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The effect of anti-pandemic measures on some aspects of obstetric care in a single obstetric unit in the Slovak Republic

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ABSTRACT

Objectives: In many countries, various anti-pandemic interventions were adopted in 2020, which also affected obstetric practices. The aim of this study is to determine their effect on the frequency of caesarean section (CS) according to Robson classification (RC).

Material and methods: Deliveries in 2019 and 2020 were retrospectively analysed. Mothers were grouped according to RC, and the frequency of CR in the different groups were compared.

Results: We found a statistically significant increase in the frequency of CR in the pandemic year (20.0% vs 17.8%, p = 0.0242). When classified into RC groups, the increase in the different groups lost statistical significance. Nevertheless, the increase was most important in Robson group 5 due to maternal rejection of vaginal delivery after CR and in Robson group 2b with elective CR. In spite of our expectations, the frequency of caesarean section performed due to indication of protracted labour was not increased.

Conclusions: Interventions that were implemented during the first and second waves of the pandemic were associated with increased frequency of planned caesarean sections.

Key words: anti-pandemic measures; childbirth; caesarean section; Robson classification; VBAC; TOLAC

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INTRODUCTION

The provision of healthcare around the world, including Slovakia, was significantly affected by the worldwide pandemic in 2020. The rate of spread of the disease combined with a lack of relevant information, public concerns as well as partly chaotic and inconsistent approach by governments and experts led to the gradual introduction and abolition of various measures, which do not always have a rational basis. The World Health Organization (WHO) described coronavirus disease 2019 (COVID-19) as a public health emergency of international concern on the 30th of January 2020 and a pandemic on the 11th of March 2020 [1]. The crisis committee has worked in Slovakia since February 2020 and gradually took several precautions, such as travel restrictions, quarantine measures, curfew, physical distancing, ban on hospital visits and so on. Mandatory nationwide population testing was performed in Slovakia, the only country in the world to do so [2]. Despite all these precautions, Slovakia became one of the countries with the highest incidence of infection and the highest mortality in the second wave of the pandemic.

The protection of public health and health workers has suppressed the needs and rights of women and their newborns [3]. Reduction in prenatal visits were mainly caused by reduction of planned inspections in counselling centres and outpatient clinics and by the propagation of telemedicine [4]. Most maternity hospitals have adopted a ban on the presence of an accompanying person at childbirth. The maternity wards have been divided into "clean" and infectious parts, with rotation of hospital employees, who had to work under significantly greater pressure. The presence of anaesthesiologists during the care of ventilated patients

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in some hospitals has reduced access to quality obstetric analgesia [5]. The pandemic has also brought some positives — maternity hospitals shortened the length of hospitalization after childbirth, which did not bring any negatives in terms of increase in the number of rehospitalizations [6].

Hospitals have stopped being a place of maximum safety for mothers to bring their children into the world due to the obvious threat of infection and some specific precautions that directly affected women's rights. There is an increased public interest in the possibility of home birth [7]. In Slovakia, however, interest in domestic births is traditionally very low, and we do not expect it to change dramatically even during a pandemic, mainly due to the lack of legislation.

Precautions to address excessive caesarean sections at the 2nd Department of Gynaecology and Obstetrics of the University Hospital in Bratislava were taken in 2016; the effectiveness was evaluated and published [8]. The WHO recommends using the 10-scale Robson classification to assess the number of caesarean sections [9]. In this study, we aim to verify whether the pandemic and its associated precautions has had an impact on the annual frequency of caesarean sections in the tertiary care centre.

Objectives

The aim of this study is to determine the effect of anti-pandemic interventions on the frequency of caesarean section according to Robson classification.

MATERIAL AND METHODS

Mothers who gave birth at the 2nd Department of Gynaecology and Obstetrics in 2019 and 2020 were included. Mothers were categorized by the year in which their children were born, 2019 (before the arrival of the COVID-19 pandemic in Slovakia) and 2020 (when anti-pandemic measures were taken). From February 2020, the following measures were gradually implemented:

- reduction of prenatal care visits;
- prohibition of visitors at hospital departments;
- suspension of maternity tours;
- no accompanying person at birth, including a partner and/or a doula;
- no medical students in the hospital;
- prohibition of private births, medical care was given only by the staff who were on duty at that time;
- creation of an isolated ward for COVID-19 positive mothers with separate staff — which led to reduction of beds for high-risk pregnant women. These women often stayed in the operating ward and the hospitalizations were shortened to the necessary extent;
- all mothers underwent an antigen test during the triage, which increased their stress load.

