Alcohol and tobacco use in individuals with type 2 diabetes: Study before and during the Covid-19 pandemic

https://doi.org/10.56238/sevened2024.018-074

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ABSTRACT

Objective: To evaluate alcohol and tobacco use in individuals with type 2 diabetes mellitus before and during the COVID-19 pandemic. Method: A longitudinal study with a quantitative approach was carried out with 72 individuals with diabetes who were treated at the outpatient clinic of a public hospital in the city of Recife, Pernambuco. Sociodemographic and clinical variables and those related to alcohol and tobacco use were evaluated through interviews and telephone contact. Results: There was a twofold increase in the frequency of alcohol use of less than 1 day/week (2 vs 4) and a variation of 2 days/month (0 vs 4). In men there was an increase in the minimum and maximum dose and in women the maximum dose allowed. Approximately 50% reduced their tobacco use and 95.8% (69) of the individuals did not take at least one puff of their cigarettes. Conclusion: Individuals had their lifestyles altered, regarding the increase in the frequency of alcohol consumption and reduction in smoking when comparing before and during the pandemic period.

Keywords: Alcohol consumption, Tobacco use, Type 2 diabetes mellitus, COVID-19, Lifestyle.

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INTRODUCTION

The rapid worldwide expansion of the Coronavirus Disease 2019 (COVID-19) pandemic has led to the disruption of the daily activities of the population, due to the need for social distancing through home confinement in order to limit the spread of the disease [1]. With the arrival of the pandemic, future uncertainties and prolonged periods indoors are associated with economic and general health concerns. In this context, the emotional responses of individuals are varied, and can negatively interfere with physical and mental health. Therefore, this situation can lead the individual to practice inappropriate habits, such as smoking and drinking, in an attempt to increase emotional balance[2].

A study of 800 Chinese exposed to the Severe Acute Respiratory Syndrome (SARS) pandemic in 2003 found that 4.7% of men and 14.8% of women who drank alcohol increased their consumption one year after the pandemic. A similar result also occurred among smokers, with a 12.9% increase in smoking frequency during the pandemic when compared to the pre-SARS period. This fact suggests that the increase in alcohol and tobacco consumption may be associated with emotional distress resulting from the pandemic moment[3].

In the face of the COVID-19 pandemic, the increase in alcohol use not only increases the usual burden of diseases associated with its consumption, but also the risk of infection by the virus, since the use of alcohol, especially excessively, can interfere with the innate and acquired immune system4. Smokers are also one of the groups vulnerable to infection by the SARS-CoV-2 virus due to increased expression of angiotensin-converting enzyme 2 (ACE2), a receptor for the virus, which increases the risk of lung damage. Therefore, the association of alcohol and tobacco can lead to a worse prognosis of the individual when infected with COVID-195,2.

Type 2 Diabetes Mellitus is a serious public health problem and in the context of the COVID-19 pandemic it is an additional factor for the worsening of infection by the virus, especially in the presence of glycemic uncontrol6. It is known that there is an association between alcohol consumption and diabetes complications. Alcohol affects diet and blood glucose, that is, the liver is overloaded by deactivating the alcohol ingested, which leads to dysregulation in the appropriate amount of glucose in the blood and a higher risk of hypoglycemic episodes. Tobacco use also interferes with disease control, increases overall mortality, cardiovascular diseases and other diabetes complications, such as diabetic foot, peripheral neuropathy and renal failure7.

Living with diabetes in the COVID-19 scenario can generate varying degrees of negative emotions, such as anxiety and depression, which can lead to greater consumption of alcohol and tobacco, and thus, the emergence and worsening of the disease's complications8. In addition, the lack of glycemic control can contribute to the worsening of COVID-19 infection in this population.

The aim of this study was to evaluate alcohol and tobacco use in individuals with type 2 diabetes mellitus before and during the COVID-19 pandemic.

