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Tobacco use by sexual and gender minorities: findings from a Brazilian national survey

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ABSTRACT

Objective The study aims to identify the prevalence of use of tobacco products by sexual and gender minorities (SGM) in Brazil, the users' profile and associations between tobacco use and social and behavioural variables.

Methodology The study used data from a representative nationwide household survey of the Brazilian population aged 12–65 years—the first one to address the issue of sexual orientation/gender identity. The study sample consisted of 15 801 individuals. Social and behavioural characteristics and the use of tobacco products were compared according to sexual orientation/gender identity. A multivariate logistic model was constructed to assess the association between tobacco use and sexual orientation/gender identity, as well as models stratified by SGM and non-SGM.

Results Prevalence of any tobacco product use was 44.7% among SGM and 17.0% among non-SGM. Water pipe use was ~8 times higher for SGM than for non-SGM (13.5% vs 1.6%). SGM tobacco users were younger and had more schooling than non-SGM tobacco users. After adjusting for social and behavioural variables, the multivariate model showed that SGM were 150% more likely to use tobacco products than non-SGM (adjusted OR 2.52; 95% CI 1.61 to 3.95). In the model for SGM, schooling, alcohol consumption, illicit drug consumption, violence and anxiety/depression were significantly associated with tobacco use.

Conclusion Prevalence of tobacco use among SGM was higher than among non-SGM, and the profile of tobacco users differed between them. It is urgent to monitor health issues in SGM in Brazil and to adopt tobacco control strategies for this group.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study yielded unprecedented data on tobacco use by Brazilian sexual and gender minorities (SGM), contributing to the elaboration of tobacco control measures, strategies and policies in this population.
⇒ The study used data from the first representative nationwide survey in Brazil to address the issue of sexual orientation/gender identity.
⇒ The term SGM encompasses subgroups with highly distinct characteristics, experiences and particular issues related to their sexual orientation or gender identity. Thus, treating all these subgroups as a single category overlooks the fact that these differences may impact tobacco use differently.

INTRODUCTION

Tobacco use is considered a pandemic and thus a serious global public health problem, confronted in Brazil through coordinated and structured actions since the 1980s. This work was strengthened later by ratification of the WHO's Framework Convention on Tobacco Control, the first international public health treaty, which contains comprehensive measures in different areas focused on the reduction of tobacco supply and demand.[1]

However, there are still numerous challenges for tobacco control in Brazil and the world.[2 3] Despite a significant reduction in smoking prevalence in recent years in the general population of Brazil, from 34.8% in 1989 to 12.8% in 2019,[4 5] tobacco use affects population groups unequally. According to the National Health Survey of 2019, prevalence of tobacco use varied according to sex (men: 16.2% (95% CI 15.6% to 16.9%) versus women: 9.8% (95% CI 9.4% to 10.3%)) and schooling (none or incomplete primary 17.6% (95% CI 16.9% to 18.4%) versus university 7.1% (95% CI 6.4% to 7.8%).[5]

Especially in the case of specific populations such as sexual and gender minorities—SGM (eg, lesbians, gays, bisexuals, transsexuals, transvestites, transgenders, queers, intersex, asexuals and others (LGBTQIA+)), the issue appears to be more serious, since published studies with data from other countries[6–8] and the rare existing Brazilian studies point to higher consumption of tobacco products in this group.[9–11]

This scenario is aggravated by other variables associated with SGM, such as higher prevalence of health problems when compared with the general population.[11–14] The population of SGM also encounters

greater difficulty in accessing health services, due to a series of factors, including prejudice, discrimination and disinformation.[15–17]

Another key point is the tobacco industry's approach to this group through supposed corporate social responsibility actions and other forms of promoting tobacco products.[18–22] There is little material (especially peer-reviewed articles) on the topic in Brazil, which ends up appearing through news in the mass media, intermittently, as in the case of the tobacco industry's sponsorship of the LGBT Parade in São Paulo in 2019, and participation in human resources forums that address the issue of diversity.[23–25]

It is thus essential to shed light on prevalence of tobacco use among SGM in Brazil, including both epidemiological indicators and an in-depth understanding of the phenomenon. Data such as prevalence, factors associated with different consumption patterns and the profile of users in this specific group compared with the general population are necessary for orienting prevention and control measures as well as for backing the creation of public policies targeted specifically to this group.

