

Association between COVID-19 Pandemic, Blood Pressure and Pulse Rate in Young Slovak Women

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ABSTRACT: This study investigates the relationships between the COVID-19 pandemic, lifestyle factors, and their impact on blood pressure (BP) and pulse rate in young adult women from Slovakia. We assessed 552 adult women aged 18 to 30 years who were categorized into subgroups based on their pandemic status. The individual's lifestyle was evaluated using a detailed questionnaire. BP and pulse rate were measured in the sitting position using a digital sphygmomanometer. Linear regression analysis tested the associations. The results showed no significant difference in physical activity and the proportion of fat mass (%) before and during the pandemic. Smoking prevalence increased during the pandemic compared to pre-pandemic levels ($p = 0.152$). While there were no significant differences in coffee consumption, the use of hormonal contraceptives was significantly higher during the pandemic ($p = 0.021$). In addition, systolic blood pressure (SBP) and pulse rate were significantly higher during the pandemic than before, indicating possible cardiovascular effects (SBP with $p < 0.001$ and pulse rate with $p = 0.001$). Regression analysis revealed that pandemic and fat mass (%) were significant predictors of SBP, while only physical activity and fat mass (%) were predictors of diastolic blood pressure (DBP). In addition, pandemic and physical activity were significant predictors of pulse rate. We observed significantly higher SBP and pulse rates during the pandemic than before in young adult women. Further studies are needed to investigate the long-term effects of the pandemic on SBP and pulse rate.

KEYWORDS: pandemic, lifestyle, young women, systolic blood pressure



Original article

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Introduction

Coronaviridae is a diverse family of viruses that infect various organisms, including not only animals but also humans. When organisms are infected with these viruses, there is a high risk of respiratory infections that can lead to various serious diseases that affect the physiology of systems in the human body. At the end of 2019, a novel coronavirus identified as SARS-CoV-2 emerged in Wuhan, China, causing an unusual outbreak of viral pneumonia. The novel coronavirus disease 2019 (COVID-19), is highly contagious and has spread rapidly worldwide (Gao et al. 2020; WHO 2020; Hu et al. 2021).

The COVID-19 pandemic has impacted public health in many ways. The measures taken to prevent the spread of the virus have disrupted daily routines and activities. Research has shown that physical activity has decreased during this time, accompanied by an increase in physical inactivity, body weight, blood pressure and the prevalence of type 2 diabetes (Flanagan et al. 2021; Robinson et al. 2021; Capra et al. 2022). In addition, young adult women who were already prone to certain physiological problems were in an unprecedented situation that could potentially affect their BP dynamics. Understanding the link between pandemic-related stress and BP fluctuations is crucial for deciphering the broader health implications (Kobayashi et al. 2021; Laddu et al. 2022; Laffin et al. 2022; Yoshihara 2023).

The study by Laffin et al. (2022) found that BP in adults in the USA was significantly higher from April to December 2020 than in 2019. During the pandemic period, the mean monthly changes from the previous year were between 1.10 and 2.50 mmHg for systolic blood pressure

(SBP) and between 0.14 and 0.53 mmHg for diastolic blood pressure (DBP); the increases in SBP and DBP applied to men and women and all age groups; larger increases were found in women for both SBP and DBP, in older participants for SBP and in younger participants for DBP. In addition, Gotanda et al. (2022) found that SBP and DBP increased by 1.79 mm Hg and 1.30 mm Hg, respectively, during the pandemic period compared to the pre-pandemic period. Celik et al. (2021) found that both SBP and DBP levels increased significantly during the day, at night and over a full 24-hour period compared to pre-pandemic levels. Notable lifestyle changes, such as reduced physical activity and increased stress levels, may also affect resting pulse rate and its variability. In addition, women tend to have a higher resting heart rate than men, around 3 to 5 beats per minute, largely due to physiological factors such as smaller heart size, hormonal differences and differences in the regulation of the autonomic nervous system (Reimers et al. 2018).

In addition, regular physical activity is known to lower resting pulse rate by improving parasympathetic tone, which is consistent with the study by Wyatt et al. (2025), who reported that pulse rate decreased by 1.5% during lockdowns, which was associated with lower activity levels.

In addition to reduced physical activity, many factors may have influenced BP during the pandemic. During the pandemic, we observed differences in smoking habits that may affect cardiovascular health. Al Ghadban et al. (2022) reported that about a quarter of their study participants were stressed by the COVID-19 pandemic and related economic crises, which were strongly associated with increased smoking behavior. Coffee consumption has also changed.