METHODS

This is a longitudinal study with a quantitative approach, carried out at the Endocrinology Outpatient Clinic of a public hospital in the city of Recife, Pernambuco, northeastern Brazil.

The population consisted of individuals with a medical diagnosis of type 2 diabetes mellitus in their health records and assisted by the service. To determine the sample size, the sample calculation equation was used for the study of proportion in a finite population9, considering a confidence level of 95%, test power of 90%, and the expected proportions for changes in alcohol and tobacco consumption during the pandemic, the sample accounted for the necessary sample size of 69 individuals with diabetes. However, of the total sample population in the pre-pandemic period (86), 14 were excluded due to the lack of a telephone number, resulting in the final sample of 72 individuals.

Individuals with communication and/or cognition impairment, recorded in the health record, that could interfere with data collection during the follow-up of the study, were excluded; presence of chronic complications in advanced stages, such as hemodialysis, amaurosis, sequelae of stroke or heart failure, previous amputations, or active ulcer in the lower limbs.

Data for the period prior to the COVID-19 pandemic were collected in person at the diabetes outpatient clinic from July 2019 to March 2020, by a previously trained research team. Thus, for this study, this information was retrieved and the database was constructed. For data on alcohol and tobacco use during the COVID-19 pandemic, a form was built via Google Forms, for application via telephone contact, using the WhatsApp tool, during the period from January to March 2021. The telephone call was previously scheduled, respecting the most convenient day and time for the participant, who was instructed to look for a calm and silent environment in order not to interfere with the understanding of the questions that made up the collection instrument.

Alcohol use was investigated based on questions about alcohol consumption (yes/no), frequency, intake in the last 30 days of at least 1 dose ≤for women and ≤2 doses for men, and at most (≥4 doses for women and ≥ 5 doses for men). The dose of alcoholic beverage was considered as 360 ml of beer or 150 ml of wine or 45 ml of distilled beverage7.

Smoking was assessed using the three items of the Questionnaire of Activities of

Diabetes Self-Care Questionnaire (QAD), a version of the Summary of Diabetes Self-Care Activities Questionnaire (SDSCA) was translated, adapted and validated for use in Brazil, showing good internal consistency, with inter-item correlation, measured by Cronbach's alpha, of 0.86.

Smoking was codified considering the proportion of smokers, the mean number of cigarettes smoked, and the last time they smoked10.

The data were entered into an electronic spreadsheet of the Excel program for Windows®, in double entry, verified with VALIDATE, a module of the Epi-info Program version 6.04 (WHO/CDC/Atlanta, GE, USA), to check consistency and validation. Next, the data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 18.0. Continuous variables were tested for normality of distribution using the Kolmogorov-Smirnov test. Data with normal distribution were described as mean and standard deviation (SD), while non-normal data were described as median and interquartile range (IQR). In the description of the proportions, the binomial distribution was approximated to the normal distribution by the 95% confidence interval.

The study was submitted to and approved by the Research Ethics Committee under CAAE registration: 12615619.0.0000.5208. It should be noted that it complied with the requirements recommended by Resolution 466/2012 of the National Health Council, in which participants were invited to participate in the research by signing the free and informed consent form.

RESULTS

Of the 86 individuals with diabetes, most are women (74.4%), under 60 years of age (52.3%), minimum age of 26 years, maximum of 80 years and average of 58.50 (SD±10.04) years, live with a partner (54.7%), complete elementary school (59.2%), monthly income less than or equal to one minimum wage (58.5%), with an average of 1378.4 reais (SD±1116.8). Regarding the clinical variables, most of them have been diagnosed with diabetes for more than 10 years (55.8%), with complications of the disease (66.3%) and refer to arterial hypertension (91.4%) as an associated prevalent comorbidity (Table 1).

Table 1. Sociodemographic and clinical characterization of individuals with diabetes assisted in an outpatient service. Recife-PE, Brazil, 2019-2020.

