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Post-COVID-19 syndrome: Descriptive analysis based on a survivors' cohort in Colombia

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ABSTRACT

Background: The prevalence of post-COVID-19 Syndrome (PCS) is estimated to be between 10% and 20%. The main reported symptoms are fatigue, memory alterations, dyspnea, sleep disorders, arthralgia, anxiety, taste alterations, coughing and depression. This study aims to determine the prevalence of post-COVID-19 symptoms in a group of Colombian patients who were recruited during their outpatient appointments.
Methodology: This cross-sectional study was conducted between December 2021 to May 2022. It included patients from outpatient facilities located in five main cities in Colombia who were positive for SARS-CoV-2 infection detected by reverse transcription-polymerase chain reaction (RT-PCR) testing and reported PCS in the following 12 weeks after their COVID-19 diagnosis.
Results: A total of 1047 individuals >18 years old met the inclusion criteria and were included in the study. The median age was 46 years old. 68.2% of the participants were female, 41.5% of the patients reported having a pre-existent condition (hypertension, anxiety disorder, diabetes, hyperthyroidism, obesity and asthma). Only 22% had received at least one dose of COVID-19 vaccine prior to the COVID-19 episode registered. The more prevalent symptoms within our group are described as follows: fatigue (53.3%), dyspnea (40.3%), arthralgia and/or myalgia (43%), cephalea (40.5%), sleep disorders (35.7%) and coughing (31.3%). 72% of the patients presented four or more post-COVID 19 symptoms, 9% two symptoms, and 10% only one symptom.
Conclusion: The findings of this study are consistent with international literature publicly available. The distribution and prevalence of post-COVID symptoms highlight the importance of further research to improve understanding and its potential consequences and implications in terms of quality of life and health care planning services.

Introduction

The National Institute for Health and Care Excellence (NICE) defines Post COVID-19 Syndrome (PCS) as the "signs and symptoms which develop during or after an infection consistent with COVID-19, continuing for more than 12 weeks and not explained by an alternative diagnosis". PCS is characterized by a cluster of symptoms which often overlap, may fluctuate over time and might affect any system in the body" [1]. This includes common symptoms like fatigue, shortness of breath, cognitive dysfunction, among others generally causing an impact on the patients' day-to-day activities. Symptoms may appear de novo, after initial recovery from an acute COVID-19 episode or persist since the beginning of the disease [2].

The extent of the physiopathological mechanisms of PCS are still not completely known despite growing research. Three main mechanisms have been described whereby the infection by the virus causes long-term symptoms: direct cell/tissue damage (due to cytolysis of the infected cells or the host's metabolic machinery being taken over or due to

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mitochondrial functions and methyltransferase), immune activation and inflammation (by creating hyperinflammatory changes and antibody cross-reactivity), and resistance to the host's physiological response (by specific changes altering hormonal regulation or hormonal signaling pathways thus changing their response) [3].

Nowadays and regarding PCS risk factors, there is evidence indicating that individuals who had a history of SARS-Cov-2 infection confirmed via testing are 1.5 times more likely to experience symptoms after 12+ weeks once the acute period of the infection by COVID-19 has resolved, this in comparison to a control group [4]. Increased risk of presenting PCS has been seen among women, elderly population, patients with high body mass index or presence of pre-existing chronic respiratory disease or hypothyroidism [5,6]. In the United Kingdom (UK), researchers observed that the presence of pre-existing conditions in individuals positive for SARS-Cov-2 increased the likelihood of PCS (OR = 1.26[95%CI =1.18–1.35]) as well as pre-existing psychiatric disorders (OR = 1.57[95%CI = 1.47–1.68]) [7]. Similarly, an increased risk was also observed in patients with asthma (OR = 1.56[95%CI =1.46–1.67]) as well as overweight and obesity (OR = 1.31[95%CI =1.21–1.42]) [7]. Incidentally, PCS seems to be associated with the degree of severity of COVID-19; a high prevalence of persistent symptoms in inpatients with COVID-19 has been identified [5,8,9] and most of the symptoms during the acute phase have also been linked to a higher risk, just as much of that for the elderly and being female [8].

The prevalence of PCS has been estimated to be between 10% and 20% [10]. The most reported symptoms are fatigue, memory alterations, dyspnea, sleep disorders, arthralgia, difficulty to focus, anxiety, taste alterations, cough, depression, and hair loss [5,6,11]. Studies to determine the effects on patients' health after COVID-19 infection across different populations has become more relevant within the scientific community to have a better understanding of PCS. This study aims to determine the prevalence of post-COVID-19 symptoms -based on the definition given by NICE - within a population sample of patients who were recruited over the course of six months during their outpatient appointments in different health facilities that offered varying degrees of care in Colombia.

Methodology

This is a descriptive, cross-sectional study that included patients over 18 years old with history of SARS-Cov-2 infection confirmed by reverse transcription-polymerase chain reaction (RT-PCR) and who presented with symptoms associated with COVID-19 for a period of 12 weeks or longer. They were recruited during outpatient appointments with either general practitioners or specialized consultants between December 2021 to May 2022 in five Colombian cities (Barranquilla, Medellín, Bucaramanga, Cali, and Bogotá D·C).