In addition to these measures, many doctors and midwives were on sick leave or quarantined, and the rest of the staff was reassigned to the COVID-19 department, which led to reduction of health professionals. The prenatal care was often handled by doctors specialized in fields that are different from obstetrics and gynecology (OB/GYN).

Our delivery rooms do not provide private toilet facilities, meaning that mothers and their companions unfortunately meet during the first period of childbirth in common areas and a shared bathroom. Therefore, the reduction of the present persons at birth was considered a highly necessary measure. Furthermore, we restricted the presence of staff during childbirth outside official working hours (with the exception of chief physicians in emergencies) to limit the spread of coronavirus among employees. An isolated ward for COVID-19-positive mothers required 24/7 healthcare, which also led to increased demands on human resources. On the other hand, thanks to great team-work with the Department of Anaesthesiology and Intensive Care medicine, access to epidural analgesia has not been reduced.

Anonymized information was obtained from the hospital medical information system and entered into Excel spreadsheets. Statistical analysis was performed using Excel and OpenEpi. A p value of 0.05 or lower was considered to be statistically significant. The statistical significance of the difference in means was tested by t-test for numerical variables and by χ^2 test and Fisher exact test for categorical variables, as appropriate. The ethics committee of the University Hospital Bratislava approved the study (EK/123/2021). Informed consent was not required because of the retrospective nature of the study.

RESULTS

A total of 3051 and 3066 women gave birth in our unit in 2019 and 2020, respectively. In 2019, 543/3051 (17.8%) women were delivered by CS compared to 613/3066 (20.0%) women in 2020. The difference is statistically significant with p value = 0.0242. It is the first increase in frequency of CS since 2015, because in 2016, multifaceted interventions were implemented to reduce the rate of CS. Their effect were evaluated and published [8]. Figure 1 shows the numbers of births and CS in the unit since 2015. After a gradual, significant decline in the number of CS, there was a statistically significant increase in 2020. The chosen perinatological data are compared in Table 1.

An analysis of frequency of CS was done based on Robson classification of mothers, shown in Table 2. The numbers of mothers in the different Robson groups of the different years were compared in Table 3. Groups 2 and 4 were divided into subgroups A and B, because induced birth and planned CS are so different that they need individual assessment. A statistically significant difference was only found in the

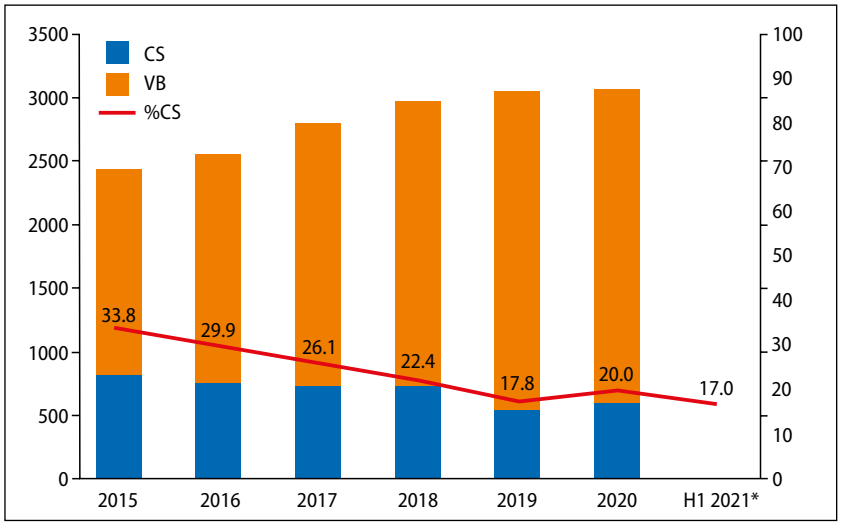

Figure 1. The evolution of vaginal deliveries (VB) and frequency of caesarean section (CS) during the adoption of interventions aimed at lowering the frequency of CS. H1 2021* is the period 1.01.2021–31.06.2021