Variables	N	%
Gender		
Male	22	25,6
Female	64	74,4
Age (years)		
< 60	45	52,3
≥ 60	41	47,7
Years of study		
≤ 8 ≤	45	59,2

> 8	31	40,8
Monthly Income (SM)		
Up to 1	48	58,5
More than 1	34	41,5
Family Starter		
With partner	47	54,7
No companion	39	45,3
Time of Diagnosis (years) 10 ≤	38	44,2
> 10	48	55,8
Comorbidities		
Yes	70	81,4
No	16	18,6
Hypertension		
Yes	64	91,4
No	6	8,6
Dislipidemias		
Yes	33	47,1
No	37	52,9
Obesity		
Yes	22	31,4
No	48	68,6
Complications of DM		
Yes	57	66,3
No	29	33,7

When analyzing alcohol consumption before and during the COVID-19 pandemic, it is observed that use decreased, but there was a two-fold increase in frequency of less than 1 day/week (2 *vs* 4). Regarding the days of the month where this occurred, the variation in the increase in alcohol use from 1 to 7 days per month is observed, being higher in 2 days/month (0 *vs* 4). In men, there was an increase in the minimum and maximum dose of alcohol, and in women, only the maximum dose allowed (1vs2) (Table 2).

Tobacco use decreased by approximately 50%, with daily and occasional consumption being more prevalent. Consumption in the last seven days reveals that 95.8% (69) of the individuals did not

take at least one puff on their cigarettes. However, among those who stated consumption, there was a 50% reduction in the pandemic period (6vs3). Glycated hemoglobin values were above the recommended values for glycemic control before and during the pandemic, but showed a reduction of 0.33% in the pandemic period (Table 2).

Table 2. Alcohol and tobacco use before and during the COVID-19 pandemic by individuals with diabetes assisted in an outpatient service. Recife-PE, 2019-2020.

	BEFORE		**DURING**	
Variables	**N**	**%**	**N**	**%**
Alcohol use				
Yes	16	18,6	11	15,3
No	70	81,4	61	84,7
Frequency of alcohol use*				
1-2 days/week	3	18,8	2	18,2
3-4 days/week	1	6,3	-	-
<1 day/week	2	12,5	4	36,4
<1 day/month	10	62,5	5	45,5
Use of 2 doses of alcohol per men in the last 30 days*				
Yes	3	50,0	6	85,7
No	3	50,0	1	14,3
Use of 1 dose of alcohol per women in the last 30 days*				
Yes	4	66,7	4	100,0
No	2	33,3	-	-
Use of 5 doses of alcohol per men in the last 30 days*				
Yes	2	33,3	3	42,9
No	4	66,7	4	57,1
Use of 4 doses of alcohol per women in the last 30 days*				
Yes	1	11,1	2	50,0

No	8	88,9	2	50,0
Days of the month this occurred (days/month)*				
1	1	25,0	3	30,0
2	-	-	4	40,0
3	1	25,0	1	10,0
4	1	25,0	-	-
5	1	25,0	-	-
6	-	-	1	10,0
≥7	-	-	1	10,0
Tobacco use				
Yes, daily	4	4,7	2	2,8
Sim, occasionally (≤	2	2,3	1	1,4
daily)				
Former smoker	25	29,1	24	33,3
Never smoked	55	64,0	45	62,5
Use of 1 cigarette - even if				
Just one puff in the last 7 Days*				
Yes	6	7,0	3	4,2
No	80	93,0	69	95,8
Median	2,0 (IQ 2,0; 2,0)		2,0 (IQ 2,0; 2,0)	
If yes, number of cigarettes/day*				
4	3	50,0	-	-
5	-	-	1	50,0
6	1	16,7	-	-
10	1	16,7	-	-
12	-	-	1	50,0
20	1	16,7	-	-
Mean ± Standard Deviation	8.00 ± 6.32		8.50 ± 4.95	
Use of the last cigarette				
Never smoked	53	61,6	46	63,9
>2 years	27	31,4	26,7	31,9

