Body Composition in Community-Dwelling Older Adults Before and After SARS-CoV-2 Infection: A Longitudinal Prospective Study in a Rural Village Struck by the Pandemic

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Abstract

Background: Information on the body composition of inhabitants of remote communities during the SARS-CoV-2 pandemic is limited. Using a longitudinal population-based study design, we assessed the association between SARS-CoV-2 infection and changes in body composition. **Methods:** Community-dwelling older adults living in a rural Ecuadorian village received body composition determinations before and 1 year after the pandemic as well as serological tests for detection of SARS-CoV-2 antibodies. The independent association between SARS-CoV-2 infection and abnormalities in body composition at follow-up was assessed by fitting linear mixed models for longitudinal data. **Results:** Of 327 enrolled individuals, 277 (85%) received baseline and follow-up body composition determinations, and 175 (63%) of them became SARS-CoV-2 seropositive. Overall, diet and physical activity deteriorated during the follow-up. Multivariate random-effects generalized least squares regression models that included the impact of time and seropositivity on follow-up body composition, showed that neither variable contributed to a worsening in body composition. Multivariate logistic regression models disclosed that the serological status at follow-up cannot be predicted by differences in body composition and other baseline covariates. **Conclusions:** Study results suggest no increased susceptibility to SARS-CoV-2 infection among older adults with abnormal body composition and no significant changes as a result of worse physical activity and dietary habits or seropositivity during the length of the study. Together with a previous study in the same population that showed decrease in hand-grip strength after SARS-CoV-2, results confirm that dynapenia (and not sarcopenia) is associated with SARS-CoV-2 infection in older adults.

Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic—caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)—is having devastating consequences on both population health and the local economy in rural areas of Low- and Middle-Income Countries (LMIC).[1-3] However, detailed regional data from these remote settings remains limited and inconclusive. It is imperative to identify factors related to a higher susceptibility to SARS-CoV-2 infection in these vulnerable populations. In general, lockdowns, curfews, reduced

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physical activity, limited access to food, and unequal employment opportunities—all in the context of poverty and low-literacy—have compromised the health status of individuals living in rural areas of LMIC which, in turn, may increase their risk of infection.[4-7]

Data from high income countries suggest that individuals were able to maintain an adequate nutritional status during the pandemic and, in general terms, several population-based studies found healthier dietary habits and lifestyles over the past year compared to those practiced before the pandemic.[8-10] A single study from Ecuador—mostly from urban centers—also showed that people were able to maintain food security despite a mandatory quarantine early in the pandemic, with many individuals (in particular women and older adults) improving their household dietary habits.[11] In contrast, other studies from LMIC report a worse diet and poor physical activity among the majority of interviewed individuals.[12-14] Most of these studies were conducted after the start of the pandemic by telephone or other remote interview methods, which are susceptible to recall bias. Changes in dietary habits and lifestyles may modify body composition, an outcome that potentially render individuals more susceptible to SARS-CoV-2 infection. To the best of our knowledge, no study has compared changes in body composition before and after the first waves of the pandemic in older adults living in rural populations of LMIC.

In January 2020, we began a study to assess differences in body composition and their correlates among older adults who were actively enrolled in the Atahualpa Project cohort. The study was interrupted when the pandemic severely struck the village, resulting in a mortality rate of 21.6 per 1000 population from March to April, a seroprevalence of 45% among survivors, and an incidence rate ratio of 7.4 per 100 person-months of virus exposure.[15-17]

The aim of this investigation was to ascertain if there were any changes in body composition directly resulting from the pandemic. The rationale for making this determination was to assess the impact of any identified changes on susceptibility to SARS-CoV-2 infection or any effect of seropositivity on body composition. Such changes or impacts would have significance for population health at a time when vulnerable groups are disproportionately affected by the pandemic.

