Preexisting clinical conditions and severity of the Acute Respiratory Syndrome

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Abstract

Introduction: The effects of the new coronavirus are still being studied. Technology, through telemedicine, emerges as a way to get in touch with suspected Coronavirus infected patients and aid in decision making, raising data that can be validated in scientific research. Method: This study hypothesizes that the severity of symptoms of Sars-Cov-2 infection is related to age and pre-existing clinical conditions. The objective is to assess the relationship between preexisting clinical conditions and the severity of the flu syndrome, as well as referral to hospital care for patients using the TeleCOVID® platform, a telemedicine platform dedicated to attending symptomatic respiratory patients. Results: We analyzed Electronic Medical Records of 1554 patients that utilized TeleCOVID®, 1165 (74.9%) were classified as mild flu syndrome and 389 (25%) as severe flu syndrome. The presence of comorbidities such as cardiovascular (OR = 1.8) and pulmonary disease (OR = 4.7) and the use of non-hormonal immunosuppressants (OR = 2.5) and insulin (OR = 3.9) showed a positive association with severe flu syndrome. Conclusion: It is concluded, therefore, that the technology made it possible to conduct a study to establish knowledge during the COVID-19 pandemic, and that severe flu syndrome is associated with cardiovascular and pulmonary comorbidities, use of non-hormonal immunosuppressants, and insulin.
Keywords: Coronavirus Infections; Severe Acute Respiratory Syndrome; Telemedicine.

Resumen

Condiciones clínicas preexistentes y gravedad del síndrome respiratorio agudo.
Introducción: Aún se están estudiando los efectos del nuevo coronavirus. La tecnología, a través de la telemedicina, surge como un medio para apoyar a los pacientes con sospecha de infección por el nuevo Coronavirus y ayudar en la toma de decisiones, lo que genera datos que pueden ser validados en la investigación científica. Este estudio plantea la hipótesis de que la gravedad de los síntomas de la infección por Sars-Cov-2 está relacionada con la edad y las condiciones clínicas preexistentes. Método: El objetivo es evaluar la relación entre las condiciones clínicas preexistentes y la gravedad del síndrome gripal, así como la derivación a la atención hospitalaria de los pacientes que utilizan la plataforma TeleCOVID®. Resultados: Como resultado, en el análisis de 1554 pacientes, 1165 (74,9%) se clasificaron como síndrome gripal leve y 389 (25%) como síndrome gripal severo. La presencia de enfermedades cardiovasculares (OR = 1,8), pulmonares (OR = 4,7), el uso de inmunosupresores no hormonales (OR = 2,5) e insulina (OR = 3,9) mostró una asociación positiva con significación estadística con el síndrome gripal severo. Conclusión: Se concluye, por lo tanto, que la tecnología permitió realizar un estudio para establecer conocimientos en medio de la pandemia COVID-19, y que el síndrome gripal severo se asocia a enfermedades cardiovasculares y pulmonares, uso de inmunosupresores no hormonales e insulina.
Palabras clave: Infecciones por Coronavirus; Síndrome Respiratorio Agudo Grave; Telemedicina.

Resumo

Condições clínicas preexistentes e gravidade da SRA: Plataforma COVID19.

Introdução: *Os efeitos do novo coronavírus ainda estão sendo estudados. A tecnologia, por meio da telemedicina, desponta como um meio para amparo aos pacientes suspeitos de infecção pelo novo Coronavírus e auxílio na tomada de decisão, que levanta dados que possam ser validados em pesquisas científicas.* ***Método:*** *Esse estudo tem como hipótese que a gravidade dos sintomas da infecção pelo Sars-Cov-2 está relacionada com a idade e condições clínicas preexistentes. O objetivo é avaliar a relação entre condições clínicas preexistentes e a gravidade da síndrome gripal, bem como o encaminhamento para atendimento hospitalar, dos pacientes usuários da plataforma TeleCOVID®.* ***Resultados:*** *Como resultados, na análise de 1554 pacientes, 1165 (74.9%) foram classificados como síndrome gripal leve e 389 (25%) como síndrome gripal grave. A presença de comorbidades cardiovasculares (OR=1.8), pulmonares (OR = 4.7), o uso de imunossupressores não hormonais (OR=2.5) e de insulina (OR=3.9) apresentaram associação positiva com significância estatística com síndrome gripal grave.* ***Conclusão:*** *Conclui-se, portanto, que a tecnologia possibilitou a realização de um estudo para estabelecer conhecimentos em meio à pandemia da COVID-19, e que síndrome gripal grave está associada à comorbidades cardiovasculares, pulmonares, uso de imunossupressores não hormonais e insulina.*

