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Original Article

Hookah Smoking among Brazilian University Students: An Exploratory Survey on the Prevalence and Perceptions of Addiction and its Harmfulness

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Abstract

Background: This study aimed to determine the prevalence, beliefs, attitudes, and perceptions of hookah use in a population of undergraduate students at a large public university in Brazil.

Methods: The sample consisted of 1348 undergraduate students aged over 18-year-old. They completed structured questionnaires on demographic information and close-ended questions on the past and current experiences of smoking hookah. The data underwent descriptive analysis and binary logistic regression.

Findings: Finally, 1298 valid survey forms were obtained from printed and digital questionnaires. More than half (53.9%) of participants reported having tried hookah at least once, however, only 10.8% reported they had experienced it within the last 30 days. The majority of the studied population presented acceptable beliefs about the harmfulness and addictive capacity of hookah smoking. However, when comparing the perceptions of those who had smoked and those who had never smoked hookah, and also, the perceptions of users and non-users, significant differences were observed. Students who were users or had already tried hookah showed a tendency to underestimate the deleterious effects of this type of smoking.

Conclusion: It could be concluded that hookah smoking was common among Brazilian university students. In addition, preoccupying misperceptions of hookah's harmfulness and addictive capacity were found. The results showed that the epidemic of hookah smoking, especially among young people, has spread far beyond the Arab world and the Persians. Accordingly, preventive measures must be taken if this population is to be protected from addiction and other serious health problems.

Keywords: Waterpipe, Addiction, Brazil, Cancer, Students

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Introduction

Hookah is a kind of pipe for shared smoking that has been originated from India 400 years ago.[1,2] Its use has become a traditional form of smoking in several countries in Southeast Asia, the Middle East, and North Africa.[2] Depending on the country or region, this device has different denominations and spellings. The English literature cites at least 32 terms, the most common of which include waterpipe, hookah, narghile, arghile, shisha, goza, and hubble bubble.[1] In Brazil, the most frequently used terms are hookah and narghile.[3]

Although waterpipe smoking is an ancient practice widespread in the Arab and Persian world, it has intensified since the 1990s in the countries of the eastern Mediterranean and North Africa, and also, in Europe, the United States and South America, including Brazil.[1,3] It has been seen that this increase in hookah use occurred mostly among adolescents and university students and that this trend continues to increase in various parts of the world.[1,4,5]

In 2010, a survey at 4 Jordanian universities found that 61.1% of students had tried narghile and 42.7% smoked it at least once a month.[6] Another study in South Africa in 2013 revealed that 40% of the university students interviewed were current waterpipe users,[7] indicating that even in non-Arab countries, there is an alarming consumption of hookah among students.

Despite the general perception that hookah is less

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harmful than cigarettes, there is sufficient scientific evidence to refute such a conception.[2,8-10] Like conventional cigarettes, hookah contains toxic products which are implicated in lung diseases (volatile aldehydes), cancer (polycyclic aromatic hydrocarbons), cardiovascular disease (carbon monoxide), and chemical dependence (nicotine).[8,9] Specifically with respect to cancer, studies have shown a consistent association between waterpipe smoking and an increased risk of lung[10] and oral cancers.[11]

The epidemic increase in waterpipe smoking among young people has become a concern for the global scientific community.[4,5] Studies in several countries worldwide have investigated the prevalence, attitudes, and especially, the reasons which lead young people to experiment, and then, go on smoking waterpipe.[6,7,12] Curiosity, peer pressure, socialization, relaxation, pleasant sensory experiences, a belief that hookah is not prejudicial to health and does not cause dependency are considered as the main reasons for which young people experiment with and continue hookah smoking.[6,7,12-15]

In Brazil, data on the prevalence of waterpipe smoking is still scarce. A large epidemiological survey of 12-65 year-olds, from all Brazilian regions, estimated that more than 2.5 million individuals have experimented with narghile smoking.[16] Another recent study has shown that 59.6% of medical students at a private university in Goiânia had already tried hookah.[17] However, this sample is too small (n = 155) and not representative of the university community.

The aim of this study was to determine the prevalence, beliefs, attitudes, and perceptions of hookah use in a large population of undergraduate students at a public university in Goiânia, in the Brazilian mid-west.