Methods and Materials

Study Population

This study was carried out in community-dwelling older adults residing in Atahualpa (a rural village located in coastal Ecuador). Several cross-sectional and longitudinal epidemiological studies on SARS-CoV-2 infection have been conducted in this village.[15-19] As previously reported,

Atahualpa's residents are homogeneous regarding race/ethnicity (Amerindian ancestry), socio-economic status (most men belong to the blue collar class and work as artisan carpenters, and most women are homemakers), and dietary habits (the diet is ancestrally rich in oily fish, vegetables, fruits, and carbohydrates but poor in other types of meat and dairy products). People get food mostly from the fish market and small grocery stores where highly processed foods are rarely found. There are no fast-food restaurants in the village and most people eat at home. Inhabitants mobilize within the village mainly by walking or bicycle riding, as very few people own a motor vehicle.[20] In addition, the migration rate is low and participant retention in the project is high, which makes Atahualpa an optimal setting for the realization of cohort studies.

Study Design

This prospective longitudinal study is based on prior enrollment of 327 non-disabled, community-dwellers aged ≥60 years registered in the Atahualpa Project cohort that received baseline clinical evaluations and body composition determinations 3 months before the onset of the SARS-CoV-2 pandemic in the village (January 2020). At least 1 serological test for detection of SARS-CoV-2 IgM and IgG by the use of lateral flow-based SARS-CoV-2 antibody testing (BIOHIT Health Care Ltd., Cheshire, UK) was performed in all subjects. The first round of testing was carried out in April 2020. This cohort was followed prospectively until May 2021 at which time body composition determinations and cardiovascular risk factors were again ascertained in those who were still active up to the censoring date. During the follow-up period, participants received home visits and clinical interviews as well as ongoing serological testing of those who had previously tested negative. For purposes of studying the effect of SARS-CoV-2 infection on body composition we took into account the serological status of the individual as well as the presence of covariates that may have influenced changes between baseline and follow-up measurements. The study protocol and comprehensive informed consent forms (signed by all participants) were approved by the I.R.B. of our Institution.

Body Composition Determinations

A bioelectrical impedance device, the InBody 270 (InBody Co., Ltd, Seoul, Korea), was used for baseline and follow-up determinations of body composition. All exams were performed by a trained physician and a Master in Healthcare Administration. According to the manufacture's guidelines (InBody 270 User's Manual—InBody USA [zendesk. com]), exams were performed in the morning hours, with persons in a fasting state for at least 2 hours, relaxed, barefoot, and in the upright position for 5 minutes before testing.
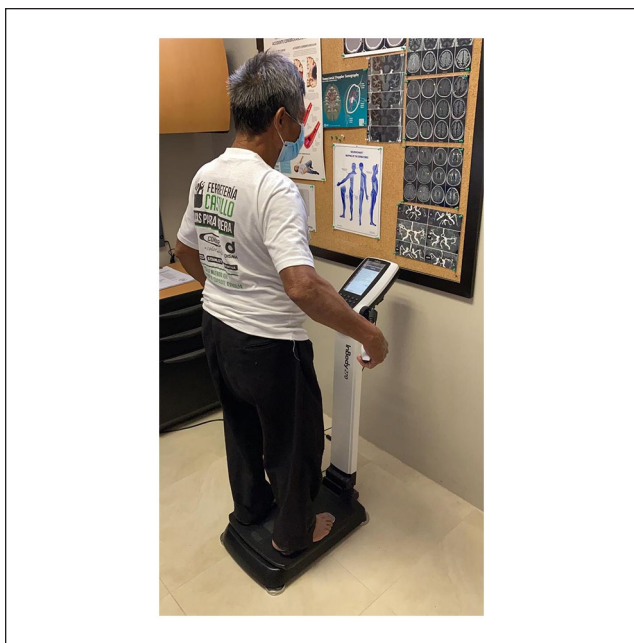
Figure 1. Study participant at the time of body composition determinations using the InBody 270. Note the position of the legs, feet, arms, and hands.