A two-stage cluster stratified sample was calculated based on the total confirmed COVID-19 cases in adults in the cities that were taken as reference points, as reported by the Colombia's National Health Institute (known in Spanish as Instituto Nacional de Salud de Colombia) as of July 28, 2021. The prevalence of Post-COVID Syndromes used was 10% [12], the relative standard error was 5%, and the design effect (DEFF) was 1.2. This, to ensure the same degree of precision during the selection process [13]. The initial sample size was 830, which was later adjusted to 995 participants, to account for a 20% non-response error.

A questionnaire was specifically designed for this study based on the available scientific evidence and the consensus reached by the medical advisory group. This questionnaire was exclusively completed by medical professionals during the consultations in which participants were recruited, following the definition of Post-COVID Syndromes established by NICE. Additionally, a pilot test was conducted among a group of 10 patients who were not included in the subsequent analyses. After the pilot testing and ad hoc validation, the questions were categorized into the following sections: sociodemographic information, medical history, epidemiological data (including the exact date of RT-PCR diagnosis),

Table 1
General characteristics for patients with post-COVID-19 syndrome.

Variables	n	%
Sex (n = 1047)		
Male	390	37,2
Female	657	62,8
Age (*n* = 901)		
Median (IQR)	46	35–58
18–29 years	123	13,6
30–39 years	190	21.1
40–49 years	201	22.3
50–59 years	199	22.1
60–69 years	119	13.2
70+ years	70	7.8
Ethnic Identity (*n* = 1046)		
Afrodescendant	16	1.5
Indigenous	11	1.1
Other	1019	97.4
Place of Residence (*n* = 1014)		
Urban	944	93.1
Rural	70	6.9
Prior tobacco use (*n* = 1034)		
Yes	63	6.1
No	971	93.9
Prior dyspnea * (*n* = 1037)		
Yes	41	4.0
No	996	96.0
Regular physical activity prior to COVID-19 (*n* = 1032)		
Yes	9	0.9
< 150 min/*week*	488	47.3
No physical activity	535	51.8
Vaccination status prior to COVID-19 (*n* = 1039)		
Yes	231	22.2
No	808	77.8
Full scheme (n = 231)	5	2.2
Chronic illness prior to COVID-19 (*n* = 1038)		
Yes	431	41.5
No	607	58.5
Under control (n = 429)	385	90.0
Hypertension	160	15.4
Anxiety/Panic attacks	90	8.7
Diabetes	59	5.7
Hypothyroidism	49	4.7
Obesity	42	4.1
Asthma	34	3.3
*Digestive disease***	35	3.4
Allergic rhinitis	32	3.1
*Cardiac disease****	26	2.5
Depression	24	2.3
Dyslipidemia	16	1.5
*Osteoarticular disease*****	15	1.4
*Autoimmune disease******	13	1.3
Migraines	10	1.0
*Auditive disorders*******	7	0.7
COPD	7	0.7
Epilepsy	6	0.6
Insomnia	4	0.4
Sleep Apnea	5	0.5
Cancer	10	1.0
Reason for RT-PCR testing request (*n* = 1045)		
Compatible symptoms	855	81.8
"Epidemiological fence"	165	15.8

(*continued on next page*)

Table 1 (*continued*)

Variables	n	%
Incidental findings	25	2.4
Facilities according to care level offered during COVID-19 (n = 1047)		
Intensive care unit	81	7.7
Intermediate care unit	21	2.0
Hospitalization – general ward	61	5.8
ER or observation ward	83	7.9
Appointments and home visits	756	72.4
No medical assistance	45	4.3
Treatment during COVID-19 (*n* = 993)		
Analgesics	316	31.8
Antibiotics	222	22.4
Blood thinners	144	14.5
Anti-inflammatories	141	14.2
Corticosteroids	140	14.1
Antihistamines	129	13.0
Inhalers	117	11.8
Vitamin/mineral supplements	103	10.4
Oxygen	98	9.9
Respiratory Support	64	6.4
Extracorporeal membrane oxygenation	6	0.6
Other treatment(s) ǂ	94	9.4
Body Mass Index as of doctor visit (*n* = 979)		
Median (IQR)	25.9	23.5–29.1
Underweight	18	2.0
Normal	372	37.0
Overweight	401	42.0
Obesity	188	19.0

*Dyspnea of any degree with physical strain **Gastroesophageal reflux. Irritable bowel syndrome. Gastritis. ***Arrythmia. cardiac insufficiency. ****Fibromyalgia. arthrosis. Scoliosis. cervical dystonia. Degenerative discopathy. Chondromalacia. *****Rheumatoid arthritis. Sjögren's syndrome. Hashimoto thyroiditis. Polymyositis. antiphospholipid syndrome. Multiple sclerosis. ***** Hypoacusis. tinnitus. ǂ Other therapies: ivermectin (5.4%). *N*-acetyl Cysteine (0.6%). colchicine (0.3%). mucolytics (1.9%). immunomodulators (1.1%) y chloroquine (0.1%).

vaccination status, treatment received during the acute phase, symptoms, and treatment after COVID-19, for a total of 31 questions (as seen in the supplementary material). The research team provided specific training to the physicians involved in patient recruitment to ensure consent and questionnaire completion were taken effectively.

