Extension project focused on health education to post-Covid-19 metabolic syndrome patients in the Amazon region

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ABSTRACT

In 2020, a new coronavirus strain led to the declaration by the World Health Organization (WHO) of a pandemic global event. With an expansion pandemic to several territories, the involvement of risk groups started to be significantly more evident than healthier patients. Categorized individuals as obese, diagnosed diabetes mellitus type 2 (DM2), and high blood pressure are shown to be more susceptible to severe cases than other individuals, reinforcing even more the greater prevalence of those diseases in our modern world. In the short period since COVID-19 onset cases, few studies could manage to address the diagnostics or even development of long-term symptoms, which sometimes take years to be noticed or start its natural clinic course. With studies showing the possibility of symptoms occurrence or serious deepening of metabolic syndrome in post-infected patients, the health education process aims to establish ways to create and raise awareness about maintaining life quality and healthy eating habits to contribute to a reduction of negative impacts long-term wise caused by a previous metabolic syndrome or started after COVID-19 infection. The extension project focused then on posterior complication development prevention caused by SARS-CoV-2 infection by encouraging a quality lifestyle. The educational booklets and attendance satisfaction questionnaires were tools for better clarification about how to make those quality lifestyle changes, besides the multidisciplinary attention as an aid to consolidate the health education to the patients. In this way, members of this project sought to foment research activities about this field with still few population studies, encouraging to consolidate the knowledge about the clinical course of this virus. Having contact amongst project members and patients, the construction of relations occurred bilaterally, with intercommunication between academic knowledge and cultural values, bringing a better future change to the patients.

Keywords: COVID-19, Metabolic syndrome, Healthy behavior.

CONTEXT FOR THE EXTENSION

In 2020, a new coronavirus strain designated as SARS-CoV-2 was responsible for thousands of hospitalizations and unpleasant outcomes for several people around the world due to its transmissibility properties, leading to the World Health Organization (WHO) declaration of a global-scale pandemic on March 11th of that year[1]. Preventive measures were taken by governments in many countries, including a more restrictive one such as lockdown (a complete closure of non-essential services to most of the population, such as leisure activities, businesses, and related services) associated with social isolation, aiming to avoid virus circulation and break the chain of virus transmission[2]. However, as the number of cases increased in more territories, risk factors and comorbidities associated with the progression to severe cases became more evident. Obesity was identified as an important contributing factor linked to higher hospitalization rates and increased mortality rates[3]. Moreover, patients diagnosed with Type 2 Diabetes Mellitus (DM2), whether obese or not, had a higher risk of infection and complications, particularly in Brazil, including patients with cardiovascular diseases and Systemic Arterial Hypertension (SAH). With more case studies on COVID-19, it was observed that the incidence of COVID-19 infection was seven times higher in patients with a metabolic syndrome diagnosis, 2.5 times higher in hypertensive patients, 2.2 times higher in obese patients, and 1.4 times higher in diabetic patients. One of the mechanisms that

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could explain this higher vulnerability to the disease is an intense inflammatory activity generated by the activation of pro-inflammatory cells, such as mast cells, which are intimately related to a cytokine storm. This leads to an intense inflammatory state, causing thromboembolic events in patients with cardiovascular diseases, and insulin resistance caused by inflammatory cytokines such as PAI-1, leptin, TNF-α, and interleukins. Additionally, the intense inflammatory activity can cause cellular damage to multiple organs, including myocardial cells, leading to impaired contractile movement and a change in the demand profile for proper tissue perfusion. The susceptibility to cardiovascular lesions is also attributed to the presence of common specific receptors, particularly elevated expression of Angiotensin-Converting Enzyme 2 (ACE2), in the cardiovascular and pulmonary systems of hypertensive and diabetic patients, this receptor serving as the entry point for the virus into cells, leading to a reduction in enzyme activity that is directly correlated with the progression of cardiac damage. However, despite the significant expansion of knowledge regarding the involvement of various systems, little has been studied about the onset of metabolic syndrome in the post-infected population with SARS-CoV-2 and its impact on the lifestyle of these patients. Despite the initial site of viral compromise being the lungs, which interferes with the general quality of life of patients, several studies indicate that the post-infection period is a second phase of care during which patients experience diverse organ dysfunctions, highlighting the real necessity for a multidisciplinary approach. In addition to addressing general organic compromise, healthcare professionals must pay attention to the endocrinological perspective when caring for patients who have experienced severe illness and required long periods of intensive care. This underscores the need for health education regarding dietary care and the importance of physical health post-COVID, considering the limited evidence on long-term sequelae of this infection. Therefore, the extension project organized and executed in the metropolitan region of Belém do Pará aimed to stimulate post-COVID lifestyle change strategies for patients who needed intensive care during hospitalization.