Palms and soles were wiped before testing to avoid excessive skin dryness. The arms were kept straight, arms did not touch the body, legs were kept apart, and heels were placed on the rear sole electrodes. Four fingers wrapped the surface of the bottom hand electrode and the thumb was on the oval electrode. Individuals were not touched by the examiner during the test (Figure 1). Among the various body composition determinations recorded by the InBody 270, we focused on the skeletal muscle mass, the percentage of total fat, and the visceral fat level. Skeletal muscle mass was measured in kilogram as a continuous value, the percentage of total fat was stratified according to gender and was considered normal if <35.9% in women or <24.9 in men, and the visceral fat level was also stratified and considered normal if <10% (in both genders).[21] In addition, the body mass index (BMI) was calculated by dividing the weight in kilograms by the height in meters squared, and continuous values were used for analyses.

Covariates Investigated

Demographics (age, gender), level of education (primary school or higher), smoking status, physical activity, diet, blood pressure, fasting glucose levels, and severe tooth loss were selected as potentially confounding variables. The American Heart Association (AHA) stratify cardiovascular health metrics in ideal, intermediate, or poor according to well-defined cutoffs.[22] These included: (1) Smoking status: ideal (never or quit >1 year), intermediate (quit ≤1 year),

and poor (current smoker); (2) Physical activity: ideal (≥150 minutes/week moderate intensity or ≥75 minutes/week vigorous intensity or equivalent combination), intermediate (1-149 minutes/week moderate intensity or 1-74 minutes/week vigorous intensity or equivalent combination), and poor (no moderate and vigorous activity); (3) Diet: ideal (4-5 healthy components), intermediate (2-3 healthy components), and poor (0-1 healthy component); based on 5 health dietary components (≥4.5 cups fruits and vegetables/day, ≥two 3.5-oz servings fish/week, ≥three 1-oz equivalent servings fiber-rich whole grains/day, <1500 mg sodium/day, and ≤450 kcal sugar-sweetened beverages/week); (4) Blood pressure: ideal (untreated and <120/<80 mmHg), intermediate (treated to <120/<80 mmHg or 120-139/80-89 mmHg), and poor (≥140/90 mmHg); (5) Fasting glucose: ideal (untreated and <100 mg/dL), intermediate (treated to <100 mg/dL or 100-125/ mg/dL), and poor (≥126 mg/dL); and (6) Total cholesterol: ideal (untreated and <200 mg/dL), intermediate (treated to <200 mg/dL or 200-239 mg/dL), and poor (≥240mg/dL). Each metric in the poor range was considered a cardiovascular risk factor. The BMI, also included by the AHA as a cardiovascular health metric, was not used as a covariate but as an independent variable. Severe tooth loss was defined when there were <10 remaining teeth (all individuals received an oral exam by a rural dentist).

Statistical Analysis

Data analyses were carried out using STATA version 17 (College Station, TX, USA). In univariate analyses, continuous variables were compared by linear mixed models and categorical variables by x^2 or the Fisher exact test as appropriate. Changes in body composition determinations between baseline and follow-up were assessed by means of linear mixed models for longitudinal data (random-effects generalized least squares [GLS] regression), adjusted for relevant covariates, including SARS-CoV-2 seropositivity. In these models, skeletal muscle mass, the percentage of total fat, the visceral fat level, and the BMI were used as dependent variables. Then, in order to explore the possibility of reverse causation, the serological status was switched to be the dependent variable, and differences between baseline and follow-up body composition determinations were evaluated in a multivariate logistic regression model to assess if the serological status at follow-up can be predicted by differences in body composition determinants and other baseline covariates.

Results

The mean age of the 327 individuals enrolled in this cohort was 70.6 ± 8.1 years, 197 (60%) were women, and 244 (75%) had primary school education only. Eighty-five

Table 1. Characteristics of 277 Study Participants at Baseline and Follow-up Visits.