The questionnaire was available in printed and digital format, ensuring that data entry was done only once per person. The collected data were subsequently stored in an Excel® database preserving the anonymity of the participants, thus protecting their identity and the confidentiality of the information. No additional interviews were conducted, and no additional documentation was requested before or after the medical appointments.

In total, 86 medical professionals took part in the recruitment process, including general practitioners (55%), surgical and non-surgical consultants who were in charge of the patients' care and collected the required information.

Inpatients, patients with medical records with incomplete data relevant for this study, patients with diagnosis of cognitive disorders or that could not answer the questionnaire / did not have a designated guardian or carer were excluded.

Information analysis

The analysis was conducted individually and regionally according to the cities selected as reference points. Qualitative variables were analyzed using frequency distribution, and quantitative variables (after conducting a Kolmogorov-Smirnov test for normality) were analyzed using the median and interquartile range (IQR). Pearson's chi-squared test (X^2) was used to determine differences between data distributions. Additionally, 95% confidence intervals were calculated regarding the prevalence of symptoms in the participants. All analyses were conducted using Stata version 16 ®.

Ethical considerations

This study was considered low risk [14]. Each participant signed an informed consent form prior to their participation and data was collected and stored under country-specific legislations and law to comply with privacy and confidentiality standards [15]. This study was approved by the ethical committee CAYRE, and the authors complied with national and international regulations, the Helsinki declaration and Good Clinical research Practices (GCP) standards.

Results

A total of 1047 patients met the selection criteria. The median age was 46 years (Q_1 35 - Q_3 58); 62.8% were female and 37.2% male. The

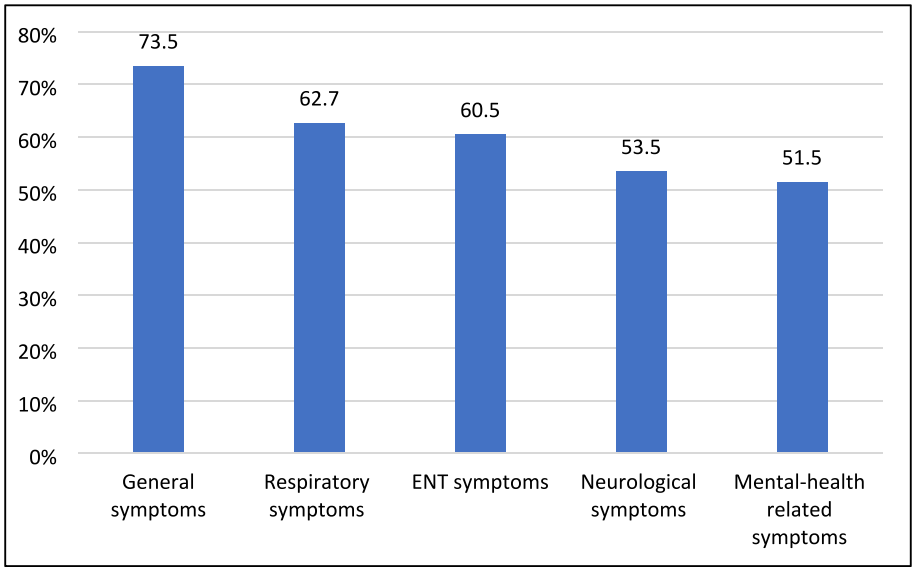

Fig. 1. Clinical findings post COVID-19 syndrome.

Table 2
Prevalence of Post-COVID-19 symptoms.