OBJECTIVES

Aligned with the principles of care and comprehensive health care, the extension project was based on the following strategies, emphasizing health education initiatives for the post-infected population with SARS-CoV-2, with a focus on cardiovascular and metabolic care measures, aiming to control the adverse effects of the infection. This included promoting healthy eating habits, regular exercise, and providing respiratory physiotherapy for those in need of rehabilitation. From the outset, the organization of the extension project was focused on bridging the gap between technical-scientific knowledge from the university and the regional knowledge of the population, fostering intercultural communication, and establishing a trustworthy and respectful relationship between undergraduate students and the public they served. As the main objective was health promotion, emphasis was placed on prevention measures and controlling pre-existing comorbidities or newly developed conditions because of the infection. Each patient was treated individually and holistically, considering their specific needs.

GOALS

It was agreed that the extension should ensure tangible outcomes and results in line with the established objectives. Therefore, the project members agreed to integrate assistance, teaching and research components to provide meaningful follow-up and deliverables to the population. This report serves as a research output that can contribute to other similar projects. Additionally, training and capacity building was provided to the project members through continuing education programs for medicine undergraduate students in the metropolitan region of Belem, the capital of the Para state. This allowed for close collaboration with postgraduate students and facilitated effective task distribution among team members.

EXTENSION ORGANIZATION

To accommodate patients, they were assisted based on an initial sorting of SARS-CoV-2 infection using previous laboratory methods

before appointments commenced, and they were assigned to multidisciplinary services. The sorting process involved either spontaneous demand or telephonic contact following specific eligibility criteria, such as previous hospitalization in the Intensive Care Unit (ICU) and confirmation of infection through laboratory tests and imaging exams indicating pulmonary involvement, such as thoracic computerized tomography (CT) or X-ray (XR), with the latter being optional. Medical appointments were connected to nutritional counseling to address lifestyle changes effectively. Initially, blood samples were collected to confirm the diagnosis of previous infection and evaluate laboratory parameters as requested by the healthcare professional, including serum glucose, serum triglycerides, and lipid profile. Patients were then monitored by various professionals such as occupational therapists, psychologists, and physiotherapists, and they were referred for evaluation and medical appointments in a single visit, receiving guidance and further referrals to other specialties such as neurology, cardiology, and/or pneumology (Figure 1).