4 to 12 months ago	-	-	1	1,4
In the last month	1	1,2	-	-
Today	5	5,8	2	2,8
Glycated hemoglobin (%)* ≤7%	21	30,0	9	29,0
> 7%	49	70,0	22	71,0
Mean ± Standard Deviation	8.64±2.45		8.31±2.34	
Glicemia de Jejum				
Median	145,0 (IQ 106.1; 218.4)		125,5 (IQ 97.5; 188.7)	

Notes: *Included only individuals with diabetes who self-reported alcohol and/or tobacco use.

DISCUSSION

The present study evaluated alcohol and tobacco consumption before and during the COVID-19 pandemic in people with type 2 diabetes mellitus, in order to investigate possible changes in the behavior of individuals.

The COVID-19 pandemic has generated unemployment and reduced working hours, which has led to a decrease in income for a large part of the population, which can result in tighter budgets, which can favor the use of alcohol and tobacco, with the worst prognosis for individuals with type 2 diabetes mellitus, infected with COVID-1911-13.

The increase in alcohol consumption can occur in periods of stress, such as the experience of the pandemic associated with uncertainties about the future, social isolation, and the social restrictions imposed by COVID-19, contributing to the worsening of health-related behaviors14. Daily alcohol intake for adults with diabetes should be limited to ≤1 drink for women and ≤2 drinks for men. Considering a dose of 150 ml of wine (a glass), 360 ml of beer (a small can) or 45 ml of spirits (a dose with a standard dispenser), measuring the equivalent of 15g, on average, of ethanol [7].

Although most participants decreased their alcohol intake, there was an increase in the frequency of alcohol use, which allows significant impacts on glycemic levels, since it contributes to the occurrence of hypoglycemic episodes. Depending on the sensitivity of each individual and the complications of the disease, the masking of hypoglycemic symptoms, reduced hepatic glucose production, and increased production of ketone bodies may occur, with a risk of worsening the hypoglycemic condition[7]. Associated with this, alcohol consumption can also destabilize the immune system and reduce the ability to fight bacterial and viral infectious diseases, such as COVID-19, increasing the risk of infection during the pandemic15,16.

In China, 32% of habitual alcohol consumers reported increased alcohol use, and 19.7% reported relapse to alcohol abuse during the pandemic17. This consumption was pointed out as a result of increased anxiety, stress, depression, and reduced mental well-being18,19. Like alcohol, the consumption of cigarettes by people with diabetes also negatively influences the control of the disease, and can be considered an antecedent factor for the development of peripheral arterial disease, such as peripheral neuropathy20-22.

Tobacco use is related to decreased sensitivity in the lower limbs. The substance present in cigarettes, nicotine, triggers adrenergic responses that increase blood glucose levels and interrupt insulin production, in addition to causing vasospasm that increases the possibility of thrombosis and can cause peripheral vascular insufficiency23,24. The prevalence of neuropathy is twice as high in current smokers (33%), compared to nonsmokers (15%) and former smokers (17%)[25]. When analyzing tobacco consumption, the present study reveals that approximately half of the individuals reduced their use during the pandemic period, a result that contrasts with that of a health survey by Fiocruz, in which it showed that most smokers are not reducing their cigarette consumption26. This contrast occurs because the pattern of behavior is changeable according to the way of coping and the social conditions of each individual15.

Another explanatory factor for this reduction in smoking is the knowledge of the worsening development of COVID-19 infection, since the substances and inhaled smoke cause damage and weakness to lung function11. Such pathophysiological changes, when advanced, lead to pulmonary involvement associated with acute respiratory syndrome caused by the Coronavirus27.