Table 1. Some obstetrical parameters in the two observed periods

	2019	2020	p value
Deliveries (n)	3051	3066	
Caesarean sections (n)	543 (17.8%)	613 (20.0%)	0.0242
Vacuum extractions (n)	158 (5.2%)	165 (5.4%)	0.3830
Forceps (n)	23 (0.8%)	20 (0.7%)	0.4435
Epidural analgesia	1475 (48.3%)	1525 (49.7%)	0.2766
Average age	31.6 (15–49)	31.9 (15–48)	0.0097
Adolescent women (19 and less)	29 (0.9%)	17 (0.5%)	0.0990
Women of advanced age (40 and more)	145 (4.7%)	148 (4.8%)	0.9389
Average foetal weight (except for geminis, premature labours)	3441.9	3448.2	0.3924
4000 g and more	295 (9.7%)	323 (10.5%)	0.2796
Stillbirths	6	8	0.7975
Early neonatal death	2	2	0.9985
Perinatal mortality	8 (0.26%)	10 (0.32%)	0.8225
Transfer to NICU	21 (0.7%)	28 (0.9%)	0.3993

NICU — neonatal intensive care unit

group of induced births in nullipara singleton cephalic (Group 2A), where there was a decline from 12.0% in 2019 to 10.4 in 2020.

Table 4 shows the percentages of CS in the different Robson groups and their share of total frequency of CS. Although we can observe a slight increase in each group except for 4A (inductions in multipara) and 8 (multiple pregnancy), none was statistically significant. The highest increase of 1.1% was found in the group of mothers with CS anamnesis, but it was caused not only by increase in frequency of CS in the group but also by increase in the number of these women (from 11.1% in 2019 to 12.2% in 2020).

Indications for CS in the group of mothers with CS anamnesis are summarized in Table 5. In 2020, the number of women that refused vaginal birth and demanded planned CS increased from 54.9% to 60.1%, but without statistical significance. In both years, there were high proportions of women with successful vaginal birth with trial of labor after cesarean (TOLAC) (86.3% and 89.9% respectively).

Analysis of CS in Group 2A is shown in Table 6. In 2020, indication for CS in the group was more frequently due to the threat of foetal asphyxia (10.4%) than non-progressive birth (8.5%). In 2019, it was the other way round. Indication for CS was less frequently due to signs of foetal intolerance

Table 2. The Robson 10-group classification system

Group	Description
1	Nullipara, singleton cephalic, ≥ 37 wk, spontaneous labour
2	Nullipara, singleton cephalic, ≥ 37 wk A. Induced B. Caesarean delivery before labour
3	Multipara, singleton cephalic, ≥ 37 wk, spontaneous labour
4	Multipara, singleton cephalic, ≥ 37 wk A. Induced B. Caesarean delivery before labour
5	Previous Caesarean delivery, singleton cephalic, ≥ 37 wk A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour
6	All nulliparous breeches A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour
7	All multiparous breeches (including previous Caesarean delivery) A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour
8	All multiple pregnancies A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour
9	All abnormal lies (including previous Caesarean delivery but excluding breech) A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour
10	All singleton cephalic, ≤ 36 wk (including previous Caesarean delivery) A. Spontaneous labour B. Induced labour C. Caesarean delivery before labour

wk — week of gestation

of birth (4.9%) than non-progressive birth (9.8%). In 2019, birth induction in Group 2A increased the risk of CS with relative risk (RR) of 1.68; in 2020, the value increased to 2.19.

The second most frequent cause of the increase are mothers in Group 2B (nullipara singleton cephalic), who underwent planned CS. The list of indications for both years is given in Table 7. Examples of non-obstetric indications include one pulmonary indication in 2019 (recurrent pneumothorax) and one infectious indication in 2020 (acute sowing of herpes zoster in the rectal area extending to introitus).