Methods

Study design and sampling

This cross-sectional study was conducted between July/2018 and November/2020 at the largest public university in the state of Goiás, Federal University of Goiás (UFG), located in Goiânia, in the Brazilian mid-west. The sample consisted of 1348 over 18-year-old undergraduate students, regularly enrolled in 68 academic units, in fields of knowledge at the university (Arts and Humanities, People and Society, Science, Technology, Engineering and Mathematics).

Firstly, students completed a printed structured questionnaire on demographic information and 22 closed questions on the past and current experiences of smoking hookah, their beliefs, attitudes and perceptions of the habit, and of the concomitant use of alcohol and other tobacco products as well. The emergence of the COVID-19 pandemic in March 2020 has led to the suspension of face-to-face classes throughout the university, which made it impossible to follow up data collection.

Thus, it was necessary to adapt the methodology initially proposed, and the printed questionnaire was converted *in toto* into a digital document, using the Google Forms platform (Google LLC, California, the United States). During the pandemic, participants received the questionnaire link by email or WhatsApp, completed and returned them, also by email/WhatsApp to the researchers. As the questionnaire was specifically tailored for this exploratory study, it was not intended to have external validity, but in spite of that, content validity was developed to ensure that all items of interest were addressed. The questions were based on other standard instruments published elsewhere[6,7,15] and were translated and adapted to the Brazilian context.

Participants were assured of the confidentiality of the survey, as all responses would be maintained anonymous and individual opinions on hookah smoking would not be made public. In addition, participants had the right to withdraw from the survey at any time.

Data analysis

Descriptive statistics (prevalence and percentage values) were calculated for the demographic characteristics, and also, for beliefs, attitudes and perceptions related to waterpipe smoking. The independent *t* test was used to assess the association between age and having experienced/being a hookah user. A binary logistic regression was used to measure the relationship between certain independent variables such as gender and student perceptions and the dependent outcome variable (Have you ever tried hookah?). Similarly, binary logistic regression was used to assess the association between the same independent variables already mentioned and the outcome of being a hookah user. All analyses were carried out using IBM SPSS Statistics v.24.0 and a 95% confidence interval was set.

Results

A total of 382 printed forms and 966 forms filled out via the internet, making up a total of 1348 forms, from which 50 were excluded due to being inadequately filled out, resulted in a final sample of 1298 respondents.

The mean age of the students was 22.2 years (SD = 4.4, Age range: 17-63 years), and more than half of the participants (57.3%) were in the age group of 20 to 24 years. Most respondents were female (58.2%), and white was the most prevalent race (52.5%), followed by mixed-race (37.5%). One-third of the study population was composed of Catholics (33.6%), while atheists (24.2%) and Evangelicals (19.5%) occupied the second and third places. Most students (55.4%) declared that they belonged to the lower middle social class, while 28.7% were upper middle class, 14.4% were lower class, and only 1.5% declared they belonged to the upper class. The vast majority (97.1%) claimed that they had no Arab ancestry.

Demographic characteristics are presented in detail in Table 1.

Table 2 shows the prevalence, beliefs, attitudes, and perceptions of students about hookah smoking. More than half of the participants (53.9%) reported having tried hookah at least once; however, only 10.8% reported they had smoked it within the last 30 days, while 55.4% of students reported having already tried a cigarette. The overwhelming majority (98.0%) felt that hookah can be harmful to health, while 28.6% considered that it is

Table 1. Demographic characteristics (n = 1298)

Variable	No.	%
Age (y)		
17-19	321	25.0
20-24	730	57.3
25-29	165	13.0
30-34	29	2.3
≥35	32	2.5
Total	1274	100
Gender		
Male	543	41.8
Female	755	58.2
Ethnicity		
White	676	52.5
Brown *(Pardo)*	482	37.5
Black	108	8.4
Indigenous	11	0.9
Other	10	0,8
Religion		
Roman Catholic	428	33.6
Evangelical	248	19.5
Muslim	1	0.1
Kardecist	109	8.6
Other	180	14.1
Atheist	308	24.2
Self-reported social class		
Lower	185	14.4
Lower middle	712	55.4
Upper middle	369	28.7
Higher	19	1.5
Do you have Arab ancestry?		
No	1240	97.1
Yes	37	2.9
Arab/Persian country of origin		
Lebanon	2	4.9
Syria	23	56.1
Egypt	8	19.5
Iran	2	4.9
Other	6	14.6