Variable	Baseline	Follow-up	*P* value
Age, years (mean ± SD)	69.9 ± 7.6	71.8 ± 7.6	.003*
Current smokers, n (%).	10 (4)	4 (1.4)	.174
Poor physical activity, n (%)	14 (5)	32 (12)	.006*
Poor diet, n (%)	22 (8)	52 (19)	<.001*
Blood pressure ≥140/90 mmHg, n (%)	116 (41)	106 (38)	.386
Fasting glucose ≥126 mg/dL, n (%)	80 (29)	95 (34)	.170
Total cholesterol ≥240 mg/dL, n (%)	38 (14)	46 (17)	.343
Body mass index, kg/m^2 (mean ± SD)	27.5 ± 5	27.4 ± 5.2	.818
Skeletal muscle mass, kg (mean ± SD)	19.8 ± 4.3	19.5 ± 4.4	.427
Increased percentage of total fat, n (%)	220 (79)	217 (78)	.754
Increased visceral fat level, n (%)	157 (57)	172 (62)	.194

Gender, level of education, and severe tooth loss were not included in the table as these numbers did not change across baseline and follow-up visits.
*Statistically significant result.

percent of the cohort (n = 277) remained in the study up to the censoring date and had follow-up InBody determinations. Overall, 175 of 277 (63.2%; 95% CI: 57.4%-68.6%) individuals who completed the study became seropositive for SARS-CoV-2 antibodies. Of them, 121 were seropositive at the time of the first round of serological tests, 9 seroconverted in June 2020, 12 in September 2020, 23 in January 2021, and the remaining 10 in April 2021. The mean (±SD) follow-up of these individuals was 317.8 (±108.1) days between seroconversion and the time of the second body composition determinations.

Among the 50 individuals who did not complete the study, 34 died (14 from COVID-19), 5 emigrated, 3 declined consent, and 8 developed disabling conditions during the follow-up period that precluded InBody determinations. The mean age (at baseline) of the 277 individuals who received baseline and follow-up InBody determinations was 69.9 ± 7.6 years, 163 (59%) were women, and 209 (75%) had primary school education only. There were no demographic differences among the 327 individuals initially enrolled in the cohort and the 277 that finished the study.

In order to assess whether differences in body composition determinations might have influenced COVID-19-related mortality after baseline, the 14 individuals who died from COVID-19 during the follow-up were analyzed separately. The mean baseline BMI was 27.7 ± 7.3 kg/m^2 (median: 25.5 kg/m^2), the mean skeletal muscle mass was 18.6 ± 4.4 kg (median: 18.3 kg), 11 (79%) had an increased percentage of total fat, and 9 (64%) had an increased visceral fat level. We found no differences in baseline body composition determinations across individuals who died because of COVID-19 and those who completed the study.

At baseline, 10 (4%) of the 277 individuals who received both InBody determinations were smokers, 14 (5%) reported no moderate or vigorous physical activity, 22 (8%) had a poor diet, 116 (41%) had blood pressure ≥140/90 mmHg, 80 (29%) had fasting glucose levels ≥126 mg/dL, 38 (14%) had total cholesterol blood levels ≥240 mg/dL, and 114 (41%) had severe tooth loss. The mean baseline BMI was 27.5 ± 5 kg/m^2 (median: 26.8 kg/m^2). Regarding mean baseline InBody determinations, the mean skeletal muscle mass was 19.8 ± 4.3 kg (median: 19.2 kg), 220 (79%) had an increased percentage of total fat, and 157 (57%) had an increased visceral fat level.

At the end of the study, 4 (1.4%) individuals were current smokers, 32 (12%) reported no moderate or vigorous physical activity during the previous 16 months, 52 (19%) had a poor diet, 106 (38%) had blood pressure ≥140/90 mmHg, 95 (34%) had fasting glucose levels ≥126 mg/dL, 46 (17%) had total cholesterol blood levels ≥240 mg/dL, 114 (41%) had severe tooth loss, and 136 (49%) had a poor sleep quality. The mean baseline BMI was 27.4 ± 5.2 kg/m^2 (median: 26.4 kg/m^2). Follow-up InBody determinations found that the mean skeletal muscle mass was 19.5 ± 4.4 kg (median: 19.1 kg), 217 (78%) had an increased percentage of total fat, and 172 (62%) had an increased visceral fat level.