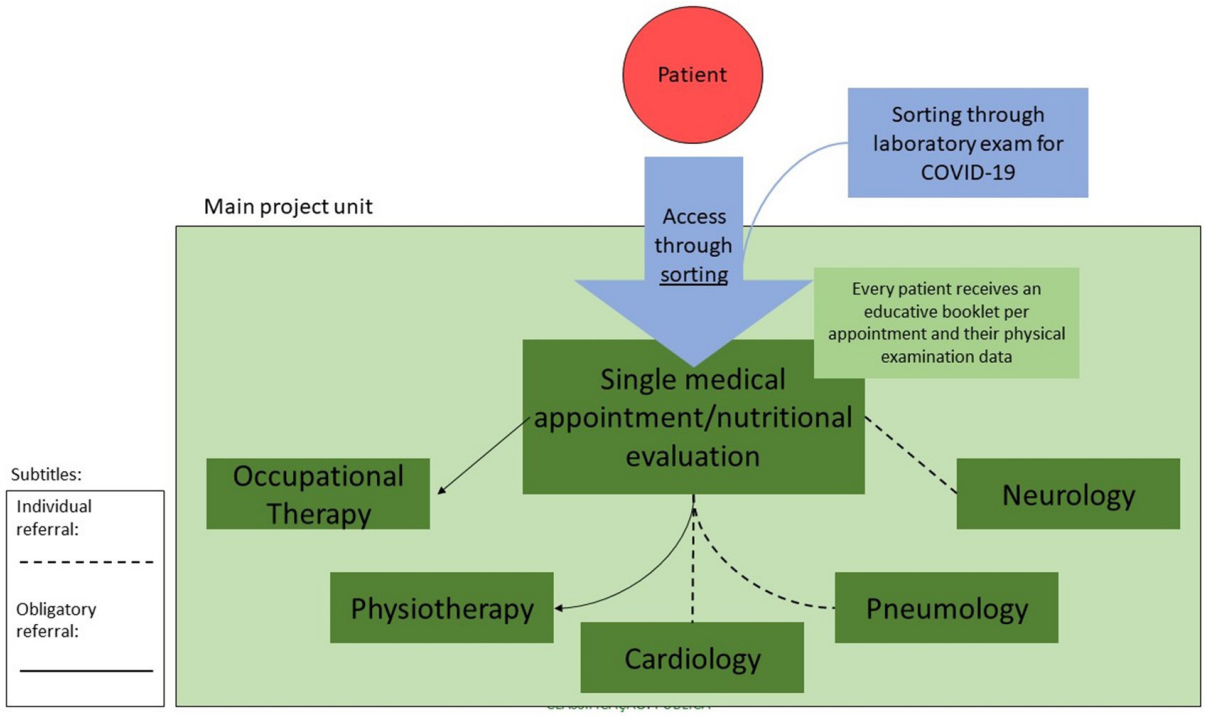


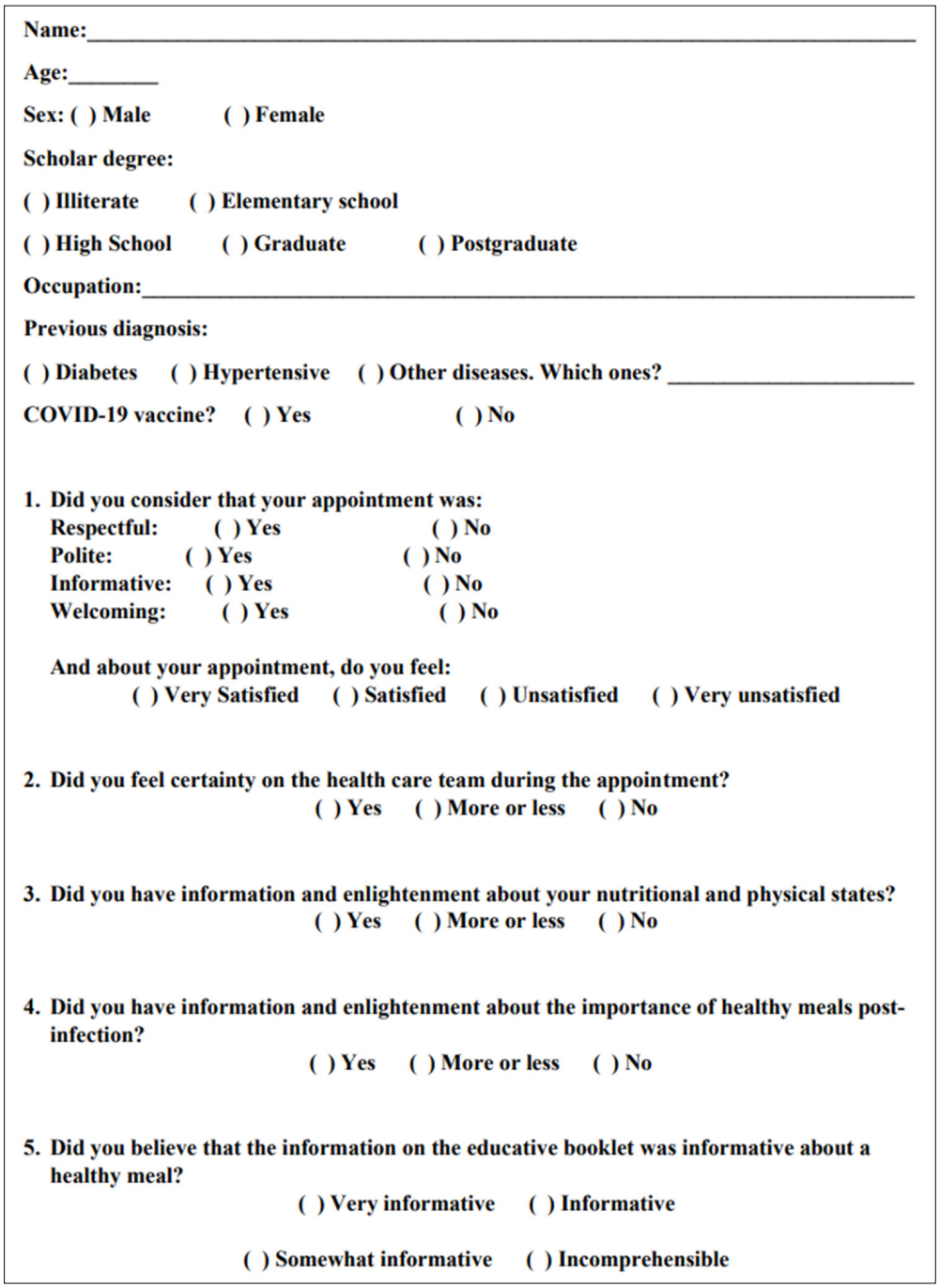
Figure 1: Schematic representation of the project organization levels.