DISCUSSION

Maintaining an appropriate frequency of caesarean section is one of FIGO's recent priorities [10]. In this regard, one of the important measures is the audit of own results using the Robson classification of mothers [11]. Our team has been dealing with the analysis of indications of caesarean sections and the possibility of influencing their development for a long time, which has led to a gradual decrease in the frequency of elective as well as acute sections [8, 12, 13]. We expected that anti-pandemic measures, especially the reduction of the presence of partner and doula during childbirth as well as the restriction of private births for doctors and midwives, will increase the frequency of caesarean sections, mainly due to indications of dysfunctional birth, because their presence favourably affects the course of childbirth [14]. We also had to partially limit the access of midwives to mothers because some midwives provided care in the infectious part of the maternity ward. Unfortunately, some employees were quarantined because of their COVID-19 infection and were unable to work, and some employees were transferred to the pulmonary COVID-19 departments. It is important to mention that the access

Table 3. The population of women in the different Robson groups in the two observed periods

Robson group	2019 (n = 3051)		2020 (n = 3066)		p value
	n	%	n	%	
1	1085	35.6	1093	35.6	0.9434
2a	366	12.0	318	10.4	0.0048
2b	17	0.6	29	0.9	0.1061
3	863	28.3	849	27.7	0.6043
4a	149	4.9	162	5.3	0.5131
4b	4	0.1	9	0.3	0.2702
5	339	11.1	373	12.2	0.2127
6	91	3.0	94	3.1	0.9082
7	34	1.1	40	1.3	0.5734
8	31	1.0	21	0.7	0.2033
9	5	0.2	9	0.3	0.4288
10	67	2.2	69	2.3	0.9540

Table 4. The frequency of caesarean section in the different Robson groups in the two observed periods

Robson group	2019 (n = 3051)				2020 (n = 3066)					
	N	Ncs	%cs	%csg	N	Ncs	%cs	%csg	Δ %csg	p %cs
1	1085	95	8.8	3.1	1093	94	8.6	3.1	0	0.9578
2a	366	54	14.8	1.8	318	60	18.9	2.0	+0.2	0.1814
2b	17	17	100.0	0.6	29	29	100.0	0.9	+0.4	xxx
3	863	8	0.9	0.3	849	14	1.6	0.5	+0.2	0.2661
4a	149	8	5.4	0.3	162	6	3.7	0.2	–0.1	0.6638
4b	4	4	100.0	0.1	9	9	100.0	0.3	+0.2	xxx
5	339	207	61.1	6.8	373	242	64.9	7.9	+1.1	0.3289
6	91	81	89.0	2.7	94	83	88.3	2.7	+0.1	1.0000
7	34	29	85.3	1.0	40	32	80.0	1.0	+0.1	0.7769
8	31	17	54.8	0.6	21	11	52.4	0.4	–0.2	1.0000
9	5	5	100.0	0.2	9	9	100.0	0.3	+0.1	xxx
10	67	18	26.9	0.6	69	24	34.8	0.8	+0.2	0.4162

Ncs — number of caesarean section; %cs — frequency of caesarean section in the Robson group; %csg — frequency of caesarean section from the overall population of women in each year; Δ%csg — the difference in the frequency of csg between the two periods; p%cs — p value of comparing the frequency of caesarean section in the different Robson groups

Table 5. Mode of delivery and indications for caesarean section in Robson group 5 (history of caesarean section, one foetus in cephalic position, term pregnancy)

	2019 (n = 339)		2020 (n = 373)		p value
	n	%	n	%	
Elective caesarean section	186	54.9	224	60.1	0.1860
TOLAC	153	45.1	149	39.9	
VBAC (% from TOLAC)	132	86.3	131	87.9	0.7998
Indication of possible foetal hypoxia on CTG	10	6.5	8	5.4	0.8545
Indication of protracted labour	11	7.2	10	6.7	1.0000

CTG — cardiotocography; TOLAC — trial of labor after cesarean; VBAC — vaginal birth after cesarean

Table 6. Frequency of caesarean section in Robson group 2a with indications

	2019 (n = 3051)	2020 (n = 3066)	p value
Deliveries in Robson group 2a (n)	366 (12.0%)	318 (10.4%)	0.0048
Caesarean sections in Robson group 2a (n)	54 (14.8%)	60 (18.9%)	0.1814
Indication of possible foetal hypoxia on CTG	18 (4.9%)	33 (10.4%)	0.0103
Indication of protracted labour	36 (9.8%)	27 (8.5%)	0.6369
*RR of caesarean section in induced delivery	1.68 (95% CI: 1.23–2.30)	2.19 (95% CI: 1.63–2.96)	