The predisposition to worsening of the COVID-19 condition in individuals with diabetes mellitus is due to the increased risk of developing a state of metabolic inflammation that stimulates an increased release of cytokines28,29, and also due to their compromised immune system, reducing the body's ability to fight infection, impairing the healing process and prolonging recovery30.

Therefore, further studies with a larger sample are needed in order to investigate the incidence of this increase in alcohol consumption to also assist in decision-making in the context of public health and public policies. It is essential that governments and civil entities in the field of health adopt strategies to present to the population about the harm associated with the consumption of this substance.

Among the limitations of the study, the fact that the survey was collected through telephone interviews, not reaching the entire population sample collected before the COVID-19 pandemic, since not everyone has access to the internet and has changed their cell phone number. In addition, the fact that the questions are self-reported may be subject to recall bias. In addition, the fact that data collection was 1 year after the beginning of the pandemic may be subject to conjunctural changes throughout the temporal evolution of the pandemic.

CONCLUSIONS

People with diabetes mellitus had their lifestyles changed, with regard to the increase in the frequency of alcohol consumption and reduction of smoking, before and during the pandemic period. It is observed that the use of alcohol decreased, but there was a doubling increase in frequency, and a reduction in tobacco use during the pandemic.

Associated with the use of alcohol and tobacco is the highest risk of hypoglycemia, the study population presents dysregulation in the adequate amount of glucose in the blood, so they have worse glycemic control.

Thus, there is a need to build health interventions that consider the particularities, characteristics and limitations of the groups to receive the intervention, so that it is possible to contribute with positive results in the cessation of alcohol and tobacco use, and in the glycemic control of individuals with diabetes, given the potential negative effects associated with health. even greater when aligned with COVID-19.

CONTRIBUTIONS

All authors contributed equally to the conception of the research project, data collection, analysis and discussion, as well as to the writing and critical review of the content with intellectual contribution and the approval of the final version of the study.

ACKNOWLEDGMENT

To the National Council for Scientific and Technological Development (CNPq), for the scientific initiation project scholarship.

FINANCING

There was no funding.

CONFLICT OF INTEREST

There was no conflict of interest.

REFERENCES

1. Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. V., et al. (2020). Impact of social isolation due to COVID-19 on health in older people: Mental and physical effects and recommendations. *Journal of Nutrition, Health & Aging, 24*(9), 938-947. https://doi.org/10.1007/s12603-020-1469-2

2. Silva, A. L. O., Moreira, J. C., & Martins, S. R. (2020). COVID-19 e tabagismo: Uma relação de risco. *Cadernos de Saúde Pública*, *36*(5). https://doi.org/10.1590/0102-311X00072020

3. Lee, S. M., Kang, W. S., Cho, A. R., Kim, T., & Park, J. K. (2018). Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Comprehensive Psychiatry, 87*, 123-127. https://doi.org/10.1016/j.comppsych.2018.10.003

4. Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C. D. H., Sanchez, Z. M., & Manthey, J. (2020). Alcohol use in times of the COVID-19: Implications for monitoring and policy. *Drug and Alcohol Review, 39*(4), 301-304. https://doi.org/10.1111/dar.13074

5. García-Álvarez, L., Fuente-Tomás, L., Sáiz, P., García-Portilla, M., & Bobes, J. (2020). ¿Se observarán cambios en el consumo de alcohol y tabaco durante el confinamiento por COVID-19? *Adicciones, 32*(2), 85-89. https://doi.org/10.20882/adicciones.1546

6. Centros para el Control y la Prevención de Enfermedades (CDC). (2020). Personas con mayor riesgo de enfermarse gravemente. Available from: https://espanol.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/index.html

7. Sociedade Brasileira de Diabetes (SBD). (2020). Diretrizes da Sociedade Brasileira de Diabetes: 2019-2020. São Paulo: Editora Clannad. Available from: https://www.diabetes.org.br/profissionais/images/Diretrizes-completa-2019-2020.pdf

8. ONU. (2020). Mantenha-se fisicamente ativo durante o distanciamento social, recomenda OMS. Available from: https://unicrio.org.br/mantenha-se-fisicamente-ativo-durante-o-distanciamento-social-recomenda-oms/#:~:text=A%20Organiza%C3%A7%C3%A3o%20Mundial%20da%20Sa%C3%BAde,e%20com%20espa%C3%A7o%20limitado.