Post COVID-19 symptoms (n = 1047)	n	Prevalence %	95% CI
Fatigue	560	53.5	50.4–56.5
Dyspnea*	497	47.5	44.4–50.5
Arthralgia/myalgia	451	43.0	40.0–46.0
Cephalea	425	40.6	37.6–43.6
Sleep alterations**	376	36.1	33.0–39.0
Cough	328	31.3	28.5–34.2
Dizziness	273	26.1	23.4–28.8
Anxiety/panic attacks	266	25.4	22.8–28.2
Excessive sweating	252	24.1	21.5–26.8
Appetite loss	244	23.3	20.8–26.0
Anosmia/hyposmia	244	23.2	20.7–26.0
Ageusia/dysgeusia	243	23.2	20.5–25.7
Depression	237	22.6	20.1–25.3
Memory alterations	235	22.3	32.8–38.7
Telogen effluvium	227	21.7	19.2–24.3
Palpitations	221	21.1	18.7–23.7
Chest pain	204	19.5	17.1–22.0
Chills	191	18.2	15.9–20.7
Nasal congestion	190	18.1	15.6–20.6
Gastroesophageal reflux	166	15.9	13.7–18.2
Rhinorrhea	143	13.7	11.6–15.8
Xerostomia	140	13.4	11.4–15.6
Diarrhea	140	13.4	11.4–15.6
Vertigo	140	13.4	11.4–15.6
Dysphonia/aphonia	115	11.0	9.2–13.0
Nausea/vomit	110	10.5	8.7–12.5
Tachycardia	111	10.6	8.8–12.6
Abdominal pain	109	10.4	8.6–12.4
Odynophagia	105	10.0	8.3–12.0
Muscle retraction	101	9.6	7.9–11.6
Joint contracture	96	9.2	7.5–11.1
Tinnitus	84	8.0	6.4–9.8
Recurring infections	70	6.7	5.2–8.4
Muscle atrophy	65	6.2	4.8–7.8
Hypoacusis	61	5.8	4.5–7.4
Constipation	61	5.8	4.5–7.4
Chest pressure	61	5.8	4.5–7.4
Skin eruptions	59	5.6	4.3–7.2
Urticaria/hives	39	3.7	2.7–5.1
Facial pain	36	3.4	2.4–4.7
Arrythmia	36	3.4	2.4–4.7
Other (dermatological)+	12	1.1	0.6–2.0
Thrombosis	10	1.0	0.5–1.7
Hypertension	8	0.8	0.3–1.5
Paresthesia	7	0.7	0.3–1.4
Other (ENT-related) ++	7	0.7	0.3–1.4
Myocarditis	7	0.7	0.3–1.4
Convulsions	6	0.6	0.2–1.2
Cardiac insufficiency	6	0.6	0.2–1.2

* Dyspnea to any degree. **Difficulty falling asleep. Waking up multiple times. Waking up before desired time or nightmares. PTSD. + vocal cord paralysis following tracheostomy. Otalgia. dysphagia. ++Acne. nail loss.

median ages for females and males were 47 years (Q_1 35 - Q_3 58) and 46 years (Q_1 34 - Q_3 57), respectively. 65.5% of the sample population was in the age range of 30 to 59 years, only 1.5% of the patients identified as Afro-descendants and 1.1% as Indigenous. Regarding the place of residence, 93% of the participants were residents in urban areas. The general characteristics of the patient group are detailed in Table 1.

41.5% of the participants had a pre-existing chronic disease prior to COVID-19; 90% of these cases were under control. The main comorbidities were hypertension, anxiety disorders / panic attacks, diabetes, hypothyroidism, obesity, and gastrointestinal diseases. In terms of prior vaccination against SARS-Cov-2, only 22% of patients had received at least the first dose, of which only 2% had completed the full vaccination regimen. The period between the time of vaccination and coronavirus infection was <2 weeks for 45.2% of vaccinated participants (Table 1).

RT-PCR tests were requested upon finding compatible symptoms (81.8%) through a process known as “epidemiological fence” in 15.8% and as incidental findings in 2.4% of the cases. The patients included in the study cohort required different types of medical care during their acute stage of COVID-19: 9.7% received care in Intermediate Care Units and Intensive Care Units (ICU), 14% were treated in inpatient wards or emergency departments/observation units, and 76% were cared for by a physician at home or did not require medical assistance. Overall, 95% of patients received treatment for COVID-19. The most prescribed treatments were analgesics (31.8%) and antibiotics (22.4%) (Table 1).

Post COVID-19 symptoms

Post COVID-19 symptoms were initially grouped into organ systems: general symptoms (fatigue, dizziness, excessive sweating, appetite loss, palpitations, chills, and recurring infections) were more commonly reported by patients (73.5%), followed by respiratory symptoms (62.7%), Ear-nose-throat (ENT) symptoms (60.5%), neurological, and mental-health related symptoms (53.5% and 51.5% respectively) (Fig. 1). It is worth noting that each patient reported having one or more symptoms from the same or alternative symptom groups.

In the general symptoms group, fatigue was the most prevalent symptom, affecting 53.3% (95%CI: 50.2–56.4) of patients. Among the symptoms related to mental health, sleep disorders were the most common, affecting 35.7% (95%CI: 32.8–38.7). Regarding respiratory symptoms, dyspnea affected 47.5% (95%CI: 44.4–50.5) of the patients. Concerning neurological symptoms, headache was the most frequent, with 40.5% (95%CI: 37.5–43.5). Osteoarticular symptoms affected 45% of patients (95% CI: 42.0–48.0). Among ENT symptoms, olfactory disturbances affected 23.2% (95%CI: 20.7–26.0) of patients, while taste disturbances affected 23.0% (95%CI: 20.5–25.7). As for gastrointestinal symptoms, gastroesophageal reflux was the most relevant, with 15.8% (95%CI: 13.6–18.1). Tachycardia was the most frequent cardiovascular symptom, affecting 10.5% (95%CI: 8.7–12.5) of patients. Finally, hair loss and telogen effluvium were the most prominent dermatological symptoms, affecting 21.7% (95%CI: 19.2–24.3) of patients. (Table 2).