From a purely psychological and emotional perspective, coffee is a good energy source that can improve mood, combat drowsiness, and improve cognitive function, which could explain the increased coffee consumption due to the pandemic (Castellana et al. 2021). However, the relationship between caffeine consumption and BP remains interesting (Han et al. 2022). The possible effects of contraceptive methods on BP in young women are also the subject of research (Gao et al. 2023; Schmidt-Lauber et al. 2023; Basile and Bloch 2024). Despite the benefits of hormonal contraception, there is evidence that it may increase the risk of adverse effects, including cardiovascular disease, obesity, hypertension, hemorrhagic stroke, breast cancer, and cerebral venous thrombosis (Rosano et al. 2022).

In addition to lifestyle-related factors, it is also important to consider the physiological mechanisms that may underlie pandemic-related changes in BP and pulse rate. The COVID-19 pandemic has been a prolonged stressor, and chronic psychological stress is known to activate the hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system, leading to increased cortisol and catecholamine levels. These neurohormonal changes contribute to increased vascular tone, heart rate and elevated BP (Esler et al. 2020). Overactivity of the sympathetic nervous system is also associated with reduced baroreflex sensitivity and impaired parasympathetic modulation, which can affect resting pulse rate and its variability. In women, these autonomic responses may be additionally modulated by hormonal fluctuations, including the effects of estrogen and progesterone, which influence vascular reactivity and cardiac autonomic control (Hart et al. 2009). Therefore, pandemic-related psychosocial

stress may have had both direct and indirect effects on cardiovascular parameters, particularly in young women who may be more susceptible to such influences.

While previous studies from countries such as the United States, Japan and Turkey provide valuable insights into pandemic-related changes in BP parameters, it is important to consider that cultural, healthcare and lifestyle differences may limit direct comparability. For example, differences in access to healthcare, perception of stress, contraceptive use and public health responses to COVID-19 could influence the magnitude or direction of physiological effects. Therefore, studying a specific population of young women of European origin is essential to understanding the context-specific impact of the pandemic.

We hypothesise that the above lifestyle factors and the COVID-19 pandemic have a potential impact on SBP and DBP levels and pulse rate in young adult women (we expect higher SBP, DBP and pulse rate during the pandemic); therefore, we investigated the relationships between these factors.

Material and methods

Participants

Relatively healthy Slovak women were recruited non-randomly and voluntarily and evaluated in the biomedical laboratory of the Department of Anthropology at Comenius University in Bratislava, Slovakia. Data were collected in two cross-sectional surveys from 2019 to 2022.

Our sample included 552 young adult university students and graduates aged 18 to 30 with a mean of 21.30 ± 2.18 SD. The analyzed sample was divided into two groups, which were collected according to the same study design: (1) one group

included those whose measurements were taken from February 2019 to March 2020 before the COVID-19 pandemic. This group included 241 women aged at least 19 and at most 29 years with a mean age of 22.14 ± 2.25 SD, and (2) the second group of 311 women aged 18 to 30 years with a mean age of 20.63 ± 1.89 SD was measured from September 2020 to November 2022 during the pandemic. One of the conditions for data collection was that women, were only allowed to participate in the study once, before or during the pandemic. The anonymised data were analysed solely for scientific purposes. Women who were unable to respond due to severe physical or mental illness and who could not undergo anthropometry or blood measurement were excluded from the study. Each participant gave written informed consent to this study, per the principles of the Declaration of Helsinki. The biomedical research was also approved by the Faculty of Natural Sciences Ethics Committee at Comenius University – number ECH19021. The methods of the present study were also previously applied in another study but with different goals [Falbová et al. 2024].

Questionnaire

The study used a standardised and validated questionnaire (modified WHO expert questionnaire from 2014 – STEPwise approach to surveillance – instrument v.3.2 in the Slovak version), which was used to collect information on the baseline characteristics of the study participants and their socio-demographic background. The following lifestyle variables were collected by self-report and personal interview: (a) physical activity was assessed by the question „How often do you exercise or engage in physical activity?“ with responses grouped into seven categories: daily,

5–6 days per week, 3–4 days per week, 1–2 days per week, 1–3 days per month, less than once per month, or never. For the purposes of the study, we grouped these seven categories into four categories (5–7 days per week, 1–4 days per week, 1–3 days per month and less, never); (b) smoking was categorized as current smoker or non-smoker; (c) coffee consumption was assessed by the question „How often do you consume coffee?“ and responses were categorized into „yes“ and „no“ groups; (d) hormonal contraception was assessed by the question „Do you use hormonal contraception?“ and responses were categorized into „yes“ and „no“ groups.