During the initial medical appointment, a physical evaluation was conducted, and inquiries were made about past illnesses and comorbidities. The physical examination aimed to record patients' weight, height (for BMI calculation), relevant circumferences (waist, abdominal, and hips) for cardiovascular risk assessment, and blood pressure (to document existing hypertensive diagnosis if applicable). The nutritional counseling addressed the same diseases and comorbidities mentioned earlier (Systemic Arterial Hypertension, Diabetes Mellitus, cardiopathy, obesity), as well as behaviors and habits (smoking, drinking, physical exercise), family medical history (prevalence of diseases among first- or second-degree relatives), and dietary habits (consumption of hypercaloric or hypocaloric meals, high salt intake, low water consumption). By organizing appointments in this manner, patients could be referred for ongoing follow-up with physiotherapy and other specialties deemed necessary by the consulting healthcare professionals. After appointments, patients had access to their physical examination results with parameters of normality as referenced by the World Health Organization (WHO), which allowed for

the identification of cardiovascular risks based on waist-to-hip ratio, assessment of visceral fat accumulation through abdominal circumference, blood pressure levels, and categorization according to the 2020 Brazilian Guidelines for Arterial Hypertension from the Brazilian Society of Cardiology (SBC). The obtained results were transcribed into patient booklets developed for the project, providing information on how to maintain an appropriate diet during periods of social isolation (Figure 2). The booklet served as a tool for continuing education, providing participants with information, and empowering them to make dietary changes and adopt a healthier lifestyle. The material covered topics such as the etiology of metabolic syndrome, risks associated with high blood pressure, and potential post-COVID effects. It was presented in accessible language and easy-to-understand format, with a focus on using more visual information than textual content.

Figure 2: Excerpt from the educational material developed for the project.

To facilitate feedback on each appointment, an organized and adapted questionnaire from the National Health Services Evaluation Program (PNASS) was created by the extension participants, and data were collected through this questionnaire. The information collected included details about participants' educational background, age, gender, occupation, satisfaction with the service, perception of enlightenment regarding their current nutritional state, the importance attributed to understanding balanced eating concerning quality of life and the prevention of dyslipidemia and metabolic syndrome during the appointment, as well as the accessibility of the booklet for the patient (Figure 3).