The patients also reported other symptoms related to organ systems different from the ones in within the questionnaire, such as visual disturbances (1.1%), especially visual acuity; dental alterations (0.3%) which included loose teeth and tooth loss; gynecological alterations (0.3%) like menometrorrhagia; and endocrine alterations (1.1%) such as diabetes or hypothyroidism post COVID-19.

In the analysis by age group, differences were observed in relation to seven specific symptoms: depression, anosmia/hyposmia, nasal congestion, rhinorrhea, skin eruptions, and visual and endocrine disorders. Depression was the most common symptom in both younger and older adults, while alterations in smell primarily affected individuals under 50 years of age. Nasal congestion was more frequent in those under 40, rhinorrhea in those under 50, skin eruptions were predominant in the 60 to 69 age group, visual disturbances occurred more frequently in adults aged 50 to 59, and endocrine alterations were detected in patients over the age of 60 (Fig. 2).

Depression was predominant in women across all age groups with a frequency >20%, muscular atrophy was more frequently seen in patients between 60 and 69 years of age as well as skin eruptions. Visual disturbances were noticed for those between the 30–39 and 50–59 age groups. In men, differences regarding anosmia/hyposmia (which was more frequent within the 18–39 age range), appetite loss (predominant in those over the age of 70), chest pain (mainly for those aged 30–39), recurring infections (in patients over 30 years old), and sleep disorders such as nightmares, waking up in the middle of the night, among others, were noticeable. Prominent across all male age groups except those between 30 and 39 years of age. Some symptoms were more frequent in women than in men (Table 3).

Regarding the number of symptoms, 72% (95% CI: 69.6–75.1) of the patients presented four or more post-COVID-19 symptoms, 9% (95%CI: 7.7–11.3) had three symptoms, 9% (95% CI: 7.7–11.3) had two symptoms, and 10% (95%CI: 7.8–11.4) had one symptom. Differences were observed between males and females regarding the number of

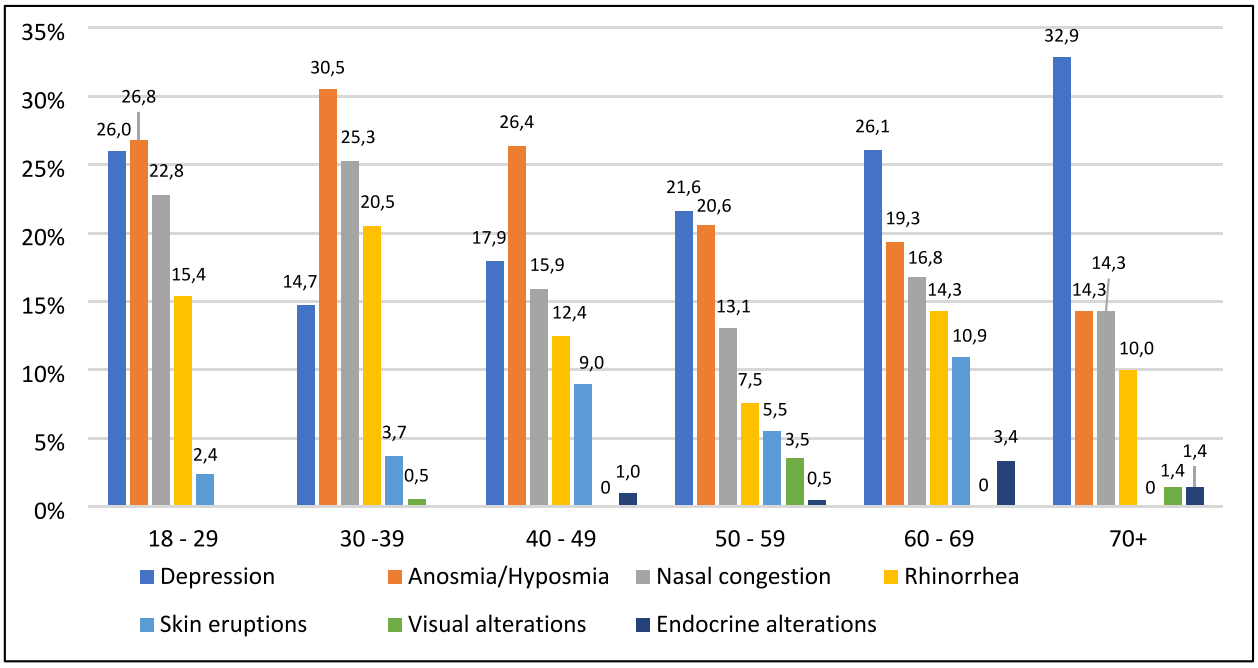

Fig. 2. Symptoms in patients with PCS categorized by age groups.

Table 3
Symptoms in patients with PCS classified by sex.