BP analysis

BP and pulse rate were measured in a sitting position using a digital sphygmomanometer OMRON M3 (Omron Healthcare Co., Ltd., Kyoto, Japan). All measurements were performed in the morning hours between 8:00 and 11:00 a.m. in a quiet room at a stable room temperature (approx. 22–24 °C). Women were instructed to refrain from caffeine, physical activity and smoking for at least 30 minutes before the measurement. After a rest period of at least five minutes in a seated position, three consecutive measurements were taken and the average values of SBP, DBP and pulse rate were calculated.

Analysis of body composition

The InBody 770 Body Composition Analyzer (Biospace Co., Korea) was used to determine human body composition parameters based on the recommendations in the user manual. Participants were tested in the morning in a quiet state. Participants stood barefoot on the pedal plate electrode. The hands hung down naturally and held the hand electrode

gently, with the angle between the trunk and the upper limbs at 15°. The analyzer evaluated various body composition parameters, but only fat mass (FM, %) was analyzed in this study.

Statistical analysis

All statistical analyses were performed with IBM SPSS for Windows (Statistical Package for the Social Science, version 25.0, Chicago, IL), with statistical significance at $p \leq 0.05$. The obtained frequencies and percentages determined participants' responses, and the normality assumption hypothesis for continuous variables was tested using a one-sample Kolmogorov-Smirnov test. The Parametric Independent Sample T-test and the non-parametric Mann-Whitney U test were used based on the normality distribution of the quantitative variables. The effect size was calculated using Cohen's $d = 2t / (df^{1/2})$ (small effect: < 0.5 ; medium effect: $0.5 - 0.8$; large effect: > 0.8). Backward linear regression analyses considered the fol-

lowing independent variables: pandemic presence, physical activity, smoking, coffee consumption, and use of hormonal contraception. Only predictors with p value less than 0.05 influenced body composition parameters.

Results

Table 1 summarises the baseline descriptions. These included age, physical activity, smoking status, coffee consumption and the use of hormonal contraceptive. Our results showed no significant difference in physical activity and fat mass percentage between the groups before and during the COVID-19 pandemic, but smoking prevalence was higher during the pandemic than before (19.60% vs. 14.90% and $p = 0.152$), although this difference was not statistically significant. In addition, there are no significant differences in coffee consumption, but the use of hormonal contraceptives is significantly lower during the pandemic at 10.30% than before at 17.01% and $p = 0.021$.

Table 1. Baseline characteristics of the participants

	Before the COVID-19 pandemic	During the COVID-19 Pandemic	
Number of participants			
Women	241	311	
	Mean $\pm$ SD	Mean $\pm$ SD	p
Age, y	22.14 $\pm$ 2.25	20.63 $\pm$ 1.89	< 0.001
Physical activity	N (%)	N (%)	
5–7 days per week	15 (6.22)	28 (9.00)	
1–4 days per week	162 (67.22)	185 (59.49)	
1–3 days per month and less	34 (14.11)	59 (18.97)	0.208
Never	30 (12.45)	39 (12.54)	
Smoking status	N = 241	N = 311	
Smokers	36 (14.90%)	61 (19.60%)	
Non-smokers	205 (85.10%)	250 (80.40%)	0.152

	Before the COVID-19 pandemic	During the COVID-19 Pandemic	
Coffee consumption	N = 241	N = 310	
Yes	190 (78.80%)	243 (78.40%)	0.898
No	51 (21.20%)	67 (21.60%)	
Use of hormonal contraception	N = 241	N = 311	
Yes	41 (17.01%)	32 (10.30%)	0.021
No	200 (82.99%)	279 (89.70%)	
FM %	N (Mean ± SD)	N (Mean ± SD)	
	241 (27.67 ± 7.08)	310 (26.81 ± 7.81)	0.096

Note: p values in bold are significant at $p < 0.05$
Abbreviations: N, number of participants; p, value of statistical significance; SD, standard deviations; FM, fat mass

Table 2 documents the BP parameters in young adult women before and during the COVID-19 pandemic. The women had significantly higher SBP (mmHg) and pulse rates during the COVID-19 pandemic than before the pandemic, with SBP during the pandemic: 119.25 ± 11.96 (mmHg) and before 114.79 ± 9.66 (mmHg); $p < 0.001$ and pulse rate during the pandemic: 81.32 ± 12.92 and before: 77.08 ± 12.69 ; $p = 0.001$. DBP (mmHg) showed no significant difference between the pre-pandemic and pandemic periods ($p = 0.399$).