* — mean relative risk of caesarean section in induced labour in primipara in term with one foetus in cephalic position against spontaneous onset of labour in primipara in term with one foetus in cephalic position (Robson group 1), CI — confidence interval ; CTG — cardiotocography; RR — relative risk

of midwives to mothers influences the duration of childbirth and the frequency of caesarean sections [15]. We expected an increase mainly in Robson's group 1 and in 2a in induced births. This trend was not confirmed in Group 1. The frequency of caesarean sections in this group was 8.8% in 2019 and 8.6% in 2020. We paid special attention to this group during the acceptance of changes to reduce caesarean sections. In published articles, the frequency of caesarean section in this group is usually higher, around 16–25% [16]. Our outcomes are approaching those of Scandinavian studies, which traditionally report low frequencies of caesarean sections [17]. The series of measures taken to reduce the frequency of caesarean sections in Swedish hospital led to a reduction in sections in Group 1 from 9.6 to 4.5% [18].

Table 7. The list of indications for elective caesarean section in Robson group 2b

	2019 (n = 17)	2020 (n = 29)
Obstetrical indications	13	20
Pathological non stress test (CTG)	4	6
Placenta praevia	2	5
Foetus magnus with/without GDM	3	0
History of myomectomy	2	5
Vasa praevia	1	0
Preeclampsia/HELLP	0	3
Myoma praevium	0	1
Foetal malformations	1	0
Non obstetrical indications	4	9
Cardiological indication	1	2
Neurological indication	1	6
Orthopaedical indication	1	0
Pneumological indication	1	0
Infectological indication	0	1

CTG — cardiotocography; GDM — gestational diabetes mellitus

In Group 2a, the increase in caesarean sections was 4.9%, but the difference was not statistically significant. It is an interesting fact that we recorded a statistically significant decrease in induced births in Group 2a from 12% to 10.4%. We think that the reason could be the reduction of the work of prenatal counselling centres, which sometimes generate induction of childbirth with vague indications as well as induction at the request of the mother after agreement with a private obstetrician. The overall decrease of inductions in this group led to the maintenance of the frequency of caesarean sections in total, although their relative number within the group increased. These operations accounted for 1.8 and 1.9% of caesarean sections of the total number of births. Interestingly, we observed an increase in the group of foetal labour intolerance (signs of impending asphyxia) and not in the group of dysfunctional childbirth. This fact can be explained by the reduction of hospitalizations due to reduced bed capacity, so we postponed the induction of labour to later stages (at least 10 days after the date of birth), when the risk of relative placental insufficiency due to its maturity increases [19]. Anyway, in both years, induction of labour increased the risk of caesarean section in groups 1 and 2a, in 2019 with RR of 1.68 and in 2020 with RR of 2.19. The increase of relative risk in 2020 may be due to later inductions of labour. This is in direct contradiction to the ARRIVE study, where induction of labour at week 39 reduced the risk of caesarean section in nulliparas from 22.2% to 18.6% [20]. The reason for the opposite result is the fact that in our case the induction of labour was performed based on medical indications that may affect the course of labour. As the main reason, we see a disproportionately high frequency of caesarean sections in the ARRIVE trial and in the group of inductions (18.6%), but especially in the group of spontaneous births (22.2%). In our case, it was 8.8% and 8.9% for Group 1, but in the group of inductions, the frequency of caesarean sections is close to the results of the ARRIVE trial (14.8% and 18.9%). At our hospital clinic, we induce births by inserting a Foley catheter and then using misoprostol by administration protocol. This procedure in a meta-analysis of published studies resulted in a total of 22% of caesarean sections, with an indication of signs of hypoxia on cardiotocography (CTG) in 7% [21]. In our case, signs of hypoxia were an indication for caesarean section in Group 2a in 2019 in 4.9% of cases and in 2020 in 10.4% of cases.

We also observed a statistically insignificant increase in Group 2b from 0.5% to 0.9% of births in total. These are very low numbers, similar to those reported by Scandinavian countries (0.3–1.4%) [22]. This statistically insignificant increase can also be attributed to the reduced availability of our counselling clinics, where we consult especially regarding non-obstetrical indications for caesarean sections with other colleagues [8].