Table 2. Prevalence, beliefs, attitudes, and perceptions (n = 1296)

Question	No.	%
Have you ever tried hookah?		
No	598	46.1
Yes	698	53.9
Have you ever tried cigarettes?		
No	578	44.6
Yes	717	55.4
Have you smoked hookah at least once in the last 30 days?		
No	1146	89.2
Yes	139	10.8
Do you think hookah can be harmful to health?		
No	26	2.0
Yes	1248	98.0
Do you think hookah is less harmful than cigarettes?		
No	912	71.4
Yes	365	28.6
Do you think hookah is addictive just like cigarette smoking?		
No	301	23.6
Yes	975	76.4
Do you think hookah smokers can quit whenever they want?		
No	712	55.9
Yes	562	44.1
Do you think water can filter the toxic products of hookah?		
No	1176	92.3
Yes	98	7.7
Do you think hookah smoking can cause cancer in any part of the body?		
No	77	6.0
Yes	1202	94.0
Do you think hookah smoking can cause oral cancer?		
No	193	15.1
Yes	1082	84.9
Do you think hookah smoking can cause lung cancer?		
No	73	5.7
Yes	1205	94.3
Do you think government policies against cigarette smoking should also be applied to hookah?		
No	258	20.2
Yes	1020	79.8
Do you consider yourself a hookah user?		
No	807	87.1
Yes	119	12.9
How often do you smoke hookah?		
Daily	5	2.3
Twice a week	9	4.1
Three times a week	10	4.6
Once or twice a month	45	20.7
Occasionally	148	68.2

Table 2. Continued

Question	No.	%
Where do you smoke hookah? (User only)		
Only in hookah bars and nightclubs	75	34.9
Only at home	61	28.4
In both places	79	36.7
Do you also consume alcoholic beverages while hookah smoking?		
No	86	31.7
Yes	185	68.3
As well as hookah, do you also smoke cigarettes?		
No	230	84.2
Yes	43	15.8
As well as hookah, do you also smoke straw cigarettes?		
No	144	56.0
Yes	113	44.0
The main reason you smoked hookah for the first time was:		
Simple curiosity	190	70.9
Peer pressure	61	22.8
Family tradition	5	1.9
Because it's exotic	5	1.9
To help me win over someone	4	1.5
Others	3	1.1

less harmful than cigarettes. With regard to addiction, 76.4% believed that hookah is as addictive as cigarettes while 55.9% believed that hookah smokers are unable to stop smoking whenever they want. The vast majority of respondents (92.3%) did not believe that water is capable of filtering toxic products. When asked about the association between hookah and cancer, the vast majority (94.0%) reported that its use could cause cancer in some part of the body, 84.9% felt it could cause cancer in the mouth while 94.3% felt it could cause cancer in the lung. A total of 79.8% of respondents felt that government policies against cigarette smoking should also be applied to hookah. Only a minority of participants (12.9%) admitted to being a hookah user. Among those who reported smoking hookah, 68.2% used it occasionally and 20.7% used it once to twice a month, while a small percentage of students (4.6%) reported using it 3 times a week, 4.1% used it twice a week, and 2.3% used it on a daily basis. Regarding location, 28.4% smoked only at home, 34.9% smoked only in bars and nightclubs while 36.7% smoked in both places. During hookah-smoking sessions, 68.3% also admitted to consuming alcoholic beverages, 15.8% also smoked cigarettes, and 44.0% also smoked straw cigarettes. Curiosity (70.9%) and peer pressure (22.8%) were the main reasons for smoking hookah for the first time.

There was no difference ($P=0.241$) in mean age between the groups of students who "had tried" hookah (mean = 22.0; SD = 3.3) and those who "had not tried it" (mean = 22.3; SD = 5.5). Similarly, there was no difference in age ($P=0.370$) between "hookah users" (n = 119; mean = 22.0; SD = 3.3) and "non users" (n = 807; mean = 22.4; SD = 4.93).