Palavras-chave: *Infecção por Coronavirus; Sindrome Respiratória Aguda, Telemedicina.*

INTRODUCTION

Coronavirus is a pathogen that causes infections in humans and animals. In late 2019, a new subtype was identified in Wuhan, China, which quickly spread to other countries and continents, declared as a pandemic by the World Health Organization (WHO) [1].

In February 2020, WHO named the New Coronavirus SARS-Cov-2 (Severe Acute Respiratory Syndrome Coronavirus 2), which produces the COVID-19 disease. The clinical picture is typical of a flu syndrome, and its presentation may vary from asymptomatic and mild cases, especially in children and young adults, to severe conditions with respiratory failure and septic shock [2]. The most common symptoms are fever (≥ 37, 8°C), cough, upper respiratory symptoms, dyspnea, myalgia, fatigue, and gastrointestinal symptoms such as diarrhea[2]. Studies relate the presence of comorbidities to a higher risk of severe symptoms in patients with COVID-19, and the presence of any preexisting disease was more common in patients who had severe COVID-19 disease [3].

With the rapid advance of the disease, Brazil faced a new challenge: how to manage the high rate of cases with insufficient resources in the health system? For this reason, in May 2020, ordinance 467 was published, which provides, on an exceptional and temporary basis, the action of Telemedicine, aimed at regulating measures to deal with public health emergencies [4].

Telemedicine in the context of COVID-19 has the role of favoring the household isolation of the potentially contaminated population or of the risk group (which does not show signs of seriousness) and avoiding as much as possible the exhaustion of face-to-face health services [5]. In this context, TeleCOVID®, a telemedicine tool, was created to provide care to patients with flu syndrome.

TeleCOVID® (www.telecovid.com) is a telemedicine system in which automated screening is performed, with artificial intelligence, through a structured online questionnaire for data collection. If the patient is classified as having flu symptoms, the patient is directed to a teleconsultation with audio and image, guided by supervised physicians and medical students. TeleCOVID® is a free tool used to provide long-distance assistance throughout the Brazilian territory.

This study aimed to determine the risk factors associated with severe flu syndrome in patients with suspected COVID-19 using the TeleCOVID® application.

METHOD

Study design

We carried out an observational and cross-sectional study through a retrospective analysis of data from the TeleCOVID® system of 1554 patients from all over Brazil, which included all individuals who accessed between 04/02/2020 and 06/22/2020.

The tool guarantees the integrity, security, and confidentiality of information. It also allows for the screening of mild or severe flu syndromes and their respective referral.

The individual who contacts TeleCOVID® does not need to identify and initially fills out an online platform with the age, height, weight, symptoms, and preexisting illnesses. Other information required is the full address, gender, health professional (yes or no), and contact with a defined or suspected case of COVID-19 (yes or no).

Symptoms that can be answered are shortness of breath; fever; running nose; cough; sore throat; tiredness; vomiting or nausea; sneezing; diarrhea; headache; body ache; loss of smell. The underlying diseases are heart disease; lung diseases; kidney disease; autoimmune diseases; Severe Hypertension; Diabetes on insulin use; cancer; transplanted; pregnancy; HIV/AIDS. Also, the use of medications should be answered: immunosuppressants; corticosteroids; insulin; treatment of Acquired Immunodeficiency Syndrome/Human Immunodeficiency Virus (AIDS/HIV).

