SHORT COMMUNICATION
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Obesity and the COVID-19: Analysis of the clinical and epidemiological profiles of 138 individuals

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SUMMARY

INTRODUCTION: Coronavirus disease 2019 (COVID-19) is the disease caused by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In the ongoing obesity pandemic, its coexistence with COVID-19 becomes worrying and has a less favorable outcome.

OBJECTIVE: This study aimed to describe the clinical and epidemiological profiles of confirmed cases of COVID-19 in individuals with obesity in the state of Alagoas.

METHODS: The observational cross-sectional study involving 138 confirmed cases of COVID-19 who had obesity as a comorbidity reported at the time of notification of the disease. The data were collected from the COVID-19 database in the state of Alagoas, and the variables analyzed were sex, age (and age group), race/color, outcome, clinical manifestations, and associated comorbidities. The Kolmogorov–Smirnov, Mann-Whitney *U*, χ^2, or Fisher's exact tests were performed as appropriate. The significance was set at 5 and 95% confidence intervals.

RESULTS: There was a predominance of females (55.1%; n=76), aged <60 years (70.3%; n=97) and brown race/color (n=76; 55.1%). The most prevalent symptoms were cough (n=84; 60.9%), fever (n=78; 56.5%), headache (n=36; 26.1%), and adynamia (n=28; 20.3%). The median age was 49 years, with no difference between genders (p=0.340). The lethality rate was 17.4% (n=24), being higher in the male population (22.6% in males and 13.2% in females). Of the 24 deaths, 13 (54.2%) were recorded in the elderly people. In addition to obesity, 54.3% (n=75) had systemic arterial hypertension and 30.4% (n=42) had diabetes mellitus. There was no difference in the prevalence of comorbidity between genders.

CONCLUSIONS: The profile studied demonstrates that obesity represents a challenge for coping with COVID-19.

KEYWORDS: Obesity. Epidemiology. Coronavirus Infections.

INTRODUCTION

Coronavirus disease 2019 (COVID-19), a disease caused by the novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first recorded in December 2019 in the city of Wuhan, China[1]. On March 11, 2020, the World Health Organization (WHO) declared pandemic status[2].

On August 17, 2020, the countries had already registered 21,809,170 cases and 772,479 deaths due to COVID-19 globally. Among the 188 countries analyzed, the United States,

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Brazil, and India are ranked top three countries with 5.4, 3.3, and 2.6 million confirmed cases, respectively[3].

Obesity has been associated with a worse prognosis of viral infections, as in Asian influenza in 1957–1960, H1N1 in 2009, and currently, COVID-19[4]. The unfavorable effects can be attributed to the metabolic and immunological breakdown, due to the chronic inflammation that accompanies obesity and the metabolic syndrome, with abnormal production of cytokines and increased acute phase reagents. Other factors, such as insulin resistance, dyslipidemia, atherosclerosis, type 2 diabetes, hypertension, and asthma, are comorbidities that adversely affect COVID-19 patients[5,6].

The coexistence of an ongoing obesity pandemic, which in some Western countries reached up to 40% of the adult population, e.g., the United States[7,6], COVID-19 can become even more dangerous. In Brazil, the number of obese people has increased to 72.03% between 2006 and 2019, according to Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey (Vigitel)[8]. About 55.4% of the population is overweight and 20.3% of them are obese adults, being similar between men and women[8]. Given the above and the need for knowledge production, this study aimed to describe the clinical and epidemiological profiles of confirmed cases of COVID-19 in individuals with obesity reported in Alagoas, Brazil.

METHODS

This is a cross-sectional observational study involving 138 confirmed cases of COVID-19 who had obesity as a comorbidity reported at the time of notification of the disease.

The data were collected from the COVID-19 database in the state of Alagoas available at http://www.dados.al.gov.br/dataset/painel-covid19-alagoas on August 1, 2020. The following variables were analyzed: gender, age (and age group), race/color, outcome, clinical manifestations, and associated comorbidities.

For statistical analysis, the normality of the data was assessed by the Kolmogorov–Smirnov test. Continuous variables were presented by means of measures of central tendency and dispersion, and categorical variables were presented by means of absolute and relative frequencies. The Mann-Whitney *U* test was used for continuous variables and the chi-square or Fisher's exact test was used for categorical variables, as appropriate. The significance was set at 5% and 95% confidence intervals. The analyses were performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0.IBM Corp., Armonk, NY).