Symptom	Male			Female		
	n = 390	%	95% CI	*n* = 657	%	95% CI
Anxiety/Panic attacks	81	20.8	16.8–25.1	185	28.2	24.7–31.7
Depression	69	17.7	14.0–21.8	168	26.6	22.2–29.0
Arthralgia/Myalgia	150	38.5	33.6–43.4	301	45.8	41.9–49.7
Anosmia/ Hyposmia	75	19.2	15.4–23.4	169	25.7	22.4–29.2
Ageusia/Dysgeusia	71	18.2	14.5–22.3	172	26.2	22.8–29.7
Gastric reflux	48	12.3	9.2–15.9	118	18.0	15.0–21.1
Nausea/Vomit	29	7.4	5.0–10.5	81	12.3	9.9–15.0
Hair loss	51	13.1	9.8–16.8	176	26.8	23.4–30.3
Other (dermatological)	1	0.3	0.01–1.4	11	1.7	0.8–2.9

symptoms, suggesting that men frequently presented one to three symptoms (men 31.7% 95% CI: 27.1–36.6 vs women 24.9% 95% CI: 21.6–28.4) whereas women generally presented four or more symptoms (men 68.2% 95% CI: 63.3–72.8 vs women 75.0% (95% CI: 71.5–78.3).

Concerning the number of symptoms observed in patients who received outpatient care compared to those who received inpatient care, it was observed that patients who received inpatient care reported a greater number of symptoms than patients who received outpatient care. 81.3% of inpatients reported having four or more symptoms, while 69.8% of outpatients reported the same number of symptoms. However, the distribution of those with three or fewer symptoms was more balanced in both groups (Fig. 3).

Regarding the treatment received for post-COVID-19 symptoms, only 67.5% (95% CI: 63.4–69.5) of the patients received some form of treatment. Analgesics were the most frequently prescribed, at 52.0% (95% CI: 48.0–55.9), followed by vitamin supplements at 29.1% (95% CI: 25.6–32.8), and antihistamines and anti-inflammatories at 19.2% (95% CI: 16.1–22.4) and 18.7% (95% CI: 15.7–21.9), respectively (Table 4).

Post COVID-19 symptoms classified by geographical regions

The geographical analysis was conducted in conjunction with the general analysis. Gender distribution was similar across all cities. However, differences in age groups among the different cities were identified. The most notable differences were observed in Medellín and Cali, where the 30 to 39 age group was more prominent, representing 26.6% (95% CI: 20.8–32.9) and 23.9% (95% CI: 15.4–34.1) respectively of the cases. In Bogotá, Barranquilla, and Bucaramanga, the majority of individuals were between 50 and 59 years old, constituting 23.2% (95% CI: 18.0–29.0), 24.1% (95% CI: 17.8–31.3), and 25.9% (95% CI 19.8–32.7), respectively. The proportion of people in the 40 to 49 age range was similar in all cities, being <20%. Finally, Medellín had the highest number of participants in the 18 to 29 age group, at 18.8% (95% CI: 13.8–24-6).

Discussion

The disease burden that PCS will bring in post-pandemic times has incentivized the development of studies in hopes of finding an answer regarding its long-term prevalence, symptoms, and complications [3]. Currently, there is a great number of observational studies and meta-analyses about post COVID-19 symptoms, which have been published within the science community. However, these have shown noticeable variation (I^2), possibly due to different definitions for PCS used in each individual study and the features within the population samples. Our study used the definition given by NICE, to select PCS patients. We found that other authors who used the same definition reported similar results to our study; For instance, Álvarez [16], conducted research on the 13 commonest symptoms in over 21.000 patients with PCS in Bogotá via survey. This study found that 63% of said patients suffered from at least one recurring symptom for over three months after first contracting COVID-19. Over 50% of the surveyed participants reported symptoms like headache, (61.7%), fatigue (60.8%), insomnia (56.7%), myalgia (53.7%), and dyspnea (51.3%) which are categorized within the ten initial symptoms that were reported by the patients who took part in our study. Anaya et al. [17] conducted a cross-sectional study which included 100 patients for CREA (*Center for Autoimmune Diseases Research* in Spanish) in Colombia and described musculoskeletal, digestive, and

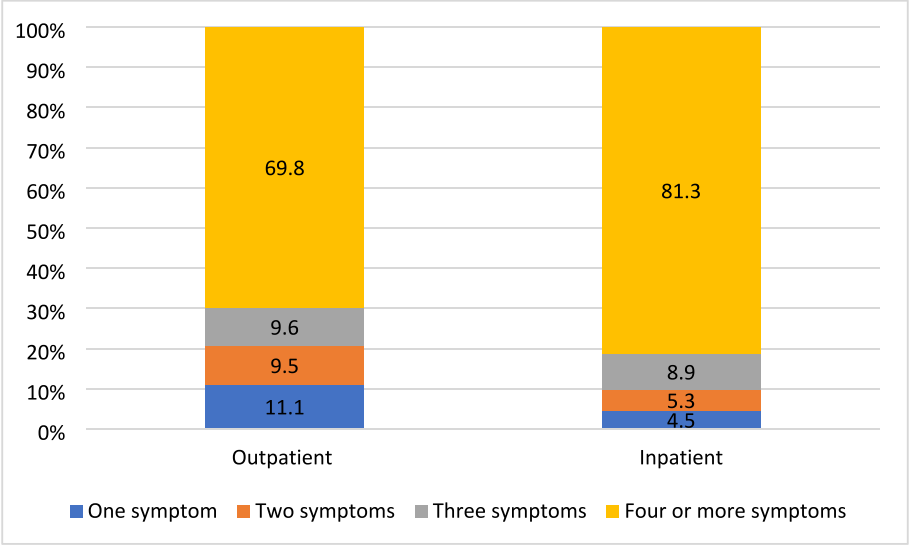

Fig. 3. Post COVID-19 symptoms according to medical assistance offered.