Brazil lacks data and information on this population from comprehensive and representative national surveys. In addition, most official health and social data collection instruments in Brazil do not have fields for identifying SGM.

The current study aims to estimate the prevalence of use of various tobacco products in Brazilian SGM, using a comprehensive and nationally representative survey, as well as the profile of these users and possible associations between tobacco use and other variables.

METHODOLOGY

The data analysed in this study are from the third National Survey on Drug Use by the Brazilian Population, a representative nationwide survey of the Brazilian population aged 12–65 years. A multistage stratified cluster sampling plan was used, including all 27 state capitals, in addition to small, medium and large cities from Brazil's five geographical regions, considering both the urban and rural areas. Data were collected from May to December 2015, obtaining a total of 16 273 complete interviews out of the 16 400 planned interviews (ie, 99.2% of the number of interviews defined a priori), in 351 municipalities. In order to address non-response, both hot deck imputation and poststratification adjustments in the weights were used. The variables used for this purpose were as follows: sex, age strata, major geographical regions and household characteristics. Further details on the survey can be found in a specific publication, summarising its methods and broad findings[26]

This was the first time in Brazil that a representative nationwide survey obtained data on SGM. The variable that allowed identification of this population was obtained with the question: 'Do you consider yourself…', with the following options: 'heterosexual', 'homosexual (gay or lesbian)', 'bisexual', 'transsexual, transvestite, transgender', 'other', 'don't know' or 'prefer not to answer'. This question ended up encompassing two distinct conceptual groups: sexual orientation (which would include options such as heterosexual, homosexual or bisexual, among others not included) and gender identity (which would include options such as transsexual, transvestite and transgender), and other definitions not included as options (eg, cisgender woman or man, non-binary, among others). Nevertheless, given the low prevalence of some categories in the sample, we opted to create a dichotomous variable called sexual orientation/gender identity, where one of the categories was 'non-SGM' (n=15 641) and the other was 'SGM', which included homosexuals, bisexuals, transsexuals, transvestites and transgenders (n=160). Individuals who reported 'other' (n=1), 'don't know' (n=428) or 'prefer not to answer' (n=43) were excluded from the analysis. The analyses presented here thus refer to a sample of 15 801 individuals.

Prevalence rates were estimated for use of tobacco products in the 12 months prior to the interview, with the respective 95% CIs, for each of the following products: industrialised cigarettes, cigars, cigarillos, pipes, clove or kretek cigarettes, straw or hand-rolled cigarettes, water pipes, smokeless tobacco (chewing tobacco, snuff) and electronic cigarettes. A variable was also constructed on the use of any tobacco product among those described above, as well as on smoked tobacco products alone (excluding chewing tobacco and snuff from the analysis). These prevalence rates were calculated for the general population and stratified between SGM and non-SGM, and the groups' comparison was based on overlapping versus no overlapping of the CIs.

Proportion of sociodemographic and behavioural characteristics of SGM and non-SGM (N and %), with the respective 95% CIs, were compared according to use or non-use of tobacco products, namely: age group (12–24, 25–34, 35–65 years), sex (male or female), having a steady/stable partner, schooling (primary or less, secondary, university (incomplete or complete)), religion, alcohol consumption (at least one dose in the 12 months prior to the interview), illicit drug consumption (use of at least one illicit drug in the 12 months prior to the interview), having been the victim of violence in the 12 months prior to the interview and depression or anxiety (self-report of diagnosis by a health professional).

The principal outcome was defined in the subsequent analyses as the use of any tobacco product in the 12 months prior to the interview. Prevalence rates, with the respective 95% CIs, were calculated for SGM and non-SGM according to the same sociodemographic and behavioural characteristics described above. Comparison of the groups was based on overlapping versus non-overlapping of the CIs.

A bivariate logistic model was fitted to assess the association between tobacco use in the 12 months prior to the survey and all the above-mentioned social and behavioural variables, including sexual orientation/gender identity.

Bivariate logistic analysis was calculated for both SGM and non-SGM, in tandem, assessing the association of the same social and behavioural variables with tobacco use.