Name:_____

Age:_____

Sex: ( ) Male ( ) Female

Scholar degree:

( ) Illiterate ( ) Elementary school

( ) High School ( ) Graduate ( ) Postgraduate

Occupation:_____

Previous diagnosis:

( ) Diabetes ( ) Hypertensive ( ) Other diseases. Which ones? _____

COVID-19 vaccine? ( ) Yes ( ) No

1. **Did you consider that your appointment was:**
   Respectful: ( ) Yes ( ) No
   Polite: ( ) Yes ( ) No
   Informative: ( ) Yes ( ) No
   Welcoming: ( ) Yes ( ) No

   And about your appointment, do you feel:
   ( ) Very Satisfied ( ) Satisfied ( ) Unsatisfied ( ) Very unsatisfied

2. **Did you feel certainty on the health care team during the appointment?**
   ( ) Yes ( ) More or less ( ) No

3. **Did you have information and enlightenment about your nutritional and physical states?**
   ( ) Yes ( ) More or less ( ) No

4. **Did you have information and enlightenment about the importance of healthy meals post-infection?**
   ( ) Yes ( ) More or less ( ) No

5. **Did you believe that the information on the educative booklet was informative about a healthy meal?**
   ( ) Very informative ( ) Informative

   ( ) Somewhat informative ( ) Incomprehensible

Figure 3: Feedback questionnaire (adapted from PNASS).

RESULTS OBTAINED

It was determined that 150 patients would be assisted between March 2021 and March 2022. As a result, the project focused on promoting health education measures for the post-infected population of SARS-CoV-2, with a specific emphasis on cardiovascular and metabolic care. Additionally, a connection was established with the service environment, enabling teaching and research activities among team members. The project also emphasized the importance of follow-up appointments for continuous monitoring of patients, highlighting the significance of understanding the long-term metabolic

effects caused by COVID-19 and maintaining a longitudinal research focus. Preventive measures and the management of non-infectious chronic diseases were consistently emphasized for both pre-existing and newly developed health conditions to interrupt the natural course of the illness and reduce the incidence of complications. Out of the proposed 150 patients, 34.67% could be scheduled for appointments. This lower percentage was due to a disruption in appointments at the main project unit during June/July, which was subsequently resumed in the first week of August 2021. Additionally, there were some patients who were lost to follow-up, and the proposed local activities were interrupted due to infrastructure issues, specifically laboratory equipment maintenance (Table 1). The average body mass index (BMI) of the patients seen at the unit was 32, classifying them as Obesity Class 1 during their appointments. Of these patients, 65% were women and 35% were men (Graph 1), with an average age of 53.71 ± 12.91 (Table 2).

Table 1

Quantitative results of the extension project.

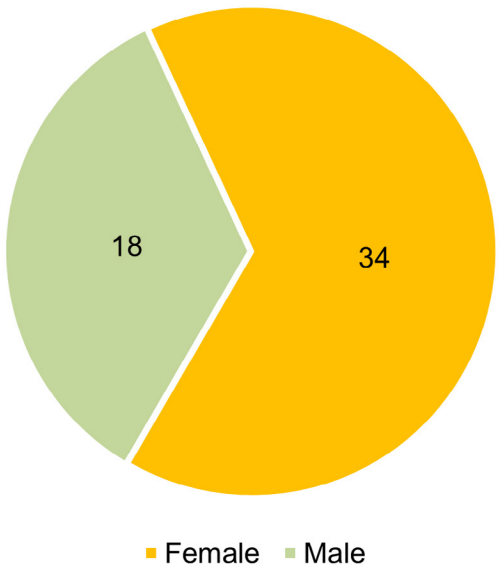
	Proposed quantitative	Reached quantitative
Total (n, %)	150 (100%)	52 (34.67%)
Men (n, %)	75 (50%)	18 (24%)
Women (n, %)	75 (50%)	34 (45.34%)

