved the study of the Pontificia Universidad Católica de Chile.

## Results

When evaluating the number of consultations for benign paroxysmal positional vertigo, an increase in consultations of 183% was observed between 2019 and 2020. During the studied period of 2020, 99 patients were included, with an average age of 54.5 years; 68.9% female (Table 1). For the same months of 2019, 54 patients consulted for benign paroxysmal positional vertigo, with an average age of 61.7 years, 83.3% female. Patients who consulted in 2020, in general, were slightly younger, and this age difference was statistically significant ( $P = 0.007$ , 95% confidence interval: 2.03 to 12.425). When we established age ranges to assess the greatest impact of this difference, we observed statistically significant differences between those younger than 45 years and those older than 66 years ( $P = 0.042$ ). In both periods, benign paroxysmal positional vertigo was more frequent in the female gender, although in the 2020 group, there was a higher proportion of male patients. This gender difference was statistically significant ( $P = 0.049$ ), but we prefer to describe this finding as a trend because it is at the limit of significance.

Regarding the evolution of the pathology, 40.2% of the patients seen in the 2020 group required repositioning maneuvers since the remaining patients presented a spontaneous resolution of the condition at the time of evaluation. The average number of maneuvers required was 1.07. In the 2019 group, 79.6% required maneuvers, with an average of 1.04. This difference in maneuver requirement between the two groups was statistically significant ( $P \leq 0.001$ ). Clinical history associated with the occurrence and recurrence of benign paroxysmal positional vertigo was reviewed (Table 1): hypothyroidism due to autoimmune thyroiditis, other autoimmune diseases, previous history of benign paroxysmal positional vertigo, mood disorders (anxiety, depression), endolymphatic hydrops, migraine, and vestibular migraine. There were no significant differences between the two groups in relation to these pathologies, except for previously diagnosed mood disorders, which were more frequent in the 2019 group.

**Table 1.** Characteristics of benign paroxysmal positional vertigo patients during July and August 2019 and 2020.

	2020	2019	P value
<b>Age (years)<sup>a</sup></b>			
Average	54.5	61.7	<b>0.007</b>
Range	17 to 84	33 to 95	
Median	56	62.5	
<b>Gender (n)<sup>b</sup></b>			
Female	68	45	<b>0.049</b>
Male	31	9	
<b>Repositioning maneuvers<sup>b</sup></b>			
Yes	40.2%	79.6%	<b>≤ 0.001</b>
No	59.8%	20.4%	
<b>Concomitant pathologies<sup>b</sup></b>			
Hypothyroidism	22.2%	13%	0.14
Autoimmune disease	7%	9.3%	0.67
Prior history of benign paroxysmal positional vertigo	21%	22.2%	0.93
Mood disorders	10.3%	25.9%	<b>0.02</b>
Endolymphatic hydrops	2%	1.8%	0.93
Migraine	13.4%	3.7%	0.056
Vestibular migraine	2 patients	0 patient	0.28
<b>Vitamin D (n)<sup>b</sup></b>			
Deficiency / insufficiency	27	7	0.12
Normal values	1	2	
Average levels (ng/mL)	18.9	18.5	
Range	8.4 to 43.8	5.6 to 35	
Median	18.7	17.6	

a Student T test

b Chi-square test.

Source: Prepared by the authors from the study data.

Finally, vitamin D levels were compared between the two groups when available. In the 2020 group, of 28 patients with vitamin D levels, 27 were deficient or insufficient (mean: 18.9 ng/mL) while, in the 2019 group, 7 of 9 patients were deficient or insufficient (mean: 18.5 ng/mL). Differences in levels between the two groups were not significant ( $P = 0.12$ ).

## Discussion

We conducted a retrospective study comparing the prevalence and clinical characteristics of benign paroxysmal positional vertigo between July and August 2020 and 2019. Although the offer of medical consultations at our center dropped significantly due to the preventive lockdown, including otorhinolaryngology, we observed a high proportion of consultations for vertigo, mainly for benign paroxysmal positional vertigo.

Patients affected by COVID-19 have not shown to have a higher proportion of audiovestibular symptoms<sup>9</sup>, which leads us to the question: Was benign paroxysmal positional vertigo more frequent during July and August 2020, the months of preventive lockdown and social isolation? Indeed, when comparing the proportion of cases with those of July and August 2019, a significant increase in consultations for benign paroxysmal positional vertigo was seen. At the same time, statistically significant differences were observed regarding age, gender, and need for repositioning maneuvers.