Table 4
Treatment received during post-COVID-19 syndrome.

Treatment during PCS ($n = 965$)	n	%	95% CI
Yes	642	67.5	63.4–69.5
No	323	32.5	30.4–36.5
Prescribed treatments($n = 642$)			
Analgesics	334	52.0	48.0–55.9
Vitamin/Mineral supplements	187	29.1	25.6–32.8
Antihistamines	123	19.2	16.1–22.4
Anti-inflammatories	120	18.7	15.7–21.9
Corticosteroids	70	10.9	8.5–13.5
Inhaler	68	10.6	8.3–13.2
Physical therapy	60	9.3	7.2–11.8
Anxiolytics/antidepressants	58	9.0	6.9–11.5
Antibiotics	36	5.6	3.9–7.6
Proton-pump inhibitors	19	3.0	1.7–4.5
Antihypertensive	18	2.8	1.6–4.3
Respiratory therapy	17	2.6	1.5–4.2
Anticoagulant	14	2.2	1.1–3.6
Oxygen	12	1.9	0.9–3.2
Sleep aids	11	1.7	0.8–3.0
Sodium Alginate	9	1.4	0.6–2.6
Myorelaxant	7	1.1	0.4–2.2
Antidiarrheal	6	0.9	0.3–2.0
Antitussives	5	0.8	0.2–1.8
Antivertigo	3	0.5	0.1–1.3
Psychotherapy	3	0.5	0.1–1.3
Thyroid hormones	2	0.3	0.03–1.1

neurological symptoms as the most prevalent ones (35%). It was also mentioned that a third of PCS patients simultaneously presented symptoms related to four different organ systems. For our study, it corresponded to three quarters of the population who reported having four or more symptoms simultaneously.

In Brazil, Miranda et al. [18] followed up on volunteers whose medical records confirmed SARS-Cov-2 infection and who sought treatment at an emergency center. 646 patients were surveyed; 50.2% reported post COVID-19 symptoms, out of which 42.6% were between the ages of 41 and 60; symptoms were more frequent in women (63.3%) than in men. Most patients reported fatigue (35.6%), persistent cough (34.0%), dyspnea (26.5%), loss of taste and smell (20.1%), and headache (17.3%). The presence of one persistent symptom occurred in 42.6% of the cases, presence of two or three symptoms simultaneously in 43.8%, four of five symptoms in 8.0%, and > 5 symptoms in 5.5% of the cases [18].

Whitaker et al. [8] conducted a study on the prevalence of post COVID-19 symptoms in 606,434 patients in the United Kingdom; the five most prevalent symptoms included fatigue (16.8%; 95%CI 16,5–17,1), dyspnea (9–8%; 95%CI 9–6–10.1), difficulty sleeping (7.5%; 95%CI 7.3–7.7), chest pressure (5.8%; 95%CI 5.7–6), and headache (5.2%; 95%CI 5.1–5.4). The study also found that 37.7% (95% CI 37.4–38.0) presented one or two symptoms, 23.5% (95%CI 23.2–23.8) two or more, and 14.8% (95%CI 14.5–15.0) three or more at or after 12 weeks; women had more symptoms than men among all categories and symptom prevalence increased with age.

Furthermore, the sample population in our study showed similar findings to those of national and international studies and might be used as point of reference regarding both general and regional aspects given the analyzed data, despite not representing the country. Besides, we highlight the fact that the sample population was recruited by convenience as the medical professionals gathered the data upon the requirements of the study. However, it should be noted that patients were surveyed regardless of medical specialty, that is to say, upon identifying persistent related symptoms (according to training and criteria provided by the researchers) during or after 12 weeks and confirmation of viral infection via RT-PCR, the participants were encouraged to partake freely in the study, even if the reason for their visit was different from post COVID-19 symptoms.

Information bias might be potentially present in this study, and, determined by the quality and precision of the information collected during the interviews and that of medical records; this was prevented by training medical professionals to correctly fill out the questionnaire, and by programming the platform to limit data entry regarding age and RT-PCR testing dates in comparison to the date of the medical visit. This, to prevent further data input in case the information did not meet the requirements for the study. Potential limitations that could influence the interpretation of these results include the cross-sectional nature of the study, which limits our ability to establish causal relationships and conduct long-term follow-up of patients. Additionally, the exclusion of inpatients may introduce selection bias, which could have led to an underestimation of the frequency and severity of post-COVID-19 symptoms. Despite these limitations, this study provides valuable information on post-COVID-19 clinical manifestations in Colombian adults, highlighting the importance of conducting further research in this area.