A multivariate logistic model was fitted to assess the putative association between tobacco use in the 12 months prior to the survey and sexual orientation/gender identity, adjusting for the above-mentioned social and behavioural variables. We also calculated multivariate logistic models stratified between SGM and non-SGM to assess how the use of tobacco products was associated with such social and behavioural variables for each of these subgroups. For all the models, we present the adjusted ORs (AORs) and their respective 95% CIs.

All the analyses were performed in R V.4.0.3 using the 'survey' and 'srvy' packages to take the complex sampling design into account.[27]

Patient and public involvement

Neither patients nor the public were involved in the study's design, performance, reporting or publication of research plans.

RESULTS

Social and behavioural characteristics of the general population according to sexual orientation/gender identity

Considering the population, independently of tobacco use, differences were observed between SGM and non-SGM in relation to all the target social and behavioural characteristics except for depression/anxiety (online supplemental table 1). Among SGM, compared with non-SGM, there were higher proportions of males (61.9% (95% CI 52.9% to 70.9%) vs 48.5% (95% CI 48.3% to 48.6%)), individuals without a steady/stable partner (62.3% (95% CI 53.4% to 71.2%) vs 38.8% (95% CI 37.5% to 40.0%)), with university schooling (42.0% (95% CI 33.0% to 50.9%) vs 16.6% (95% CI 15.4% to 17.8%)), that consumed alcohol (73.2% (95% CI 64.4% to 82.1%) vs 42.9% (95% CI 41.6% to 44.3%)), that consumed illicit drugs (23.0% (95% CI 15.5% to 30.5%) vs 3.1% (95% CI 2.6% to 3.5%)), and that had been victims of violence in the 12 months prior to the interview (18.2% (95% CI 10.2% to 26.2%) vs 6.4% (95% CI 5.8% to 7.0%)). Meanwhile, there was a lower proportion of persons aged 35–65 years among SGM (28.7% (95% CI 21.6% to 35.9%)) than among non-SGM (51.8% (95% CI 51.6% to 52.0%)), and this difference was statistically significant (online supplemental table 1).

Social and behavioural characteristics of tobacco users according to sexual orientation/gender identity

Independently of sexual orientation/gender identity, most individuals who used tobacco products were males. In the population that had used tobacco products in the 12 months prior to the survey, most SGM were from the younger age groups (ie, 12–34 years), while non-SGM were mostly over 35 years. There was also a statistically significant difference in schooling: among SGM that consumed tobacco products, 34.8% (95% CI 22.1% to 47.5%) had studied up to secondary school and 45.5% (95% CI 19.3% to 36.3%) had complete/incomplete university degree, while most non-SGM users had less schooling, with 55.5% (95% CI 52.8% to 58.3%) having completed primary school or less, while only 12.6% (95% CI 10.9% to 14.3%) had complete/incomplete university education. Meanwhile, among tobacco users, there was a lower proportion of SGM with steady/stable partners (33.3%, 95% CI 19.9% to 46.7%), compared with non-SGM (61.0%, 95% CI 58.4% to 63.6%) (online supplemental table 1).

The prevalence rates of SGM tobacco users that consumed alcohol and illicit drugs (85.8% (95% CI 75.4% to 96.2%) and 35.3% (95% CI 22.5% to 48.0%), respectively) were higher than the prevalence rates among non-SGM tobacco users (67.1% (95% CI 64.7% to 69.6%) and 11.5% (95% CI 9.8% to 13.2%), respectively). The proportion of SGM tobacco users that reported having been victims of violence was also significantly higher than among non-SGM users (28.3% (95% CI 14.4% to 42.2%) vs 10.9% (95% CI 9.1% to 12.7%)) (online supplemental table 1).

Use of tobacco products in the 12 months prior to the survey according to sexual orientation/gender identity

The prevalence of use of any tobacco product by SGM was 44.7% (95% CI 35.1% to 54.2%), significantly higher than by non-SGM (17.0%; 95% CI 16.2% to 17.9%). The prevalence of use of industrialised cigarettes by SGM was 39.5% (95% CI 29.9% to 49.2%), significantly higher than the prevalence among non-SGM (15.1%; 95% CI 14.3% to 15.9%) (online supplemental table 2).