Based on the information collected, the patient is defined as low risk or high risk for COVID-19. Low-risk patients receive guidelines from the Ministry of Health by e-mail. Those at risk or having pre-existing diseases are sent to a consultation with the health professional.

In the online service, the professional evaluate the information collected, and at the end of the consultation, he advises on cases of mild flu syndrome in home isolation, as well as clinical management. On the other hand, cases of severe flu syndrome with mild shortness of breath or tired-

ness are sent to the primary care unit (Basic Health Unit or Emergency Care Unit). Finally, cases of severe flu syndrome with moderate/severe shortness of breath are sent to reference service centers.

The study was approved by the Ethics Committee of the Escola Superior da Santa Casa de Misericórdia de Vitória – EMESCAM (approval number: CEP 4,111,859). Informed consent was obtained during the beginning of the teleconsultation service.

Variables

We collected the following sociodemographic variables for statistical analysis: age (categorical - if over 65 years old or not) and gender; and on the presence of cardiovascular, pulmonary, renal comorbidities, diabetes, cancer, previous transplantation, and obesity defined with a Body Mass Index (BMI) greater than or equal to 30kg/m2. As for the use of medications, information was collected regarding the use of insulin, corticosteroids, and other immunosuppressants. The information about the variables is limited to the data present in the electronic medical record.

Outcome analyzed

The outcome analyzed was the presence of mild or severe flu syndrome, according to the definitions of the severity of the MH, in which the severe flu syndrome is considered when the patients who reported shortness of breath, and the mild flu syndrome when those who had at least 1 of these criteria: fever, runny nose, cough, sore throat, tiredness, vomiting/feeling sick, sneezing, diarrhea, headache, body pain and loss of smell.

Statistical analysis

Statistical analysis was performed from the sample described in absolute and relative values for the prevalence of symptoms and comorbidities between the different groups. Univariate analysis was performed between the prevalence ratios of the dichotomous categorical variables and the presence of severe flu syndrome using the chi-square test. Multivariate analysis was performed using multiple logistic regression to obtain the odds ratio (OR), adjusted for gender, age, and comorbidities. All analyzes were performed using the Statsmodels library in Python language. Their values are described together with the respective p-value and Confidence Interval (CI).

RESULTS

Exploratory analysis of data from 1554 patients concluded that 1165 (74.9%) were classified as mild flu syndrome and 389 (25%) as severe flu syndrome.

Table 1 contains the descriptive statistical analysis of the predictor variables within the entire study sample. The presence of cardiovascular (OR=1.8), pulmonary (OR=4.7), the use of non-hormonal immunosuppressants (OR=2.5), and insulin (OR=3.9) comorbidities showed a statistically significant positive association with severe flu syndrome.

Table 1: Odds ratio of Logistic Regression analysis of factors associated with Severe Acute Respiratory Failure treated by Telemedicine.

VARIABLE	TOTAL	MILD FLU SD	SEVERE FLU SD	Odds Ratio (Ci 95%)	p-value
Age ≥ 65 years old	64	31	18	1.49 (0.7-3.15)	0.29
Obesity	199	128	43	0.97 (0.6-1.5)	0.93
Cardiovascular diseases	76	36	32	1.82 (1.03-3.2)	0.03
Systemic Arterial Hypertension (SAH)	176	101	47	0.97 (0.6-1.4)	0.90

Lung diseases	110	34	56	4.77 (2.9-7.6)	0.00
Diabetes Mellitus (DM)	39	20	12	0.77 (0.2-2)	0.59
Kidney diseases	38	19	17	1.50 (0.6-3.2)	0.30
Cancer	19	9	7	1.17 (0.3-3.9)	0.79
Autoimmune diseases	80	42	23	1.12 (0.6-2)	0.69
Transplanted	12	4	3	0.75 (0-6.9)	0.80
Pregnancy	19	11	6	1.11 (0,3-3,6)	0.86
HIV/AIDS	19	10	4	0.67 (0-8.9)	0.76
Non-hormonal immunosuppressants	32	11	17	2.55 (1-6.4)	0.04
Corticosteroids	104	48	42	1.50 (0.9-2.4)	0.11
Insulin	30	12	15	3.90 (1.4-10.5)	0.00
HIV/AIDS treatment	23	13	5	0.31 (0.02-3.48)	0.34

DISCUSSION

The use of Telemedicine was largely impacted by the COVID-19 pandemic. Through TeleCOVID®, the care of countless patients was possible following the social distance proposed by health organizations. During the consultations, we identified the main comorbidities that are related to the clinical conditions of Severe Flu Syndrome.