Since these are secondary open access data, in which it is not possible to identify individuals, this study did not require the appreciation of the Research Ethics Committee.

RESULTS

Of the 138 records analyzed, 55.1% (n=76) were females, with a minimum age of 15 and a maximum age of 84 years. The median age was 49 years (interquartile range [IQR] 21), with no difference between genders (p=0.340). The lethality rate was 17.4% (n=24), being higher in the male population (22.6% in males and 13.2% in females). When comparing deaths and survivors, a significant difference in age was observed (p=0.004): the median age of death was 61.5 (IQR 25) and of survivors was 47 (IQR 21). Additionally, the number of deaths increased with aging (p=0.007). Of the 24 deaths, 13 (54.2%) were recorded in the elderly people (Figure 1 and Table 1).

In studying the epidemiological profile, there was a predominance of the population aged <60 years (70.3%; n=97) and brown race (n=76; 55.1%). The most prevalent symptoms were cough (n=84; 60.9%), fever (n=78; 56.5%), headache (n=36; 26.1%), and adynamia (n=28; 20.3%). Only the variables cough and fever showed differences between the sexes (p=0.047 and p=0.004). In addition to obesity, 54.3% (n=75) had systemic arterial hypertension and 30.4% (n=42) had diabetes mellitus. There was no difference in the prevalence of comorbidity between genders (Table 1).

DISCUSSION

The WHO classifies both COVID-19 and obesity as international public health emergencies. The association between the two conditions is not yet fully known, but obesity is known to promote a secretion of proinflammatory cytokines, and obese individuals have an impaired immune response. The angiotensin II-converting enzyme (ACE II) is expressed in quantity in adipose tissue and has a high affinity for SARS-CoV-2, which may explain the less favorable outcomes of COVID-19 in obese patients[9–11].

Global clinical observations indicate that the virus can cause more serious complications in obese individuals or those with related conditions. In a Chinese study with 30 infected patients, those with high body mass index (BMI) (>27), therefore were considered obese, had the disease with more severe symptoms compared with patients with a BMI of 22[12].

In a retrospective cohort of 124 patients from France, obesity (BMI >30 kg/m²) was present in 47.6% of the intensive care unit (ICU) patients, which is associated with the need for invasive mechanical ventilation (IMV)[13]. In a study with 3,615 patients from New York, it is demonstrated that patients with a BMI of 30–34.9 were 2.0 and 1.8 times more likely to be admitted to acute and critical care, respectively, than individuals with a BMI of <30[14]. Additionally, reviews carried out