We performed additional analyses on the prevalence of use of any tobacco product, for all interviewees who answered 'don't know' for the variable sexual orientation/self-identified gender (n=428). The prevalence was 18.1% (95% CI 13.9% to 22.3%) (data not included in the table).

Among SGM, the prevalence of water pipe smoking was eight times higher than the estimated prevalence among non-SGM (13.5% (95% CI 7.2% to 19.8%) vs 1.6% (95% CI 1.2% to 1.9%)). There was also a statistically significant difference in the prevalence of kretek cigarette smoking between SGM (8.3%; 95% CI 3.6% to 13.1%) and non-SGM (0.9%; 95% CI 0.7% to 1.0%). Cigars, electronic cigarettes and pipes showed prevalence less than 1% in the general population, but in all these cases, the point prevalence rates among SGM were higher than among non-SGM (however, without statistical significance) (online supplemental table 2).

Prevalence of use of tobacco products in the 12 months prior to the survey according to social and behavioural characteristics and sexual orientation/gender identity

Prevalence of tobacco use among SGM was statistically higher than among non-SGM in both sexes and in all age groups and schooling levels, and was also higher among

individuals who consumed alcohol, that reported having been victims of violence, and that reported a diagnosis of depression/anxiety (online supplemental table 3). Prevalence of tobacco use increased proportionally with age among non-SGM, with 12.3% (95% CI 10.7% to 14.0%) in the 12–24 years group, 16.6% (95% CI 15.0% to 18.3%) in the 25–34 years group, and 19.7% (95% CI 18.6% to 20.8%) in the group 35–65 years group, but the same was not observed among SGM: (20.2% (95% CI 11.4% to 29.1%), 27.4% (95% CI 19.7% to 35.0%), and 24.6% (95% CI 19.8% to 29.3%), respectively) (online supplemental table 3).

Neither SGM nor non-SGM showed statistically significant difference in prevalence of tobacco use according to presence of a steady/stable partner, but prevalence of tobacco use among SGM was significantly higher than among non-SGM for both types of partner status (online supplemental table 3).

Among non-SGM, the prevalence of tobacco use decreased as schooling increased and was higher among individuals with primary schooling or less (21.1% (95% CI 19.8% to 22.4%)) and lower among those that had finished university (12.9% (95% CI 11.3% to 14.6%)). The same pattern was not seen among SGM (online supplemental table 3).

Higher prevalence rates of tobacco use were seen in persons that had consumed alcohol in the previous 12 months, compared with non-consumers, among both SGM (52.3% (95% CI 41.4% to 63.2%) vs 23.8% (95% CI 6.8% to 40.7%)) and non-SGM (26.6% (95% CI 25.2% to 28.1%) vs 9.8% (95% CI 9.0% to 10.6%)). The same was true for those who had used illicit drugs in the previous 12 months compared with those who had not, both in SGM (68.6% (95% CI 52.0% to 85.2%)) vs 37.6% (95% CI 26.8% to 48.3%)) and non-SGM (64.0% (95% CI 56.9% to 71.0%) vs 15.5% (95% CI 14.8% to 16.3%)).

As observed among non-SGM, prevalence of tobacco use among SGM was higher in those who had suffered violence in the 12 months prior to the interview (69.5%; 95% CI 41.5% to 85.8%), compared with those who had not (39.2%; 95% CI 28.7% to 49.6%), and among those with diagnosis of depression and/or anxiety (36.7%; 95% CI 41.5% to 85.8%) compared with those without such a diagnosis (40.1%; 95% CI 29.9% to 50.3%). However, although these differences exceeded 30 and 20 percentage points, respectively, they were not statistically significant.

Among SGM, no statistically significant difference was seen in prevalence of tobacco use between those without versus with a religion, contrary to non-SGM, in whom prevalence of tobacco use was higher among those without a religion (27.2% (95% CI 24.0% to 30.4%)) compared with those with a religion (16.1% (95% CI 15.2% to 16.9%)).

Additional information on statistical modelling

Bivariate analysis showed that SGM had an OR of 3.94 (95% CI 2.66 to 5.84) for having used tobacco products in the previous 12 months compared with non-SGM. Other intermediate analyses revealed that for non-SGM, all variables (with the sole exception of having a steady partner) were associated with tobacco use. Among SGM, the use of alcohol and illicit drugs, having been a victim of violence, and previous diagnosis of anxiety and depression were associated with tobacco use (online supplemental table 4).