9. Arango, H. G. (2011). *Bioestatística - Teórica e Computacional: com bancos de dados reais* (3rd ed.). Rio de Janeiro: Guanabara Koogan.

10. Michels, M. J., Coral, M. H. C., Sakae, T. M., Damas, T. B., & Furlanetto, L. M. (2010). Questionário de Atividades de Autocuidado com o Diabetes: Tradução, adaptação e avaliação das propriedades psicométricas. *Arquivos Brasileiros de Endocrinologia & Metabologia, 54*(7), 644-651. https://doi.org/10.1590/S0004-27302010000700009

11. Barbosa, D. J., Gomes, M. P., Gomes, A. M. T., & Souza, F. B. A. de. (2020). Relação entre o consumo de drogas psicoativas e COVID-19: Síntese de evidências. *Journal of Management in Primary Health Care, 12*, 1-9. https://doi.org/10.14295/jmphc.v12.1000

12. Mansfield, K. E., Mathur, R., Tazare, J., et al. (2021). Indirect acute effects of the COVID-19 pandemic on physical and mental health in the UK: A population-based study. *Lancet Digital Health, 3*(4), e217-e230. https://doi.org/10.1016/S2589-7500(21)00017-0

13. Malta, D. C., Gomes, C. S., Barros, M. B. A., Lima, M. G., Almeida, W. S., & Sá, A. C. M. G., et

al. (2021). Doenças crônicas não transmissíveis e mudanças nos estilos de vida durante a pandemia de COVID-19 no Brasil. *Revista Brasileira de Epidemiologia, 24*, e210009. https://doi.org/10.1590/1980-549720210009

14. Garcia, L. P., & Sanchez, Z. M. (2020). Consumo de álcool durante a pandemia da COVID-19: Uma reflexão necessária para o enfrentamento da situação. *Cadernos de Saúde Pública, 36*(10), e00124520. https://doi.org/10.1590/0102-311X00124520

15. Ayele, T. A., Shibru, H., Sisay, M. M., Melese, T., Fentie, M., Azale, T., et al. (2022). The effect of COVID-19 on poor treatment control among ambulatory hypertensive and/or diabetic patients in Northwest Ethiopia. *PLoS ONE, 17*(5), e0266421. https://doi.org/10.1371/journal.pone.0266421

16. Bhalla, S., Sharma, B., Smith, D., et al. (2021). Investigating unhealthy alcohol use as an independent risk factor for increased COVID-19 disease severity: Observational cross-sectional study. *JMIR Public Health and Surveillance, 7*(11), e33022. https://doi.org/10.2196/33022

17. Sun, Y., Li, Y., Bao, Y., Meng, S., Sun, Y., Schumann, G., et al. (2020). Brief report: Increased addictive internet and substance use behavior during the COVID-19 pandemic in China. *American Journal on Addictions, 29*(4), 268-270. https://doi.org/10.1111/ajad.13066

18. Murthy, P., & Narasimha, V. L. (2021). Effects of the COVID-19 pandemic and lockdown on alcohol use disorders and complications. *Current Opinion in Psychiatry, 34*(4), 376-385. https://doi.org/10.1097/YCO.0000000000000720

19. Sivapuram, M. S., Nagarathna, R., Anand, A., Patil, S., Singh, A., & Nagendra, H. R. (2020). Prevalence of alcohol and tobacco use in India and implications for COVID-19 – Niyantrita Madhumeha Bharata Study projections. *Journal of Medicine and Life, 13*(4), 499-509. https://doi.org/10.25122/jml-2020-0079