Conclusions

In conclusion, PCS is now a clinical entity that resides among us and which therefore, becomes difficult to diagnose, given its pathophysiological features as well as frequent multisystemic affectations. It is important to establish clinical guidelines regarding treatment, recovery, and clinical pathways which will serve as means of identification and guidance to treat patients effectively to avoid negative changes in their health and lifestyle; doing so also helps to avoid overusing medical resources due to a lack of specific diagnoses.

Declaration of Competing Interest

This study was funded by Tecnoquímicas, however, the literature search, study development, and interpretation of results were conducted independently and objectively by the authors. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloepi.2023.100126.

References

[1] National Institute for Health and Care Excellence (NICE) SIGN (SIGN) and RC of GP (RCGP). Covid19 Rapid Guideline: Managing the Longterm Effects of Covid19. National Institute for Health and Care Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN) and Royal College of General Practitioners (RCGP). 2022. p. 1–106.

[2] World Healtn Organizarion. A clinical case definition of post COVID-19 condition by a Delphi consensus data accessed:2021-12-23. WHO/2019-nCoV/Post_COVID-19_condition/Clinical_case_definition/2021.1. 2021.

[3] Umesh A, Pranay K, Pandey RC, Gupta MK. Evidence mapping and review of long-COVID and its underlying pathophysiological mechanism. Infection 2022;50:1053–66.

[4] Michelen M, Sigfrid L, Kartsonaki C, Shemilt I, Hastie C, O'hara M, et al. Characterising long COVID: a living systematic review. BMJ Global Health 2021;6(9):e005427.

[5] Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global prevalence of post-coronavirus disease 2019 (COVID-19) condition or long COVID: a meta-analysis and systematic review. J Infect Dis 2022;226(9):1593–607.

[6] Nguyen NN, Hoang VT, Dao TL, Dudouet P, Eldin C, Gautret P. Clinical patterns of somatic symptoms in patients suffering from post-acute long COVID: a systematic review. Eur J Clin Microbiol Infect Dis 2022;41(4):515–45.

[7] Thompson EJ, Williams DM, Walker AJ, Mitchell RE, Niedzwiedz CL, Yang TC, et al. Long COVID burden and risk factors in 10 UK longitudinal studies and electronic health records. Nat Commun 2022;13(1).

[8] Whitaker M, Elliott J, Chadeau-Hyam M, Riley S, Darzi A, Cooke G, et al. Persistent COVID-19 symptoms in a community study of 606,434 people in England. Nat Commun 2022;13(1):1–10.

[9] Kim Y, Kim SE, Kim T, Yun KW, Lee SH, Lee E, et al. Preliminary guidelines for the clinical evaluation and management of long COVID. Infect Chemother 2022;54(3):566.

[10] WHO. Coronavirus disease (COVID-19): Post COVID-19 condition [Internet]. [cited 2022 Nov 23]. Available from: https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition?gclid=EAIaIQobChMIlsyllqHF-wIVFNGGCh1g7wWxEAAYASAAEgI8EfD_BwE.

[11] Lopez-Leon S, Wegman-Ostrosky T, Perelman C, Sepulveda R, Rebolledo PA, Cuapio A, et al. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. Sci Rep 2021;11(1).

[12] The prevalence of long COVID symptoms and COVID-19 complications - Office for National Statistics [Internet]. [cited 2021 Aug 10]. Available from: https://www.ons.gov.uk/news/statementsandletters/theprevalenceoflongcovidsymptomsandcovid19complications.

[13] Kish L. Survey sampling. New York, London: John Wiley & Sons, Inc; 1965. IX + 643 S., 31 Abb., 56 Tab., Preis 83 s. [Internet]. [cited 2021 Aug 10]. Available from: https://onlinelibrary.wiley.com/doi/epdf/10.1002/bimj.19680100122.

[14] Colombia M de saud de. Ministerio de salud. Resolucion numero 8430 de 1993. Minist Salud 2012;32(4):471–3.

[15] Congreso de Colombia. Ley Estatutaria 1581 De 2012. https://www.unicauca.edu.co/versionP/sites/default/files/files/LEY_1581_DE_2012.pdf. 2012.

[16] Alvarez-Moreno CA, Pineda J, Bareño A, Espitia R, Rengifo P. Long COVID-19 in Latin America: low prevalence, high resilience or low surveillance and difficulties accessing health care? Travel Med Infect Dis 2023;51(November 2022):102492.

[17] Anaya JM, Rojas M, Salinas ML, Rodríguez Y, Roa G, Lozano M, et al. Post-COVID syndrome. A case series and comprehensive review. Autoimmun Rev 2021;20(11).

[18] de Miranda DAP, Gomes SVC, Filgueiras PS, Corsini CA, Almeida NBF, Silva RA, et al. Long COVID-19 syndrome: a 14-months longitudinal study during the two first epidemic peaks in Southeast Brazil. Trans R Soc Trop Med Hyg 2022;116(11):1007–14.