Table 2

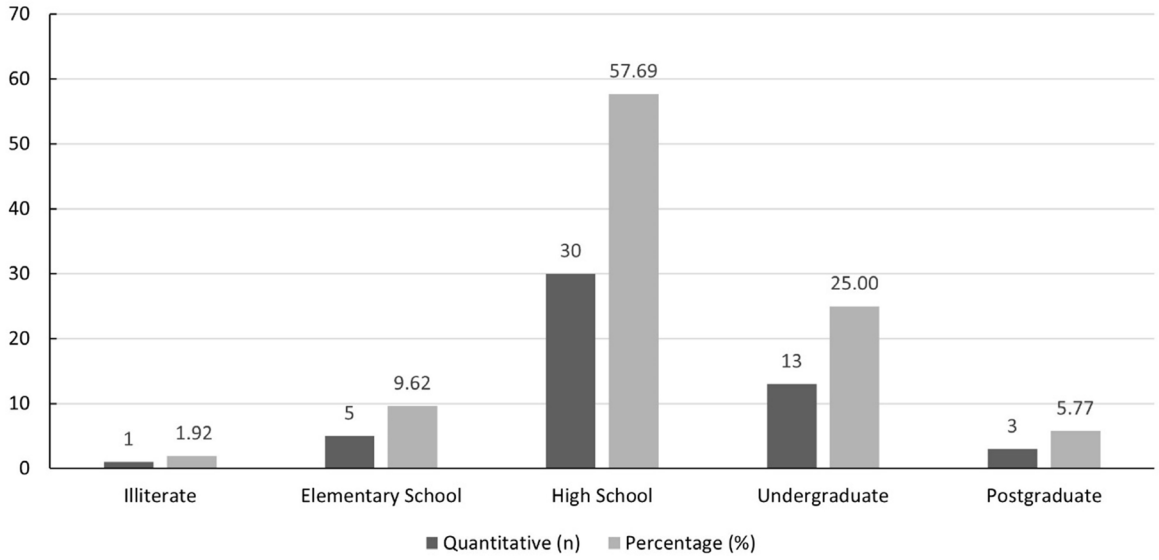
Registered patients age mean and median.

	Mean ± SD	Median (max., min.)
Total	53.71 ± 12.91	51 (76.21)
Male	55.11 ± 13.26	56 (76.33)
Female	52.60 ± 12.88	56 (76.21)

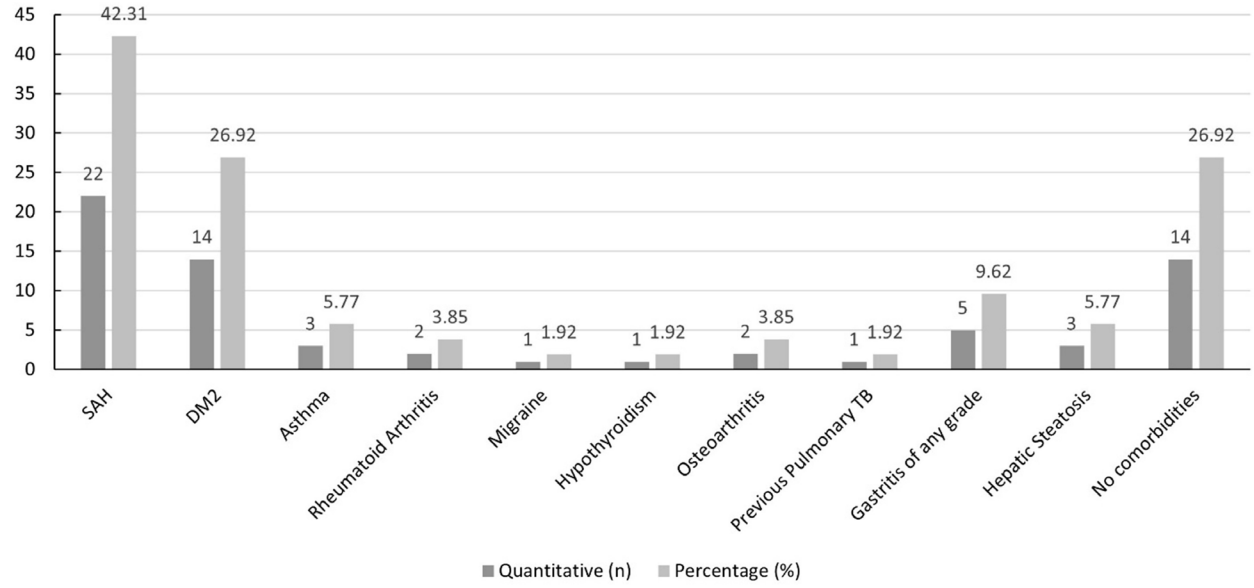
Concerning educational background, 57.69% of the patients assisted had completed high school, 25% had an undergraduate degree, and 9.62% had completed only elementary school. Additionally, 1.92% of patients were illiterate (Graph 2). Regarding comorbidities, 43.31% of patients had a diagnosis of Systemic Arterial Hypertension (SAH), 26.92% had Type 2 Diabetes Mellitus (DM2) as one of their comorbidities, 34.61% had other comorbidities different from the previous ones (such as rheumatoid arthritis, hypothyroidism, migraines, among others), and 22.92% of patients did not have any clinical comorbidities at the time of assessment (Graph 3). During the implementation of the project activities, the COVID-19 vaccination campaign progressed gradually. Among the patients, 76.92% had received at least one dose of the vaccine. It is important to note that the vaccination campaign in the state of Para followed the vaccination schedules organized by the Municipal Health Secretary during this period (Table 3).