20. Silva, L. F. M., Ferreira, A. G. N., Pereira, A. L. F., Pascoal, L. M., Neto, M. S., & Dutra, R. P. (2021). Comprometimento vascular periférico em pacientes diabéticos: Fatores etiológicos e manifestações clínicas. *Saúde e Desenvolvimento Humano, 9*(2), 1-11. https://doi.org/10.18316/sdh.v9i2.6836

21. dos Reis, R. C. P., Duncan, B. B., Szwarcwald, C. L., Malta, D. C., & Schmidt, M. I. (2021). Control of glucose, blood pressure, and cholesterol among adults with diabetes: The Brazilian National Health Survey. *Journal of Clinical Medicine, 10*(15), 3428. https://doi.org/10.3390/jcm10153428

22. Chwal, B. C., dos Reis, R. C. P., Schmidt, M. I., Duncan, B. B., Barreto, S. M., Griep, R. H., et al. (2023). Levels and correlates of risk factor control in diabetes mellitus – ELSA – Brasil. *Diabetology & Metabolic Syndrome, 15*(1), 4. https://doi.org/10.1186/s13098-022-00961-3

23. Le Foll, B., Piper, M. E., Fowler, C. D., Tonstad, S., Bierut, L., Lu, L., et al. (2022). Tobacco and nicotine use. *Nature Reviews Disease Primers, 8*(1), 19. https://doi.org/10.1038/s41572-022-00346-w

24. Grøndahl, M. F., Bagger, J. I., Lund, A., Faurschou, A., Rehfeld, J. F., Holst, J. J., et al. (2018). Effects of smoking versus nonsmoking on postprandial glucose metabolism in heavy smokers compared with nonsmokers. *Diabetes, 41*(12), 1260-1267. https://doi.org/10.2337/dc17-1818

25. Jaiswal, M., Divers, J., Dabelea, D., Isom, S., Bell, R. A., Martin, C. L., et al. (2017). Prevalence of and risk factors for diabetic peripheral neuropathy in youth with type 1 and type 2 diabetes: SEARCH for Diabetes in Youth study. *Diabetes, 40*(9), 1226-1232. https://doi.org/10.2337/dc17-0179

26. Fundação Oswaldo Cruz (Fiocruz). (2020). ConVid pesquisa de comportamentos. Fiocruz. Available from: https://convid.fiocruz.br/index.php?pag=fumo

27. Monteiro, A. R., Barros, L. A., Albernaz, P. C., Vieira, V. B., Barroso, V. D., & Rodrigues, M. C. (2020). Diabetes mellitus, obesidade e maus hábitos de vida: Sua relação com a COVID-19. *Revista Científica da FMC, 15*(2). https://doi.org/10.29184/1980-7813.rcfmc.377.vol.15.n2.2020

28. Silva, Á. L. F., Matias, L. D., Freitas, J. M., Oliveira, J. C., & de Andrade, L. (2020). Medidas de prevenção da COVID-19 em pessoas que vivem com diabetes mellitus. *Revista de Enfermagem Atual In Derme, 93*, e020004. https://doi.org/10.31011/reaid-2020-v.93-n.0-art.808

29. Wendt, F. R., De Lillo, A., Pathak, G. A., De Angelis, F., COVID-19 Host Genetics Initiative, & Polimanti, R. (2021). Host genetic liability for severe COVID-19 associates with alcohol drinking behavior and diabetic outcomes in participants of European descent. *Frontiers in Genetics, 12*, 765247. https://doi.org/10.3389/fgene.2021.765247

30. Bornstein, S. R., Dalan, R., Hopkins, D., Mingrone, G., & Boehm, B. O. (2020). Endocrine and metabolic link to coronavirus infection. *Nature Reviews Endocrinology, 16*(6), 297-298. https://doi.org/10.1038/s41574-020-0353-9