Wu Z. et al. [3] carried out a study with 44415 patients and found that 20% of the symptomatic cases were severe. We also found that 27.5% of the symptomatic cases seen were classified as severe flu syndrome. The higher prevalence in this study may have occurred because we used only 1 criterion to define the severe condition, while other studies use more criteria, reducing the number of patients who fit the definition.

The study by Safya R. et al. [6] with 5700 patients hospitalized with COVID-19 showed that the main comorbidities related to hospitalization were hypertension, diabetes, and obesity. In this study, we did not find an association of the same comorbidities with Severe Flu Syndrome. However, the use of insulin, which can be understood as a proxy for diabetes, was positively associated with the severe state of the disease. This divergence may have occurred because the baseline population of each study was different, as we used patients at home, with conditions not as severe as hospitalized patients.

The meta-analysis by Bo L. et al [7] found that the most prevalent comorbidities among patients with a severe clinical picture due to COVID-19 were hypertension (28.8%), cerebrovascular diseases (16.7%), and diabetes (11.7%). In this study, the most prevalent comorbidities in severe flu syndrome were lung diseases (14.3%), SAH (12%), and obesity (11%), while in the mild flu syndrome, they were obesity (10.9%), SAH (8.6%) and use of corticoids (4.1%).

The study by Wi-Jie G. et al[8] with a population of 1590 people showed that the prevalence of hypertension was 32.7% in the severe flu syndrome and 12.6% in the mild flu syndrome, while in our study the prevalence in severe cases was 12% and 8.6% in mild cases. The cardiovascular disease was 33.9% versus 15.3% and in our study 8.2% versus 3% for the severe and mild flu syndrome, respectively. The DM was 34.6% versus 14.3% and in our study 3% and 1.7%. The kidney diseases were 38.1% versus 15.7% and 4.3% versus 1.63% in our study. Cancer was 50% versus 15.6%, and in our study was 1.7%

versus 0.7%. (8) The divergences may have occurred because we used a population that self-reports their diseases as a database, thus there is no way to prove them, as in a study with the population of a hospital.

As for obesity, Jennifer L. et al. [9] found that, of patients hospitalized with COVID-19, 21% had a BMI (Body Mass Index) between 30-34 kg/m², and were twice as likely to have the severe flu syndrome. A BMI ≥ of 30 kg/m² was found in 16% of the patients, being 3.6 times more related to severe flu syndrome. In this study, we did not find an association between obesity and the severe cases of the disease, which may have occurred because the information was self-reported and not measured by patients.

Jain V. et al. [10] reported that the comorbidities with the greatest positive association with severe clinical features of COVID-19 were lung diseases (OR=6.42), cardiovascular diseases (OR=2.7), and SAH (OR=1.97). While our study found that the presence of lung diseases (OR=4.7), cardiovascular diseases (OR=1.8), the use of insulin (OR=3.9), and non-hormonal immunosuppressants (OR=2.5) were related to increased the severe cases of the disease. We did not find any statistical association between hypertension and Severe Flu Syndrome.

The limitation of this study was the impossibility of monitoring the patients, preventing knowledge of their serological status and whether they were hospitalized. Furthermore, associations between comorbidities and severe cases may not have been found, since patients who undergo teleconsultation may not present a clinical condition as severe as those who seek hospital services as a first option.

CONCLUSION

The use of telemedicine was boosted during the pandemic and is a way to expand medical care to countless patients. In this context, technology enables one to carry out a study to establish knowledge about COVID-19. We found that severe flu syndrome is associated with cardiovascular and pulmonary comorbidities, use of non-hormonal immunosuppressants, and insulin.

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