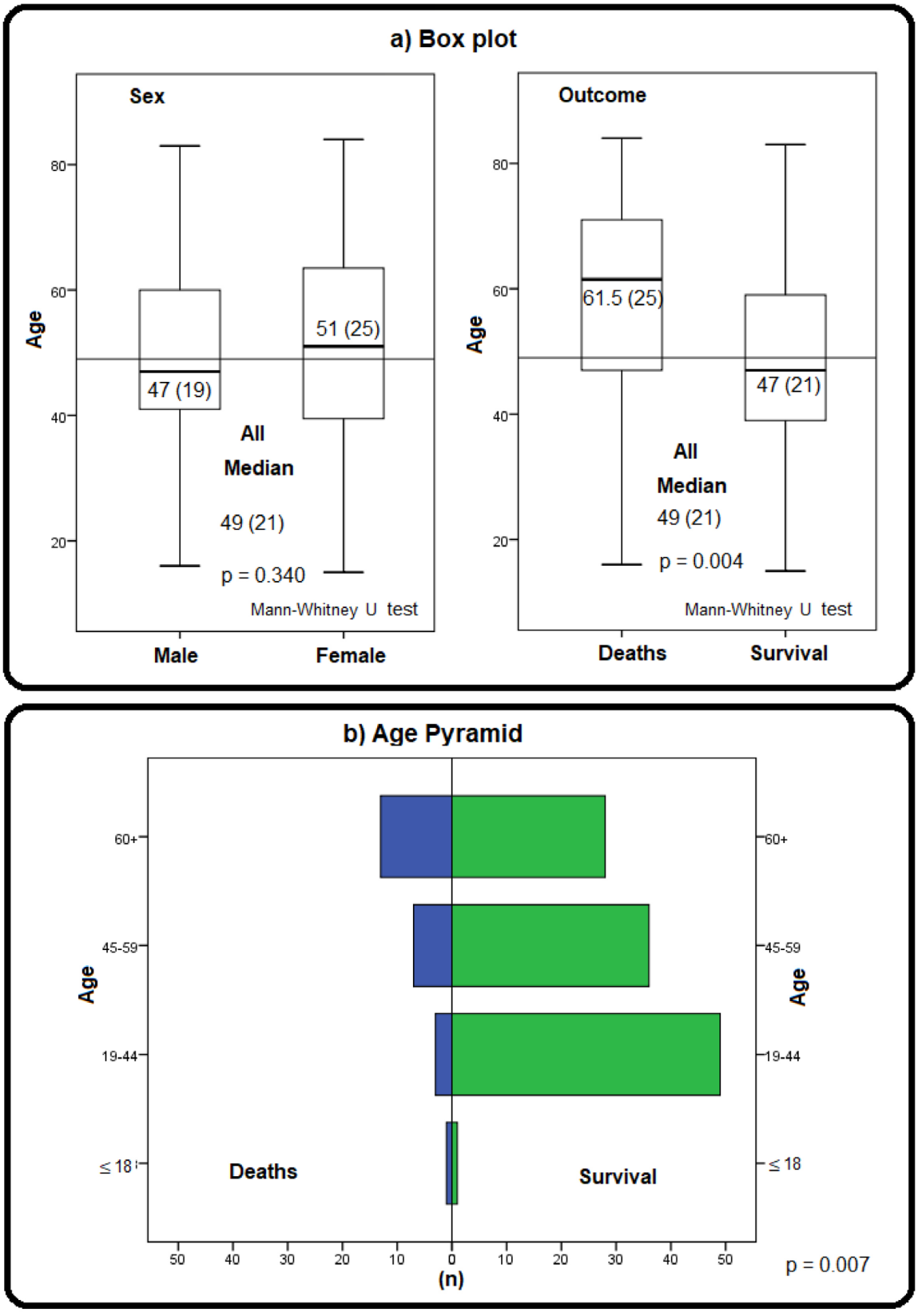

Figure 1. Age distribution of COVID-19 cases in individuals with reported obesity. Alagoas, Brazil (n=138).

Table 1. Clinical and epidemiological characterization of confirmed cases of COVID-19 in individuals with reported obesity. Alagoas, Brazil (n=138).

	Male (n=62; 44.9%)		Female (n=76; 55.1%)		Total (n=138; 100%)		p-value*
	n	%	n	%	n	%	
Age							
≥60	18	29.0	23	30.3	41	29.7	0.513
<60	44	71.0	53	69.7	97	70.3	
Race/color							
East Asian	1	1.6	1	1.3	2	1.4	0.141
White	11	17.7	11	14.5	22	15.9	
Unknown	21	33.9	13	17.1	34	24.6	
Pardo	27	43.5	49	64.5	76	55.1	
Black	2	3.2	2	2.6	4	2.9	
Outcome							
Death	14	22.6	10	13.2	24	17.4	0.110
Survival	48	77.4	66	86.8	114	82.6	
Clinical manifestations							
Fever	37	59.7	41	53.9	78	56.5	0.308
Cough	43	69.4	41	53.9	84	60.9	0.047
Headache	9	14.5	27	35.5	36	26.1	0.004
Loss of strength	9	14.5	19	25.0	28	20.3	0.094
Difficulty breathing	6	9.7	8	10.5	14	10.1	0.55
Dyspnea	11	17.7	6	7.9	17	12.3	0.068
Myalgia	4	6.5	12	15.8	16	11.6	0.073
Odynophagia	6	9.7	7	9.2	13	9.4	0.575
Comorbidities							
Cardiovascular disease	8	12.9	5	6.6	13	9.4	0.166
Diabetes mellitus	18	29.0	24	31.6	42	30.4	0.446
Chronic respiratory disease	3	4.8	2	2.6	5	3.6	0.404
Systemic arterial hypertension	31	50.0	44	57.9	75	54.3	0.225
Chronic renal disease	3	4.8	1	1.3	4	2.9	0.237

*Exact test Fisher.

also ratify the relationship between obesity and worse prognosis for COVID-19[5,15].