Table 1 depicts the characteristics of participants at baseline and follow-up visits. Besides being older, individuals had worse physical activity and a worse diet at follow-up, but there were no other significant differences across both determinations in univariate analyses. When individuals were stratified according to their serological SARS-CoV-2 status, individuals remaining seronegative up to the end of the study had a worse diet when compared to baseline. In addition, both the diet and the physical activity were worse among those who seroconverted during the study period (Table 2).

Separate random-effects GLS regression models that included the impact of time between measurements and seropositivity on follow-up body composition determinations,

Table 2. Characteristics of 277 Study Participants Across Categories of SARS-CoV-2 Serological Status.

Variable	Characteristics of individuals remaining seronegative (n = 102)			Characteristics of individuals who seroconverted during follow-up (n = 175)		
	Baseline	Follow-up	P value	Baseline	Follow-up	P value
Age, years (mean ± SD)	70.7 ± 8.6	71.7 ± 8.6	.407	69.5 ± 6.9	70.5 ± 6.9	.176
Current smokers, n (%)	5 (5)	2 (2)	.445	5 (3)	2 (1)	.448
Poor physical activity, n (%)	6 (6)	11 (11)	.205	8 (5)	21 (12)	.012*
Poor diet, n (%)	6 (6)	15 (15)	.038*	16 (9)	37 (21)	.002*
Blood pressure ≥140/90 mmHg, n (%)	47 (46)	42 (41)	.480	69 (39)	64 (37)	.582
Fasting glucose ≥126 mg/dL, n (%)	27 (26)	33 (32)	.357	53 (30)	62 (35)	.306
Total cholesterol ≥240 mg/dL, n (%)	10 (10)	17 (17)	.148	28 (16)	29 (17)	.885
Body mass index, kg/m^2 (mean ± SD)	27.6 ± 5.3	27.2 ± 5.3	.590	27.5 ± 4.8	27.5 ± 5.3	.841
Skeletal muscle mass, kg (mean ± SD)	19.8 ± 4.2	19.5 ± 4.2	.611	19.8 ± 4.3	19.5 ± 4.5	.524
Increased percentage of total fat, n (%)	78 (76)	77 (75)	.869	142 (81)	140 (80)	.787
Increased visceral fat level, n (%)	59 (58)	62 (61)	.669	98 (56)	110 (63)	.191

Gender, level of education, and severe tooth loss were not included in the table as these numbers did not change across baseline and follow-up visits in both seronegative and seropositive individuals.
*Statistically significant result.

showed that none of the dependent variables (skeletal muscle mass, the percentage of total fat, the visceral fat level, and the BMI) contributed to a worsening in body composition, after adjusting for all the investigated covariates (Table 3). Several covariates remained independently significant in 1 or more of these models, notably increasing age (inversely associated in all models), as well as being female (inversely associated with skeletal muscle mass, but directly associated with visceral fat levels and the BMI), primary school education and a poor diet (directly associated with the BMI), high blood pressure (directly associated with the percentage of body fat), and severe tooth loss (inversely associated with skeletal muscle mass). Likewise, when using serological status as the dependent variable, multivariate logistic regression model disclosed that the serological status at follow-up cannot be predicted by differences in body composition determinations and other baseline covariates (Table 4). In this model, no single covariate remained independently significant.

Discussion

This longitudinal prospective study, carried out in a population of community-dwelling older adults living in a rural setting failed to confirm 2 hypothesized associations between SARS-CoV-2 infection and body composition determinations. First, results failed to document an increased susceptibility to SARS-CoV-2 infection among individuals with pre-pandemic abnormal body composition, and second, the study did not demonstrate any effect of infection on body composition as determined at the time of follow-up.