An interesting result is a slight, statistically insignificant increase in women who rejected TOLAC and chose elective caesarean section in their post-caesarean section state. The number of these women declined from 45.1% to 39.9% of all women in Group 5. We suppose that the limitation of support during childbirth (partner, doula) and the impossibility of choosing a midwife and obstetrician led woman to choose the elective section in the post-section state. Overall, we recorded a statistically insignificant difference in the number of caesarean sections in Group 5; in 2019 it was 54.9%, and in 2020 it was 60.1%. Elective section was the main indication (54.9% vs 60.1%) followed by signs of asphyxia (6.5 vs 5.4%) and prolonged labour (7.2 vs 6.7%). The choice of TOLAC changes during pregnancy. According to a study in the USA, in the 24th week, up to 85% of mothers consider TOLAC, but in terms of birth, only 40% actually choose it, similar to our case [23]. The success rate of VBAC is calculated by different models and is in the range of 60–90% [24]. Our results have the tendency to become better in the long run. In 2018, we had 67.2% of caesarean sections in Group 5; in 2019, it was 61.1% and in 2020, it was 64.9% [8]. Overall, the frequency of caesarean sections in Group 5 varies from 55 to 100% [17, 25].

We renewed the trend of keeping the level of caesarean sections low after the end of the measures; in the first half of 2021, the frequency of caesarean sections at our maternity unit was 17.0% (264/1553).

The average age of mothers who gave birth at our obstetric unit is steadily rising (Fig. 2), while the number

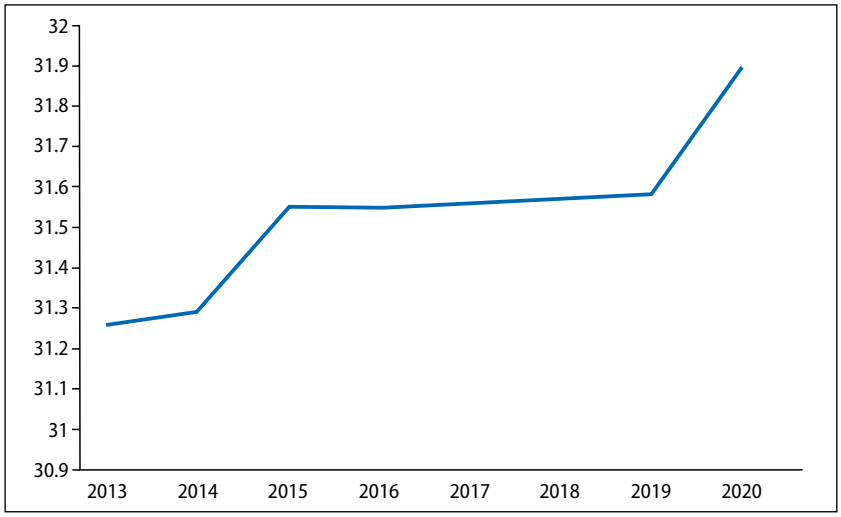

Figure 2. The increase in the average age of women who gave birth in our obstetric unit

of caesarean sections is decreasing (Fig. 1). The last rise in age in 2020 was relatively very sharp, similar to 2015, but we cannot explain this situation.

It is said that one must learn and take something positive from every situation. We consider the introduction of some measures to be positive — the cancellation of antenatal personal instructions by anaesthesiologists before epidural analgesia and their replacement with online education, access to online virtual examinations of maternity wards and better organization of prenatal clinics so that pregnant women do not congregate in the waiting room. We maintained these measures even after the cancellation of the pandemic measures.

CONCLUSIONS

The anti-pandemic interventions were associated with an increase in the frequency of CR. After the end of measures, the frequency of CR returned back to low values. Since the re-adoption of anti-pandemic interventions may occur in the future, we believe that some arrangements should be made so the frequency of CR would stay stable.

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Author contributions

Jozef Zahumensky: team coordination, design of the study, text writing (discussion); Petra Psenkova: data analysis, text writing (results); Michaela Ostatnikova: data analysis, text writing (results); Zuzana Chvalna: text writing (introduction, abstract); Natalia Dominova: data collection, text writing (materials and methods); Michaela Jurcisinova: text writing (discussion).

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Conflict of interest

Authors have no conflict of interest to disclose.

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