A retrospective study of 3,406 patients at a university hospital in the United States showed that morbid obesity is strongly associated with the mortality of individuals hospitalized over 50 years. Of the hospitalized individuals, the lethality in individuals above 50 years old reached 38%, while in the young population it was 10.5%[9]. In our investigation, the median age of individuals who died was substantially higher than the age observed in survivors (61.5 and 47, respectively). In addition, the age pyramid shows the concentration of deaths in the elderly population.

Several studies have already reported the advanced age as a risk factor for COVID-19 mortality, in addition to being associated with longer hospital stay and high viral load. The factors, such as immunosenescence (i.e., reduced efficiency of

natural immune cells in the elderly), chronic subclinical systemic inflammation of old age, and accumulation of comorbidities, are related to the worst prognosis of the disease in this group[16]. The retrospective cohort study with 200 patients in New York identified 46 obese (BMI ≥35 kg/m²), among which 20.4% were 65 years old or more[17]. The study also observed that, among the elderly, both malnutrition and obesity were linked to an unfavorable outcome for patients[17]. In Brazil, about 20.9% of the elderly population is obese (BMI ≥30 kg/m²)[8].

In addition to age and obesity, other comorbidities and underlying risk factors can act together, increasing the risk of complications and mortality due to COVID-19. Diabetes mellitus, arterial hypertension, cardiovascular disease, chronic kidney disease, chronic lung disease, cancer, immunosuppression, and smoking are among the most common risk factors[18]. In an investigation carried out in Pernambuco, the presence of cardiovascular diseases accelerated mortality from COVID-19 in 4 days[19]. In our study, 54.3% of individuals with obesity had systemic arterial hypertension and 30.4% had diabetes mellitus.

The prevalence of multiple comorbidities in individuals hospitalized with COVID-19 has been widely reported. In a study with 103 patients hospitalized with COVID-19 in the state of Rhode Island (the United States), the most common comorbidity was arterial hypertension, followed by diabetes mellitus and heart disease (64.0, 36.8, and 24.2%, respectively)[2]. A study carried out in Pernambuco, involving 197 deaths due to COVID-19 who had underlying cardiovascular diseases, 78.7% of them had two or more comorbidities, the most common being diabetes mellitus and obesity[20]. The overlap of multiple risk factors should be the subject of scientific investigations to estimate the importance of each one in COVID-19 severity and mortality.

Even considering the methodological care adopted, this study has following limitations. Secondary data are subject to the influence of collection procedures, such as filling in the notification form and typing, which may result in inconsistent records. Obesity reported in this study had no precise specification of the classification method, such as BMI or weight and height. The inclusion of weight and height variables in the notification forms could have reduced this bias and allowed a more accurate analysis of the relationship between obesity and COVID-19 in Brazil.

CONCLUSION

Based on the observed profile, this study showed that obesity represents an additional challenge in coping with the COVID-19 pandemic, mainly due to the high lethality and the overlapping of comorbidities in the same individual. We emphasize the importance of protecting the obese population from contamination by SARS-CoV-2 and of establishing measures that make the diagnosis possible and ensure adequate clinical monitoring for those who are infected by the virus. In addition, the need to strengthen public policies that have an effect on risk factors becomes an urgency.

AUTHORS' CONTRIBUTIONS

KCM: Conceptualization, Data Curation, Formal Analysis, Methodology, Writing – Original Draft, Writing – Review & Editing. JLSL: Conceptualization, Data Curation, Formal Analysis, Methodology, Writing – Original Draft, Writing – Review & Editing. AGSJ: Conceptualization, Data Curation, Formal Analysis, Methodology, Writing – Original Draft, Writing – Review & Editing. RFC: Conceptualization, Data Curation, Formal Analysis, Methodology, Writing – Original Draft, Writing – Review & Editing. CDFS: Conceptualization, Data Curation, Formal Analysis, Methodology, Writing – Original Draft, Writing – Review & Editing.

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