

# Hospitalizations for Obstetrical Conditions During and After the Covid-19 Pandemic

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**ABSTRACT:** Background: During the Covid-19 pandemic there have been a drastic decrease in hospitalizations for non-Covid conditions. The aim of this study was to evaluate the trend in hospitalizations for obstetrical conditions during and after the Covid-19 pandemic. Methods: For this study there we used electronical data base in order to search for all the obstetrical patients that were hospitalized in a tertiary maternity, Clinical Emergency County Hospital Craiova, during the pre-pandemic period (between March - December 2019), during pandemics (2020 March - December, 2021 March - December) and post pandemics (2022 March - December). Results: The total number of hospitalizations during 2020 dropped by 28% compared to the pre-pandemic year - 2019, and further by 30% in 2021, and by 26% in 2022. In terms of day admissions, a decreasing trend can be observed, with a total of 3230 admissions, from which, 208 in 2020 showing a decrease of 93%, 695 in 2021 with a decrease of 78% and 941 in 2022 with a decrease of 70% compared to 2019. We experienced a significant increase of vaginal birth rate during the pandemic (2020-2021) of 24% that can be attributed to the unavailability of many surrounding low-risk birth units during the pandemic. Conclusion: The obstetrical conditions hospitalizations dramatically dropped during the COVID-19 pandemic and have not yet recovered to the pre-pandemic level.

**KEYWORDS:** SARS-COV2 pandemic, obstetric conditions, hospitalization, lockdown, birth.

## Introduction

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by a virus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

The first known case was identified in Wuhan, China, in December 2019 [1-3].

The disease quickly spread worldwide, and on 11th March 2020, the disease was declared a pandemic by the World Health Organization (WHO) [4].

The first case of infection with the new coronavirus in Romania was confirmed on February 26, 2020 and because of the massive increase in the number of infected people, on March 16, 2020, the emergency state was established, which blocked any activity, apart from the primary needs.

The "lockdown" continued until May 14, 2020, when the state of alert was established [5,6].

In Romania, the majority of medical services are provided through the public healthcare system.

A new context emerged to which health professionals had to adapt, and that is the increasing number of acute ill COVID-19 patients in detriment of chronic ill patients, including gynecological and obstetrical conditions.

The practice and scope of surgery and medicine transformed radically as the virus spread across the world due to staffing problems, procedure prioritization, intraoperative virus transmission risk, and effects on surgical education [5-8].

The volume of COVID-19 patients requiring specialized maternal and newborn care put the perinatal health system under a great deal of pressure [5-10].

In this scenario, some hospitals had to be converted into Covid units, forcing pregnant women to seek medical care from hospitals like ours.

There has been evidence of a decline in the number of persons seeking chronic or emergency care since the beginning of the pandemic, the reasons for the decline are probably multifaceted and include patient avoidance of emergency care due to COVID-19 fear, and changes in patient lifestyle and self-management in the context of social distancing [11].

Furthermore, due to hormonal changes, pregnant women are more likely to experience emotional instability and sensitivity, leading to loss of perception of the need of care during pregnancy due to the Covid-19 pandemic and medical stress [12,13].

The aim of this study was to determine the variation of obstetrical conditions admissions in our unit during the pandemic and post-pandemic years (2020, 2021 and 2022) compared to the pre-pandemic year (2019).

## Methods

### Study protocol

The investigation was planned as a single tertiary center comparative retrospective study.

This study included patients who were admitted to the Obstetrics and Gynecology Unit of the Clinical Emergency County Hospital Craiova, Romania between March to December in the years 2019 (pre-pandemic), 2020 (pandemic), 2021 (following introduction of the vaccine) and 2022 (post vaccination).

The charts of all patients hospitalized in these periods were retrospectively reviewed.

The figures of monthly hospitalization were compared among the years.

Only obstetrical patients were included in the study.

For a more detailed analysis we divided our patients in 4 categories: prenatal care (day hospitalization for standard care, blood tests and ultrasound or genetic invasive procedures), common pregnancy related pathologies (hypertension, diabetes, preeclampsia, thrombophilia, intrauterine growth restriction and anemia), bleeding (due to abortion, placenta previa), and general aspect regarding births (vaginal births and C-sections, preterm or at term).