The multivariate model for the general population showed that, after adjusting for other sociodemographic and behavioural variables, SGM were 150% more likely to use tobacco products when compared with non-SGM (AOR 2.52; 95% CI 1.61 to 3.95) (online supplemental table 5).

In the multivariate model fitting data on non-SGM, all the variables analysed were associated significantly with the outcome. As for the model on SGM, the ORs were only statistically significant for schooling, alcohol consumption, illicit drug consumption, violence and anxiety/depression. The direction of these associations remained the same for the two groups.

DISCUSSION

This study presents nationally representative data on Brazilian SGM and points to a higher prevalence of tobacco use in this population, when compared with non-SGM, corroborating findings from studies with similar characteristics in other countries.[9–11]

According to the current study's findings, SGM tobacco users are mostly younger, more educated and with a lower proportion of persons with steady/stable partners, which distinguishes them from non-SGM tobacco users or tobacco users in general in Brazil, but similar to the profile of users of electronic smoking devices and water pipes with regard to age and schooling.[28] In addition, the majority of SGM tobacco users were male, similar to the general population of tobacco users, but they showed higher prevalence of alcohol and illicit drug consumption. This information is relevant for proposing tobacco control measures targeted to SGM, both for prevention of tobacco use initiation and for tobacco use cessation.

Analysing the prevalence of use of single tobacco products (ie, separately for various products), we found higher prevalence rates for the use of nearly all types of products in SGM when compared with the total population and non-SGM.

Various recent studies have reported the use, by SGM, of so-called alternative tobacco products, or other tobacco products, generally meaning products other than industrialised cigarettes.[29–31] Such use can be concurrent (use of more than one tobacco product), or as already reported, the concurrent use of other products such as alcohol and illicit drugs in this population,[31–36] which was also seen in the current study.

The prevalence of use of electronic cigarettes, water pipes and straw cigarettes in the Brazilian population over 15 years of age remains low according to comprehensive

population surveys.[28 37] However, an increase has been observed in these prevalence rates in recent years. It is also worthy of note that use of electronic cigarettes and water pipes is higher among younger individuals with more schooling and who reside in the states of the Midwest, South and Southeast regions of the country.[28] In the case of straw cigarettes, although consumption is higher in persons 25 years or older living in rural areas, there was a decrease in this group and an increase in younger individuals and residents of urban areas.[37 38]

The increase in the use of these products in the Brazilian population, especially young people, poses an important challenge for the country's tobacco control efforts. However, there are still no published data that allow assessing a possible increase in tobacco use among SGM, since information on sexual orientation and gender identity is not normally collected or published, especially in surveys with representative samples of the population, as mentioned above.

Electronic nicotine delivery systems, which included electronic cigarettes and heated tobacco products, have their commercialisation, importation and advertising banned in Brazil by the National Health Regulatory Agency.[39] However, the news story on the tobacco industry's sponsorship of the LGBT Parade in 2019, cited above, mentions heated tobacco products, even quoting the brand name and referring readers to the company's website for more information.[40] In other words, the story featured both news and advertising, mixing a purported corporate social responsibility measure with publicity for a new product in this population group.

The tobacco industry uses a series of promotional strategies for its products, meanwhile garnering support from strategic groups and persons such as legislators and opinion-makers.[41 42] Corporate social responsibility,[43] which includes an approach to minority groups, has been documented in other studies, not only in relation to sexual minorities, but also blacks and indigenous peoples.[20 44 45] There are also numerous reports and extensive evidence that the tobacco industry promotes its products among SGM, for example, through the inclusion of videos and advertising in various media.[19 21 22] There is thus a need for more research to assess the hypothesis that such approaches partly explain the higher tobacco use observed in this population.