In the UK Biobank Study, both a high waist circumference and an increased BMI were associated with a higher risk of infection by SARS-CoV-2 (as detected by RT-PCR

in nasal and throat swabs), suggesting that adiposity increases the susceptibility to this virus, particularly in older adults.[23] Another German study reported an increased susceptibility to SARS-CoV-2 infection among individuals with a genetically predicted high BMI.[24] Both studies were conducted in different ethnic groups and socio-economic backgrounds than that of Atahualpa, which may explain these disparity in outcomes. It is also possible that changes over time (after SARS-CoV-2 infection) diminished the significance of the difference between baseline and follow-up InBody determinations in the present study.[25]

During the pandemic, Atahualpa's residents significantly reduced leisure-related physical activity, such as jogging, bicycle riding, and playing sports, but those who were working on their own continued with their duties at home (eg, women doing household chores and men in carpentry shops located at their homes). Because of this, most study participants continued with their usual levels of activity despite confinement. Their diet has changed during the pandemic largely as a result of reduced incomes and lack of resources with the greatest effect on level of consumption of fruits and vegetables. However, our post-pandemic survey did not find increases in fat or carbohydrates intake, or that individuals were eating more than usual. This finding diverges from reports from some developed countries, where overeating has been common during lockdowns.[26] It is likely that economic constraints account for the lack of overeating seen in the population enrolled in this study.

An overall reduction in physical activity (mostly leisure-related) together with a lower food intake may explain why body composition determinations did not show significant differences between baseline and follow-up evaluations. Even though their diet changed, individuals did not generally

Table 3. Random-Effects GLS Regression Models That Included the Impact of Time and Seropositivity on Follow-up Body Composition Determinations.

Variable	Skeletal muscle mass	Percentage total fat	Visceral fat level	Body mass index
Impact of time	β: .025 (−.27 to .33) P=.868	β: −.059 (−.13 to .02) P=.120	β: .005 (−.07 to .07) P=.897	β: −.209 (−.55 to .13) P=.233
Impact of SARS-CoV-2 status	β: −.007 (−.58 to .57) P=.980	β: .027 (−.06 to .11) P=.055	β: −.042 (−.14 to .06) P=.399	β: −.414 (−1.54 to .72) P=.475
Age	β: −.159 (.19 to −.12) P<.001*	β: −.009 (−.01 to .02) P=.003*	β: −.013 (−.02 to −.00) P<.001*	β: −.194 (−0.27 to −.12) P<.001*
Being female	β: −6.558 (−7.12 to −5.99) P<.001*	β: .068 (−.02 to .16) P=.133	β: .449 (.35 to .55) P<.001*	β: 3.150 (2.04 to 4.26) P<.001*
Primary school education	β: .499 (−.17 to 1.17) P=.142	β: .054 (−.05 to .16) P=.306	β: .085 (−.03 to .19) P=.143	β: 1.377 (.06 to 2.69) P=.041*
Current smokers	β: .032 (−.85 to .91) P=.944	β: .038 (−.16 to .24) P=.710	β: .056 (−.15 to .26) P=.586	β: −.119 (−1.16 to .92) P=.822
Poor physical activity	β: −.256 (−.57 to .05) P=.105	β: .036 (−.04 to .11) P=.351	β: .054 (−.02 to .13) p=.153	β: .020 (−.34 to .38) P=.911
Poor diet	β: .103 (−.19 to 0.39) p=0.492	β: .069 (−.01 to .14) p=0.052	β: .049 (−.02 to .12) p=0.159	β: .519 (.18 to .85) p=0.002*
Blood pressure ≥140/90 mmHg	β: .433 (.16 to .70) P=0.002*	β: .070 (.01 to .13) P=.026*	β: .001 (−.06 to .06) P=.963	β: .228 (−.09 to .54) P=.158
Fasting glucose ≥126 mg/dL	β: −.013 (−.29 to .27) P=.928	β: −.041 (−.11 to .02) P=.222	β: −.009 (−.07 to .06) P=.797	β: −.007 (−.34 to .33) P=.967
Total cholesterol ≥240 mg/dL	β: −.015 (−.37 to .34) P=.142	β: .018 (−.06 to .09) P=.672	β: .055 (−.03 to .14) P=.184	β: .010 (−.39 to .42) P=.961
Severe tooth loss	β: −.572 (−1.14 to −.01) P=.048*	β: −.052 (−.14 to .04) P=.245	β: −.072 (−.17 to .02) P=.145	β: −.938 (−2.06 to .18) P=.100

Neither dependent variable contributed to a worsening in body composition, after adjusting for all the investigated covariates (numbers in parenthesis represent 95% confidence intervals).
*Statistically significant result.