Graph 1: Number of patients assisted from March 2021 to March 2022.



Graph 2: Maximum scholar degree of attending patients.



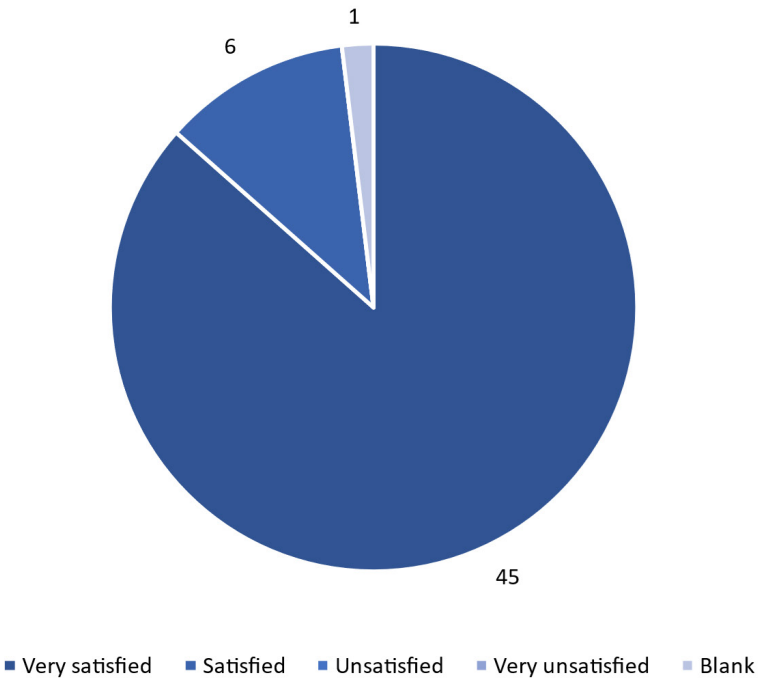
Graph 3: Isolated present comorbidities during clinical assessment.

Table 3

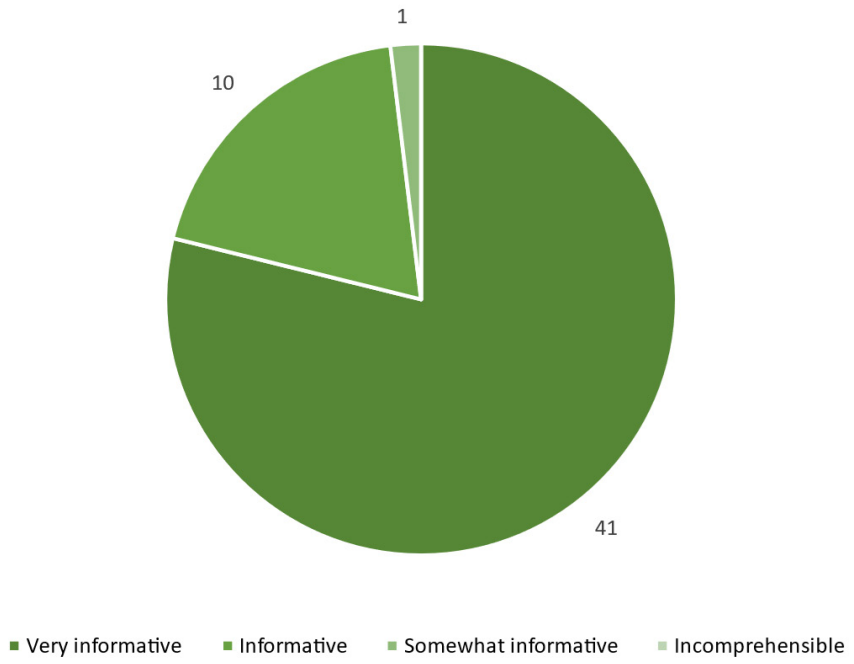
Number of doses of any COVID-19 vaccine administered to the assisted patients.