The study indicated that having a religion was a protective factor against tobacco use in non-SGM and the general population, but not in SGM. A published paper with data from a longitudinal study in the USA reported that young members of sexual minorities suffer intolerance and oppression by some religious denominations, which may help explain the fact that having a religion does not have the same beneficial effect in this population.[46]

Alcohol and illicit drug consumption, history of victimisation from violence, and a diagnosis of depression or anxiety by a health professional were associated with higher prevalence of tobacco use in SGM. Blosnich *et al*,[47] in a systematic review of the aetiology of the disparity in tobacco use among sexual minorities, discuss the existence of two groups in which factors related to higher prevalence of tobacco use in SGM could be classified: those exclusive to this population, such as internalised homophobia, reaction to the disclosure of their sexual orientation and identification with subgroups belonging to sexual minorities; and others that are common to the general population but with higher rates in SGM, including alcohol and illicit drug use, violence and mental disorders. In the current study, despite similarities in factors common to the general population, it was not possible to find a significant difference in magnitude.

The article by Blosnich *et al*[47] is still the most extensive review of factors that may explain prevalence of tobacco use among SGM. Recent reviews were performed in specific subidentities within this population, which may help elucidate the topic, since the subgroups have distinct characteristics, as in the case of transgenders and bisexuals.[8 48] However, such reviews have not addressed aetiological factors in depth.

Notwithstanding the topic's importance, we highlight a limitation to the study, namely a factor that was impossible to explore due to the relatively low figures for SGM (despite the large sample size), but that is highly relevant: the understanding that the term SGM (or LGBTQIA+ and its variations) encompasses different groups related to sexual orientation and gender identity. In fact, LGBTQIA+ combines subgroups with highly distinct characteristics and experiences and particular issues inherent to their sexual orientation or gender identity. Thus, treating all these subgroups as a single category reduces the fact that these differences may impact tobacco use differently, including the way it is manifested. An example involves studies that address specific groups within SGM, such as studies on transgenders, non-binary, lesbians or gays, or even those that manage to stratify their analyses within some subcategory of this broad category.[6–8 10 35 49]

Another limitation is a possible missclassification in the sexual orientation/gender identity variable due to how the question were organized in the survey. Since the issue is sensitive, there will always be the possibility of classification error.[50] However, the fact that this is an unprecedented nationwide survey on this topic—which has received relatively little attention in Brazil—over-rides these possible limitations.

In addition, despite data collection having been carried out in 2015, this national survey is an important baseline for the topic addressed.

Meanwhile, the results are fully generalisable for the Brazilian population in the respective period, due to strict compliance with probability-sampling rules in every step and procedure, according to both the national guidelines issued by Brazilian Institute of Geography and Statistics - IBGE - and international guidelines.[51 52]

There is still a gap in knowledge of underlying determinants of this association or that can help understand it better. There is also a need for studies that better explore

a possible explanatory or causal model for such higher prevalence rates in the consumption of tobacco by SGM.

Based on the above, it is urgent to obtain data that characterise SGM with all their diversity through large population-based studies, as well as to intensify health studies in this group. Meanwhile, in addition to future studies, the data presented here provide potential backing for immediate policies and actions to protect this population from tobacco use and its associated harms and risks.

We believe it is important to address the interface between tobacco control policies and other related policies such as LGBT health, mental health and human rights. We also highlight the importance of pursuing specific strategies for the profile of tobacco users that was identified in this population (young, more educated and single), such as intensifying communication and monitoring of internet/social networks, bars and parties. Finally, we emphasise the importance of greater attention to this population in terms of the supply of treatment for nicotine addiction and the inclusion of this topic in clinical protocols.

In addition to the characteristics of this group as a whole, policies and measures should take those who use tobacco products into account in order to communicate and act more effectively to reverse this situation.

Contributors AMC: substantial contributions to: the conception and design of the work; analysis and interpretation of data for the work; drafting the work, revising it critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. NB: substantial contributions to: the conception and design of the work; the acquisition, analysis, interpretation of data for the work; drafting the work, revising it critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. CC: substantial contributions to: the acquisition, analysis and interpretation of data for the work; revising the work critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. FB: substantial contributions to: the acquisition, analysis and interpretation of data for the work; revising the work critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. VdMF: substantial contributions to: the conception and design of the work; analysis and interpretation of data for the work; revising the work critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. AMC is responsible for the overall content as the guarantor.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Ethics Committee for Research with Human Beings of FIOCRUZ (No. 902.763m of theCEP/EPSJY-CAAE: 35283814.4.0000.5241). Participants gave informed consent to participate in the study before taking part.

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