Table 2. Blood pressure parameters in young adults women before and during the COVID-19 pandemic

	Before the COVID-19 pandemic					During the COVID-19 pandemic						
Women	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD	p	Cohen´s d
SBP (mmHg)	240	89.00	156.00	114.79	9.66	309	89.00	162.00	119.25	11.96	< 0.001	0.410
DBP (mmHg)	240	51.00	91.00	69.16	7.15	309	50.00	99.00	70.12	8.41	0.399	0.123
Pulse rate	240	50.00	124.00	77.08	12.69	309	54.00	136.00	81.32	12.92	0.001	0.331

Note: p values in bold are significant at $p < 0.05$
Abbreviations: N, number of participants; p, value of statistical significance; SOS, Speed of sound; SD, standard deviations; SBP, systolic blood pressure; DBP, diastolic blood pressure, d-effect sizes calculated using Cohen´s formula

Table 3 shows the backward linear regression analysis used to test the independent influence of the pandemic and lifestyle factors and FM% on BP parameters in women. The Durbin-Watson test showed that there was no autocorrelation. The pandemic and FM% were significant predictors of SBP. A positive B coefficient was found for SBP, suggesting that pandemic and FM% were associated with higher SBP levels. Physical activity and FM% were significant pre-

dictors of DBP. A positive B coefficient was found for these predictors, suggesting that these predictors were associated with higher DBP levels. In addition, pandemic and physical activity were significant predictors of pulse rate, with $p < 0.001$. The positive B coefficient for these predictors suggests that the pandemic and physical activity may lead to higher pulse rates. Not statistically significant variables were excluded from the models, including coffee consumption, smoking, and hormonal contraception, since despite showing a significant

difference between groups, they did not remain a significant predictor when controlling for other variables in the multivariate analysis. The overall significance of the models, as measured by the coefficient of determination (R^2), ranged from 0.068 to 0.122, suggesting that these variables explained only a small to moderate proportion of the variation in the dependent variables. This represents a limitation of our models and suggests that other unmeasured factors may contribute significantly to BP variations in this population.

Table 3. Linear regression analysis of selected predictors with blood pressure parameters in women

Dependents variables	Predictors	B	95 % CI for B	SE for B	p	R ²	Durbin-Watson	T
Women								
SBP (mmHg)	Pandemic	4.774	2.987 – 6.560	0.909	< 0.001	0.122	1.943	5.249
	FM%	0.437	0.318 – 0.556	0.061	< 0.001			7.221
excluded variables: physical activity, coffee consumption, smoking, hormonal contraception								
DBP (mmHg)	Physical activity	0.500	0.050 – 0.950	0.229	0.029	0.095	1.976	2.184
	FM%	0.288	0.201 – 0.375	0.044	<0.001			6.529
excluded variables: pandemic, coffee consumption, smoking, hormonal contraception								
Pulse	Pandemic	4.137	2.019 – 6.256	1.078	< 0.001	0.068	1.925	3.837
	Physical activity	1.866	1.132 – 2.599	0.373	< 0.001			4.997
excluded variables: FM%, coffee consumption, smoking, hormonal contraception								

Note: p values in bold are significant at $p < 0.05$

Abbreviations: B, beta coefficient; CI, confidence interval; p, value of statistical significance (regression analysis, backward method;); R², coefficient o determination; SE, standard error; SBP, systolic blood pressure; T, tolerance (collinearity analysis), and FM, fat mass

Discussion

The pandemic and lifestyle factors

Our results show no significant differences in the frequency of physical activity and fat percentage between the groups before and during the COVID-19 pandemic.