Patients seen in July and August 2020 were generally younger. In both years, the female gender predominated; however, the proportion of males increased in 2020. Although in 2020 there was a higher proportion of consultations for this pathology, there was also a greater proportion of patients whose spontaneous resolution did not require repositioning maneuvers compared to the 2019 group. These patients exhibited clinical features compatible with benign paroxysmal positional vertigo, but when they presented for their repositioning maneuver, they no longer exhibited the typical nystagmus for benign paroxysmal positional vertigo.

In both groups, practically all the patients whose vitamin D levels were requested presented lower than 30 ng/mL levels. This study does not aim to evaluate causality between vitamin D levels and the occurrence of benign paroxysmal positional vertigo, but the vitamin D deficiency and insufficiency in these patients are striking. According to the 2016-2017 National Health Survey, 87% of women aged 15 to 49 years had vitamin D deficient/insufficient levels, while in those aged 65 years and older, 86.6% had deficiency/insufficiency<sup>10</sup>. This estimated prevalence is important since benign paroxysmal positional vertigo is a frequent pathology. Vitamin D has been implicated in the recurrence of this condition<sup>6</sup> due to its participation in the homeostasis of calcium necessary to maintain otoconia. The true prevalence of vitamin D deficiency and insufficiency at the national level should be evaluated.

At the beginning of this study, and again at the time of writing this manuscript, an active search for studies regarding the COVID-19 pandemic and benign paroxysmal positional vertigo was conducted. There are no other studies on the subject to the best of our knowledge, so this would be the first article to address this topic. This study has limitations intrinsic to a retrospective study. Not all patients had vitamin D levels, nor was a survey conducted in relation to stress or mood due to the pandemic we are experiencing. Although a higher proportion of patients with diagnosed mood disorders was seen in the 2019 group, it has been observed that patients who have consulted in the 2020 group report worry and anxiety about work and economic issues. They have not necessarily been evaluated by a mental health specialist, and, therefore, there may be an underestimation of the prevalence of mood disorders due to lockdown<sup>7</sup>. A recent review by Brooks et al. reports a higher prevalence of post-traumatic stress disorder and mental health impairment during periods of lockdown. While there was a higher prevalence of mood disorders in our study in 2019, this may be due to the underdiagnosis of mood disorders during the lockdown<sup>7</sup>. Another point to consider is that otolaryngology consultations dropped significantly in this period, so it may be that the proportion of patients consulting for benign paroxysmal positional vertigo was underestimated. Likewise, the study periods were short and only included one center.

## Conclusion

The COVID-19 pandemic lockdown has caused a significant impact worldwide, not only because of the direct effects of the disease but also because of mental distress. We observed a high prevalence of benign paroxysmal positional vertigo consultations during July and August 2020, the months of preventive lockdown for COVID-19 in Chile. We observed a higher number of visits for this condition, even when access to the specialty consultations dropped drastically in that period. In other words, the proportion of consultations for benign paroxysmal positional vertigo was high. Patients who consulted for benign paroxysmal positional vertigo were, in general, younger, and although it was more frequent in women in the 2019 and 2020 group, the incidence by gender in the 2020 group was not as marked as the previous year. Similarly, the need for repositioning maneuvers was lower in the 2020 group. Since we observed a high proportion of vitamin D deficiency in the included patients, it would be interesting to conduct a national prevalence study to evaluate vitamin D deficiency and insufficiency in our population.

## Notes

### Authorship roles and contributions

SW: conceptualization, methodology, validation, formal analysis, investigation, data curation, writing (original draft preparation), writing (review and editing), visualization, supervision, project administration. FGH: methodology, validation, formal analysis, investigation, data curation, writing (original draft preparation), writing (review and editing), visualization. MAC: methodology, validation, formal analysis, investigation, writing (original draft preparation), writing (review and editing), visualization.

### Competing interests

The authors have no conflicts of interest to declare.

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## Ethical considerations

This study was approved by the Pontificia Universidad Católica de Chile Ethics Committee (protocol number: 200717005). The authors declare their willingness to share the study data upon request.

## From the editors

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