### Study outcomes

We studied the differences regarding the patients hospitalized to our department during the study period between the years 2020 (pandemic),

2021 (introduction of the vaccine) and 2022 (post vaccination) and 2019 (pre-pandemic).

### Statistical analysis

The number of patients hospitalized, depending on their condition was recorded for each month of the above-mentioned years, and the calculated figures compared the pre-pandemic, pandemic, and post-vaccination periods with the pre-pandemic year, 2019.

All results were expressed as number and percentage of the total number. For the statistical analysis we used the Chi-square test or the Two-way ANOVA test for multiple comparisons with the "Dunnett's multiple comparisons test" correction. In all cases, the value of  $P < 0.05$  represented the statistically significant difference.

The study followed to the guidelines set up in the Declaration of Helsinki and received approval from the Ethics Committee of the Emergency University County Hospital of Craiova (no.156/24.09.2021) and the Committee of Ethics and Academic and Scientific Deontology of the University of Medicine and Pharmacy of Craiova (no. 63/03.03.2023).

## Results

### 1. Hospitalizations rates during the pre-pandemic period, pandemics and post-pandemic.

In table 1 we present the data for the entire study period, namely the number and percentages for all hospitalization types, according to the diagnosis of patients.

Compared to 2019 the total number of hospitalizations decreased with 28% in 2020, 30% in 2021 and 26% in 2022.

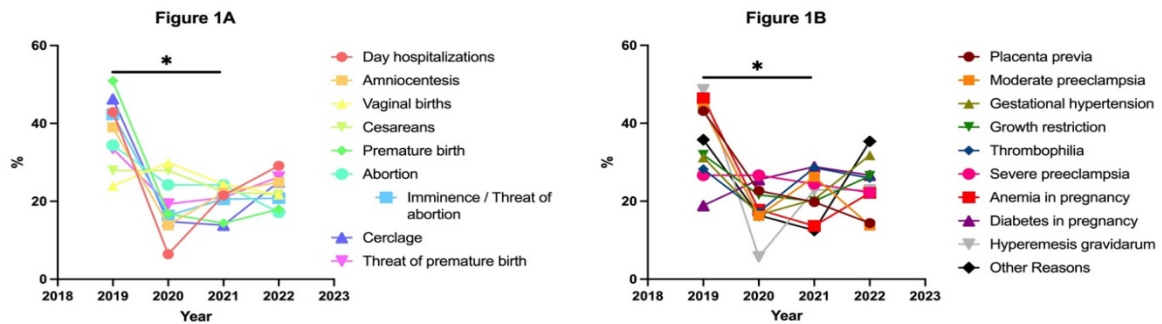
This decrease in hospitalizations is superposable to the period affected by restrictive measures imposed on the population to limit the spread of the Sars-Cov2 virus.

Also, in Figure 1 we presented the trend of hospitalizations in the tertiary maternity of our department.

Compared to all the other causes of hospitalization in our department, we noticed that vaginal births represent a cause of hospitalization that recorded, in opposition to the others, an increase during the pandemic period to 48.57% (n=2604) vs. 27.94% (n= 2088) in 2019 (pre-pandemic period,  $p < 0.001$ ).

**Table 1. Hospitalizations in the tertiary maternity of Clinical Emergency County Hospital Craiova, during the pre-pandemic periodic (2019), during pandemics (2020, 2021) and post-pandemic (2022). \* Chi-square test.**