In addition, the most frequent frequency observed was 1 – 4 days per week in women in both study groups, regardless of pandemic status. These results may suggest a relative stability in the frequency of physical activity in young adult women in Slovakia, even though a non-significant

decrease was observed in the most common category (1–4 days/week). When interpreting these results, it is important to consider the specific national context. During the pandemic, strict but relatively short lockdown periods were imposed in Slovakia compared to some other countries. Cultural factors such as a preference for outdoor activities and access to nearby natural environments may have facilitated the maintenance of physical activity levels. We hypothesise that despite the closure of gyms and sports clubs, women in Slovakia continued to engage in structured physical activities, such as exercising at home, outdoor activities, online fitness classes or virtual challenges. These findings are similar to those of López-Vaneciano et al. (2021), who indicated that students who met current minimum physical activity recommendations before the lockdown generally continued to meet these recommendations during the pandemic-related lockdown. Although Shaun et al. (2021) observed that the proportion of students who engaged in physical activity one to three times per week remained relatively stable before and after lockdown — 37.6% and 36.3%, respectively — a study conducted in Bangladesh reported a sharp decline in students' physical activity, dropping from 43.6% before lockdown to only 7.5% after lockdown. On the other hand, research with students, cyclists and athletes found a notable increase in physical activity during this period (Romero-Blanco et al. 2020; Venter et al. 2020). In addition, another study by Ingram et al. (2020) observed a decrease in physical activity associated with negative mood during lockdown. This difference suggests that fluctuations in physical activity levels may affect psychological well-being differently depending on context and individual factors.

The prevalence of smokers was higher during the pandemic than before, ranging from 19.60% to 14.90%, $p = 0.152$. Comparing smoking status with another study by Koyama et al. (2021), both studies address changes in smoking behavior during the COVID-19 pandemic, albeit in different contexts. While our study found an increased prevalence of smokers during the pandemic, the Osaka Health App study showed other changes in the smoking habits of current smokers amid Japan's state of emergency. Our findings are in line with those of Ghadban et al. (2022), who found that about a quarter of their participants experienced stress due to the COVID-19 pandemic and the associated economic challenges, which was closely associated with higher smoking rates. However, pandemic-related stress appears to influence smoking behaviour in different ways — while some people reported smoking more, others reduced their tobacco consumption (Bommelé et al. 2020; Elling et al. 2020; Chen 2020).

Our results on coffee consumption show that the majority of women did not change their habits (78.80% vs. 78.40%, $p = 0.898$). However, it is important to point out that our methodology was based solely on self-report comparing the periods before and during the pandemic. In contrast, other studies have reported increased coffee consumption during quarantine (Alhuseini and Alqahtani 2020; Al-Musharaf et al. 2021). In addition, the study by Bakaloudi et al. (2022) found that some individuals increased their coffee consumption during quarantine while others decreased or maintained their consumption and that factors such as changes in routine, working from home, and stress influenced caffeine consumption behavior during the pandemic.

Use of hormonal contraception before the pandemic was significantly higher (17.01%) than during the pandemic (10.30%), with $p = 0.021$. Although hormonal contraceptive use differed significantly between groups in the descriptive analysis, it was excluded from the regression models due to lack of statistical significance after adjustment. This suggests that its effect was not independent of other variables in the model. Our findings are consistent with those of Walker (2022), who observed a 22% decrease in prescriptions for the combined contraceptive pill during the withdrawal period compared to the same three months in 2019. In contrast, there was no significant change in prescriptions for progestogen-only pills. Prescriptions for long-acting methods decreased, with the largest decreases for implants (76% less than before the lockdown), intrauterine devices (79% less than before the lockdown), and intrauterine devices (76% less than before the lockdown). In another study by Chiu et al. (2023), no increase in the use of hormonal contraceptives was found. But this study compared contraceptive sales before and during the COVID-19 pandemic. It examined the changes in sales of different contraceptive methods, including hormonal contraceptives, to assess trends in contraceptive use during the pandemic.

The pandemic and BP parameters

SBP and pulse rate were higher in the pandemic group of women than in the pre-pandemic group, with $p < 0.001$. Although the regression models showed statistically significant associations between pandemic exposure and SBP or pulse rate, their explanatory power was limited (R^2 between 0.068 and 0.122). This indicates that the models ex-