Table 3 illustrates the relationship between certain independent variables and the event of having experienced hookah. Male gender was a factor subtly associated with having smoked hookah at least once (OR = 1.461; 95% CI [1.169-1.826]). On the other hand, having tried a cigarette was strongly associated with having also tried hookah (OR = 15.269; 95% CI [11.636-20.036]). The following beliefs: hookah is less harmful than cigarettes (OR = 1.473; 95% CI [1.150-1.885]), it is not as addictive as cigarettes (OR = 1.778; 95% CI [1.360-2.325]), hookah smokers are able to stop smoking whenever they want (OR = 2.190; 95% CI [1.744-2.749]), and water can filter the products (OR = 1.806; 95% CI [1.165-2.800]), were all significantly associated with having experienced hookah. There was also a loose association between being opposed to the application of restrictive government policies to hookah and having already used it (OR = 1.509; 95% CI [1.141-1.997]).

The association between the same independent variables in Table 3 and the dependent outcome "being a hookah user" is shown in Table 4. The belief that hookah can be harmful to health was not significantly associated with being a user (OR = 3.084; 95% CI [0.935-10.177]), which is similar to the result shown in Table 3 in relation to having experienced hookah. For all other independent variables, there was a statistically significant association between beliefs and being a hookah user. Female gender was also a protective factor against being a user. Unlike Table 3, Table 4 shows that the students' perceptions of whether or not hookah causes cancer were significantly associated with being a user: "Do you think hookah smoking can cause cancer in any part of the body?" (OR = 2.766; 95% CI [1.476-5.181]), "Do you think hookah smoking can cause oral cancer?" (OR = 1.893; 95% CI [1.199-2.987]), "Do you think hookah smoking can cause lung cancer?" (OR = 2.557; 95% CI [1.346-4.858]).

Discussion

This study found that 53.9% of university students had experienced hookah in their lifetime. Such a high prevalence corroborates a trend already seen in studies conducted in Brazil by Martins et al[18] (47%) and Araújo et al[17] (59.6%). However, these two surveys involved small samples limited to medical students, while the sample studied in the present study involved a large sample of Brazilian university students (n = 1298) from all fields of knowledge. Studies in different countries have shown various percentages of university students who had admitted to trying hookah: United States[19] (72.8%), South Africa[20] (63%), Jordan[6] (61.1%), England[21] (37.9%), Occupied Palestinian Territory[22] (33.4%), Iran[23] (26.6%),

Table 3. Binary logistic regression of real experiences of hookah (n = 1296)

Independent variables	Have you ever tried hookah?				*P*	OR	95% CI	
	No (n = 598)		Yes (n = 698)				Inf.	Sup.
	n	%	n	%				
Gender								
Male	221	40.7	322	59.3	0.001	1.461	1.169	1.826
Female	377	50.1	376	49.9				
Have you ever tried cigarettes?								
No	456	78.9	122	21.1	<0.001	15.269	11.636	20.036
Yes	141	19.7	576	80.3				
Do you think hookah can be harmful?								
No	11	42.3	15	57.7	0.704	1.165	0.531	2.556
Yes	574	46.1	672	53.9				
Do you think hookah is less harmful than cigarettes?								
No	443	48.7	467	51.3	0.002	1.473	1.150	1.885
Yes	143	39.2	222	60.8				
Do you think hookah is addictive just like cigarette smoking?								
No	106	35.3	194	64.7	<0.001	1.778	1.360	2.325
Yes	480	49.3	494	50.7				
Do you think hookah smokers can quit whenever they want?								
No	387	54.4	324	45.6	<0.001	2.190	1.744	2.749
Yes	198	35.3	363	64.7				
Do you think water can filter the toxic products of hookah?								
No	553	47.1	622	52.9	0.008	1.806	1.165	2.800
Yes	32	33.0	65	67.0				
Do you think hookah smoking can cause cancer in any part of the body?								
No	37	48.1	40	51.9	0.716	0.918	0.579	1.456
Yes	551	45.9	649	54.1				
Do you think hookah smoking can cause oral cancer?								
No	86	44.8	106	55.2	0.691	1.065	0.782	1.449
Yes	501	46.3	580	53.7				
Do you think hookah smoking can cause lung cancer?								
No	36	49.3	37	50.7	0.568	0.871	0.543	1.398
Yes	552	45.9	651	54.1				
Should government policies against cigarette smoking also be applied to hookah?								
No	98	38.0	160	62.0	0.004	1.509	1.141	1.997
Yes	489	48.0	529	52.0				

and Hong Kong[24] (23.8%). It was surprising to see that the prevalence rates found in North American and South African studies, as well as in this study, were higher than those reported in Iran and the Occupied Palestinian Territory, indicating that the habit has spread beyond the Arab and Persian countries.