	At least one dose	Non vaccinated
Total (n, %)	40 (76.92)	12 (23.07)
Male (n, %)	13 (25)	5 (9.61)
Female (n, %)	27 (51.92)	7 (13.46)

Regarding the desired feedback on the attitude in the care provided, all patients demonstrated a high level of satisfaction with the team, recognizing the instructions as welcoming and the professional attitude as appropriate, with 86.53% of the patients left the appointment "very satisfied" and 11.53% of the patients left the appointment "satisfied," with none of them leaving the appointment "unsatisfied," with one answer left blank (Graph 4). As for the feedback on the educational booklet, 78.84% of the patients found the information "very informative," 19.23% of the patients found the information "informative," and 1.92% of the patients found the information "somewhat informative" (Graph 5). The regular project team meetings remained online on a weekly basis, discussing the members' presence in the outpatient clinic, approaches to patient care and addressing any questions that arose during the activities. Extraordinary meetings were held bimonthly to coordinate efforts to reach a larger number of patients during the second year of the pandemic. With the booklet titled "Dietary Care after COVID-19," patients included in the physiotherapeutic rehabilitation program after COVID-19 received notes on anthropometric and clinical parameters, enabling them to understand their health status. The booklet also included a technically adapted explanation in layman's terms about metabolic syndrome, clarifying the findings from the physical examination. In addition to informative sections about cardiovascular diseases, diabetes, and dyslipidemia, the project's booklets introduced feasible ways to make dietary changes in the patients' routines. Alongside the verbal explanations provided by the students and responsible team, this was the necessary requirement to evaluate the questionnaire for feedback.



Graph 4: Satisfaction level towards care received during appointment.



Graph 5: Informative feedback about in booklet information.

DIFFICULTIES FACED

Despite the efforts of the entire team involved in the project, as well as the collaborative cooperation of the coordinators at the main facility, the COVID-19 pandemic was still in full force. With health measures sanctioned by the city government, activities needed to be interrupted on several occasions to implement lockdowns, thus slowing down the spread of the disease. Another challenge was the high demand for laboratory tests, which resulted in constant maintenance of the clinical analysis devices, causing screening to be unavailable during those times and preventing the scheduling of new appointments. It is worth noting that the difficulty in achieving a greater impact on the population was due to the constant fear of new COVID-19 cases, as well as the vaccination schedule and its progression, according to the municipal health department.

CONCLUSION

Finally, the initial project was concluded at the primary main unit, while continuing to be followed up at a second unit that provided support for the ongoing care of these patients, aiming to provide clarification on the propensity or development of post-COVID metabolic diseases. As a result, the patients who were assisted to did not experience any loss in their follow-up and were reassigned according to the available healthcare resources. The project helped establish the continuous care of these patients, aiming to provide appropriate and longitudinal healthcare to address metabolic diseases in patients who suffered during the pandemic period. With the gradual resumption of activities, extensions of this nature will be crucial in the holistic care of patients after their initial infection by the coronavirus, particularly for those who demonstrated greater severity during the illness.

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Authorship requirements

DMP organized the project application format, collected the data, and assisted in face-to-face appointments, as well as contributed to the outline of the study and participated in the writing of the preliminary version, as well as in the correction and translation of the text into English. ISMSS, TDRO, JMRM, GAMC, APC, BSK, and PHMS collected the data, assisted in face-to-face appointment, and participated in the writing of the preliminary version. RMFL served as the project advisor and coordinator, as well as reviewed and approved the final version of the manuscript.

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