Table 4. Multivariate Logistic Regression Model Showing That the Serological Status at Follow-up (Dependent Variable) Cannot be Predicted by Differences in Body Composition Determinants and Other Baseline Covariates.

Serological status	Odds ratio	95% confidence interval	P value
Skeletal muscle mass difference	1.04	0.86-1.25	.694
Percentage total fat difference	0.87	0.40-1.88	.729
Visceral fat level difference	1.63	0.72-3.66	.244
Body mass index difference	1.17	0.98-1.41	.086
Age	0.98	0.94-1.01	.208
Being female	1.19	0.68-2.06	.541
Primary school education	1.58	0.86-2.90	.142
Current smokers	0.61	0.08-4.62	.630
Poor physical activity	1.02	0.56-1.86	.956
Poor diet	1.52	0.89-2.56	.121
Blood pressure ≥140/90 mmHg	0.91	0.54-1.54	.723
Fasting glucose ≥126 mg/dL	1.17	0.68-2.04	.567
Total cholesterol ≥240 mg/dL	0.91	0.46-1.81	.794
Severe tooth loss	0.73	0.43-1.22	.229

increase their daily caloric intake, especially from fat and carbohydrates, 2 important nutrients that directly affect body composition. These behavior patterns nay differ from other populations where individuals experience changes in body composition determinations due to lockdown restrictions.[27] It is also notable that our study participants were taken from the community and not from a long-term care facility where residents do not engage in active physical

activity, are often medicated with sedative drugs, and live in closed and crowded environments.

A recent study demonstrated a significant decrease in hang-grip strength after SARS-CoV-2 infection in the population of community-dwelling older adults living in Atahualpa.[18] Decreased hand-grip strength in the absence of a reduction in skeletal muscle mass as seen in the present study is characteristic of dynapenia,[28] a condition different from sarcopenia that may result from increasing age, but that also occurs in the context of debilitating conditions.[29] Findings from the present study that show no decrease in skeletal muscle mass after SARS-CoV-2 infection taken together with the previously observed reduction in hand grip strength after SARS-CoV-2, strongly suggest that direct damage to skeletal muscle fibers as a result of SARS-CoV-2 is responsible for the observed changes.

This study prospectively assessed body composition in a population of community-dwelling older adults who underwent a formal evaluation (using the same device) both before and more than 1 year after the onset of the SARS-CoV-2 pandemic. This designs reduced the likelihood of unexpected confounders that may occur when 2 different populations are compared. Another strength of this study is the inclusion of long-term participants in the Atahualpa Project cohort in whom other risk factors have already been assessed. Nevertheless, the study has limitations. The study population was limited to people aged 60 years or more and therefore overlooked the status of middle-aged adults with SARS-CoV-2 infection. The InBody 270 device was selected because is the best amongst the impedance-type tests and is a reliable surrogate of Dual X-ray absorptiometry when this technology is not available.[30,31] In addition, while the antibody test we used is reported to have high diagnostic reliability, we cannot exclude the possibility of misclassification due to false positive or false negative results,[16] or the remote probability of cross-reactions with other viruses that are endemic in the region.[32] While the present study did not take into account COVID-19 severity in relation to body composition determinations, measurements did not differ between those who died from COVID-19 and individuals who completed the study, suggesting that a worse body composition was not related to fatal COVID-19.

In conclusion, this longitudinal cohort demonstrated no increased susceptibility to SARS-CoV-2 infection among older adults with abnormal body composition and no significant changes in body composition despite worse physical activity and dietary habits as the result of the pandemic. Further studies are warranted to confirm our findings.

Author Contributions

OHD: study design, manuscript drafting; RMM: statistical analysis; DAR: data collection and analysis; PP: data collection and analysis; BYR: study coordinator; MJS: study design, significant intellectual contribution to manuscript content.

Declaration of Conflicting Interests

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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