In the context of current hookah use (having smoked in the last 30 days), a rate of 10.8% was found similar to that reported by Kruger et al [20] (9.9%) and Abbasi-Ghahramanloo et al[23] (8.9%), but lower than that found by Kassem et al[19] (41.8%), Azab et al[6] (42.7%), and Jackson and Aveyard[21] (21.1%). Although the findings of the present study are consistent with those mentioned above,[20,23] the fact that data collection was mostly carried out during the COVID-19 pandemic could cause a reduction in hookah usage in the recent period.

The findings of the present study show that male gender were positively associated with having tried and being hookah users, which is consistent with the results of many others.[6,21-23,25,28] However, Alolabi et al[26] and Lee et al[24] reported contrary results. Such gender discrepancies could be explained by the different socio-cultural aspects of each country or region. It was found that cigarette smoking significantly increased the risk of

Table 4. Binary logistic regression of hookah smoking in terms of users and non-users (n = 926)

Independent Variables	Condition				*P*	OR	CI (OR)	
	Non-User (n = 807)		User (n = 119)				Inferior	Superior
	n	%	n	%				
Gender								
Male	318	84.1	60	15.9	0.023	1.564	1.063	2.301
Female	489	89.2	59	10.8				
Have you ever tried cigarettes?								
No	384	96.7	13	3.3	<0.001	7.402	4.094	13.384
Yes	423	80.0	106	20.0				
Do you think hookah can be harmful?								
No	9	69.2	4	30.8	0.064	3.084	0.935	10.177
Yes	798	87.4	115	12.6				
Do you think hookah is less harmful than cigarettes?								
No	615	92.9	47	7.1	<0.001	4.907	3.284	7.333
Yes	192	72.7	72	27.3				
Do you think hookah is addictive just like cigarette smoking?								
No	164	75.2	54	24.8	<0.001	3.257	2.184	4.857
Yes	643	90.8	65	9.2				
Do you think hookah smokers can quit whenever they want?								
No	489	95.1	25	4.9	<0.001	5.782	3.639	9.187
Yes	318	77.2	94	22.8				
Do you think water can filter the toxic products of hookah?								
No	761	88.2	102	11.8	0.001	2.757	1.523	4.991
Yes	46	73.0	17	27.0				
Do you think hookah smoking can cause cancer in any part of the body?								
No	40	72.7	15	27.3	0.001	2.766	1.476	5.181
Yes	767	88.1	104	11.9				
Do you think hookah smoking can cause oral cancer?								
No	122	80.3	30	19.7	0.006	1.893	1.199	2.987
Yes	685	88.5	89	11.5				
Do you think hookah smoking can cause lung cancer?								
No	40	74.1	14	25.9	0.004	2.557	1.346	4.858
Yes	767	88.0	105	12.0				
Should government policies against cigarette smoking also be applied to hookah?								
No	131	73.2	48	26.8	<0.001	3.489	2.312	5.263
Yes	676	90.5	71	9.5				

CI, confidence interval

trying hookah and being a hookah user, as already shown by other investigations.[23,25,27,29,30] The findings indicate that one smoking modality predisposes to the initiation and maintenance of others. Although some researchers have reported that younger age was associated with hookah smoking,[19,20,27] this association was not found in the present study, and studies by Abbasi-Ghahramanloo et al[23] and Kakaje et al.[28]

Taking our sample as a whole, the majority of the population studied presented acceptable beliefs about hookah smoking as encountered by Alvur et al.[31] Almost 100% of the students involved in the present study considered it harmful to health and most expressed correct perceptions about its toxicity, harmfulness and addictiveness in relation to cigarettes and restrictive policies (Table 2). However, when comparing the perceptions of those who had smoked and those who had never smoked hookah (Table 3), and comparing the perceptions of users and non-users (Table 4), significant differences were seen. With the exception of saying that hookah can be harmful to health, the obtained data show that the fact of having tried, and above all, being a user (higher OR) were associated with misconceptions about the harmfulness, addictive capacity and toxicity of

hookah as shown in other studies.[7,15,32-37]