plained only a small proportion of the variance in cardiovascular outcomes, suggesting that other unmeasured factors may also play a role. Furthermore, in contrast to the observed increases in SBP and pulse rate, no significant difference in DBP was found between the two groups ($p = 0.399$). This null finding suggests that the cardiovascular changes observed during the pandemic are more likely due to increased sympathetic activity or acute stress responses, which increase SBP and heart rate rather than DBP. In the literature consulted, we found very few studies investigating changes in BP during COVID-19 lockdown in young adult women. The mechanisms underlying these findings are not yet clear, but there are several possible explanations for the increased SBP and pulse rate in the population during the COVID-19 pandemic. Most importantly, BP was influenced by housework, increased housework and sedentary behaviour, isolation, pandemic-related stress and major changes in personal lifestyle. In addition, alcohol consumption is known to increase BP, and several studies have shown an increase in alcohol consumption and binge drinking during the pandemic (Grossman et al. 2020; Pollard et al. 2020). Our results are similar to those of Nagata et al. (2023), who observed an increase in BP in early adolescence. The results of another study by Nolde et al. (2024) provide clear evidence of higher BP in individuals in Australia during the COVID-19 pandemic compared to the pre-pandemic period. In the study by Gotanda et al. (2022), the number of BP measurements decreased significantly at the beginning of the pandemic and then gradually increased. During the pandemic, SBP and DBP increased compared to the pre-pandemic

period. In the study by Laffin et al. (2022) among US adults, annual changes in SBP and DBP showed no differences between 2019 and January to March 2020. In this study, the annual increase in BP from April to December 2020 was significantly higher than in 2019. During the pandemic period, mean monthly changes from the previous year ranged from 1.10 to 2.50 mm Hg for SBP and from 0.14 to 0.53 mm Hg for DBP. The increase in SBP and DBP applied to men, women and all age groups. Larger increases were observed in women for both SBP and DBP, in older participants for SBP and in younger participants for DBP (all $p < 0.001$).

In our study, pulse rate was significantly higher in the pandemic group compared to the pre-pandemic group ($p < 0.001$), suggesting a potential physiological response to pandemic-related stress or lifestyle changes. This finding contrasts with the results of Wyatt et al. (2025), who reported a 1.5% decrease in pulse rate during lockdowns, attributing the reduction to lower physical activity levels among participants.

Limitations of the study

Our study provides unique results, but these are limited by the cross-sectional design of the study. While we compared two cross-sectional data sources, we did not interview the same women over time. Nevertheless, both are population-representative surveys, and we used identical measures to assess the results to allow for cross-study comparison. A notable limitation is the sample size ($n = 552$), which is moderate but may not be sufficient to detect small effect sizes in subgroup analyses. We did not perform an a priori power analysis, which limits the interpretation of non-significant results.

Future studies with larger samples are needed to confirm our findings and better estimate effect sizes of pandemic-related changes in cardiovascular parameters. We also acknowledge concerns regarding the representativeness of the sample. The participants were not randomly and voluntarily recruited among Slovak university students and graduates. While this group represents a specific and relevant population group (i.e. young, educated women), the generalisability of the results to the wider population of young Slovak women may be limited. It should be noted that general limitations of this study include the subjective nature of the lifestyle assessment, which was obtained by self-report, and that important data may not have been fully captured. This potential limitation was at least partially addressed through face-to-face interviews with all women. Although we used a validated digital sphygmomanometer and body composition analyzer, we did not provide information on device calibration, precision, or measurement error that may have affected the reliability of the recorded values. Furthermore, although the regression models showed statistically significant relationships, their explanatory power was limited (R^2 between 0.068 and 0.122), meaning that only a small proportion of the variance in the results was explained. This should be taken into account when interpreting the predictive power of the models. Although the multivariable regression models were used to control for known confounding factors, the possibility of residual confounding remains. Unmeasured variables such as psychological stress, alcohol consumption or socioeconomic status may have influenced the cardiovascular outcomes and should be considered in future studies.

Conclusions

We found significant differences in SBP and pulse rate between the group of women before the pandemic and the group of women during the pandemic. We observed significantly higher SBP and pulse rate in young adult women during the pandemic than before. However, no significant difference was observed in DBP between the two groups. Given the demographic specificity of our sample—young Slovak women who were university students or recent graduates—the generalizability of our findings to broader populations is limited. Additionally, while we adjusted for several covariates, we cannot rule out the influence of unmeasured factors such as psychosocial stress, alcohol consumption, or socioeconomic status, which may have contributed to the observed changes in cardiovascular parameters. Nevertheless, these results highlight a potential public health concern. In light of these findings, targeted follow-up and cardiovascular monitoring specifically for young adult women should be considered, especially after a pandemic, to assess the persistence and long-term health effects of these changes.

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Author contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [DF], [LV], [SS], [LK], [VP] and [RB]. The first draft of the manuscript was written by [DF], [LK], [VP] and all authors commented on previous versions

of the manuscript. All authors read and approved the final manuscript.

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Conflict of interest

None to declare.

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