The findings of the present study, consistent with the results of aforementioned studies, also showed that students who had already tried hookah and those who claimed to be users tended to believe that hookah would be less harmful than cigarettes,[7,15,32,34-36] would not be as addictive as cigarette smoking,[7,15,33-36] that people could stop smoking it whenever they wanted,[7,33-35] that water could filter the smoke toxins,[7,36] and were opposed to certain restrictive policies.[36,37] These perceptions were even stronger among users than those who had tried it. Such misconceptions are really preoccupying as the scientific literature has shown that the undesirable effects of smoking hookah can be as harmful[8,9,38-41] and as addictive[8,42] as smoking cigarettes.

With specific regard to the association between hookah and cancer, the present study showed that, when the perceptions of those who had tried it were compared with the perceptions of those who had not, there was no difference, or in other words, both groups believe that smoking hookah can cause cancer in some part of the body, lung, and mouth. But, when comparing the perceptions of users and non-users, a significant difference was found; in other words, users tended not to believe that smoking hookah can cause cancer. These data are a cause for concern and information campaigns are needed, as the association between hookah smoking and malignancies has already been established by several studies, especially with regard to lung[10,41-45,46] and oral[11,41,43,44,46] cancers.

In this study, students' attitudes towards hookah smoking are based on the responses of those who admitted to being regular smokers. Although such data represent a small percentage of the sample, it was found to be consistent with the results of others studies,[47,48] that curiosity (70.9%) was the main reason for trying hookah. The second most prevalent motive was peer pressure (22.8%), which was also reported by other studies.[12,34,48] Less than 2% of students reported family tradition as their motivation for trying hookah as the vast majority (97.1%) claimed not to have Arab ancestry. In contrast, Rice,[5] Roskin and Aveyard,[14] and Jawad et al,[49] all reported that family and cultural feelings influenced young Arabs living in North America and the UK in their decision to smoke hookah.

Another attitude meriting consideration is the fact that, during hookah sessions, 68.3% of students reported consuming alcoholic beverages, 15.8% smoked cigarettes, and 44% smoked straw cigarettes. In Brazil, smoking straw and paper hand-rolled cigarettes is a traditional habit among rural inhabitants, especially males.[50] In recent years, this practice has spread to urban zones and has become quite popular among young people, as shown in the present study. That seems to be a trend not only in Brazil but also in other countries.[51,52] It is crucial to emphasize that the combination of any type of smoking, whether hookah, cigarette, or straw cigarette and chewing tobacco, with alcohol is extremely dangerous as the tobacco-alcohol synergism greatly increases the risk of carcinogenesis, especially oral cancer.[53-55]

One of the limitations of this study is its cross-sectional design, whose results that involved one single university in Brazil must be carefully analyzed in terms of inferences and extrapolations. Furthermore, the data themselves were obtained through self-reports, which were assumed to have been honest, but a certain degree of bias could be present in the information. In spite of that, the high prevalence of hookah experimentation and the misperceptions identified justify the implementation of public policies to clarify students on issues covering the harmfulness, toxicity, safety and addictiveness of hookah smoking. Case-control and longitudinal studies are required to obtain more robust evidence on the association between hookah use and unfavorable health outcomes.

It could be concluded that hookah smoking had a high prevalence among undergraduate students in Brazil. Besides that, preoccupying misperceptions regarding harmfulness and addictive capacity were found. The results of the present study showed that preventive measures, aimed especially at university students, should be undertaken.[56,57]

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Authors' Contribution

Conceptualization, methodology, project administration, original draft writing, review and editing: LAC. Data collection, data curation and writing the manuscript: GLCG, ISB, LFRS, MTLR and LLC. Methodology, statistical analysis and data interpretation: GJPLO. All authors read and approved the final manuscript.

Conflict of Interests

None declared.

Ethical Approval

The study was approved by the Research Ethics Committee of the Federal University of Goiás CEP/UFG (Report: 3.087.457), and all participants signed an informed consent form.

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