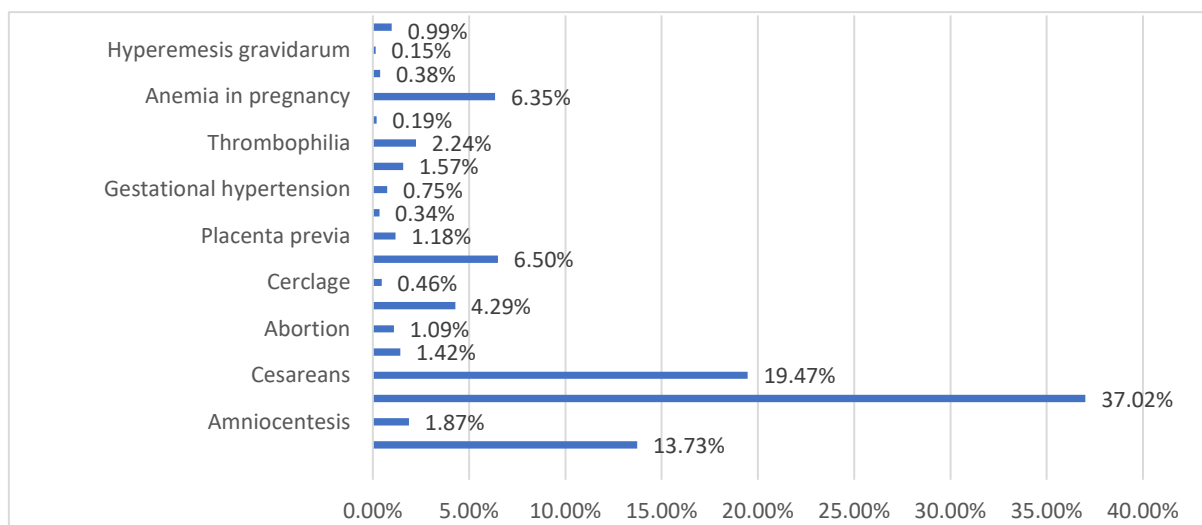
Overview	2019		2020		2021		2022		TOTAL	TOTAL PERCENTAGE	P value*
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage			
Total hospitalizations	7473	100%	5361	100%	5216	100%	5478	100%	23528	100,00%	<0.001
Day hospitalizations	1386	18,55%	208	3,88%	695	13,32%	941	17,18%	3230	13,73%	0,017
Amniocentesis	172	2,30%	61	1,14%	98	1,88%	110	2,01%	441	1,87%	<0.001
Vaginal births	2088	27,94%	2604	48,57%	2124	40,72%	1893	34,56%	8709	37,02%	<0.001
Cesareans	1279	17,11%	1277	23,82%	1031	19,77%	995	18,16%	4582	19,47%	<0.001
Premature birth	170	2,27%	56	1,04%	48	0,92%	60	1,10%	334	1,42%	<0.001
Abortion	88	1,18%	62	1,16%	62	1,19%	44	0,80%	256	1,09%	0,005
Imminence / Threat of abortion	427	5,71%	165	3,08%	207	3,97%	210	3,83%	1009	4,29%	<0.001
Cerclage	50	0,67%	16	0,30%	15	0,29%	27	0,49%	108	0,46%	0,021
Threat of premature birth	513	6,86%	295	5,50%	321	6,15%	401	7,32%	1530	6,50%	0,009
Placenta previa	120	1,61%	63	1,18%	55	1,05%	40	0,73%	278	1,18%	<0.001
Moderate preeclampsia	35	0,47%	13	0,24%	21	0,40%	11	0,20%	80	0,34%	0,011
Gestational hypertension	55	0,74%	29	0,54%	36	0,69%	56	1,02%	176	0,75%	0,809
Growth restriction	118	1,58%	80	1,49%	74	1,42%	98	1,79%	370	1,57%	0,263
Thrombophilia	149	1,99%	91	1,70%	151	2,89%	137	2,50%	528	2,24%	0,736
Severe preeclampsia	12	0,16%	12	0,22%	11	0,21%	10	0,18%	45	0,19%	0,736
Anemia in pregnancy	694	9,29%	266	4,96%	204	3,91%	331	6,04%	1495	6,35%	<0.001
Diabetes in pregnancy	17	0,23%	23	0,43%	26	0,50%	24	0,44%	90	0,38%	0,398
Hyperemesis gravidarum	17	0,23%	2	0,04%	8	0,15%	8	0,15%	35	0,15%	0,221
Other Reasons	83	1,11%	38	0,71%	29	0,56%	82	1,50%	232	0,99%	0,801



**Figure 1. The hospitalizations rates in the tertiary maternity of Clinical Emergency County Hospital Craiova, during the pre-pandemic periodic (2019), during pandemics (2020, 2021) and post-pandemic (2022). \* P < 0.05 at two-way ANOVA multiple comparisons test.**

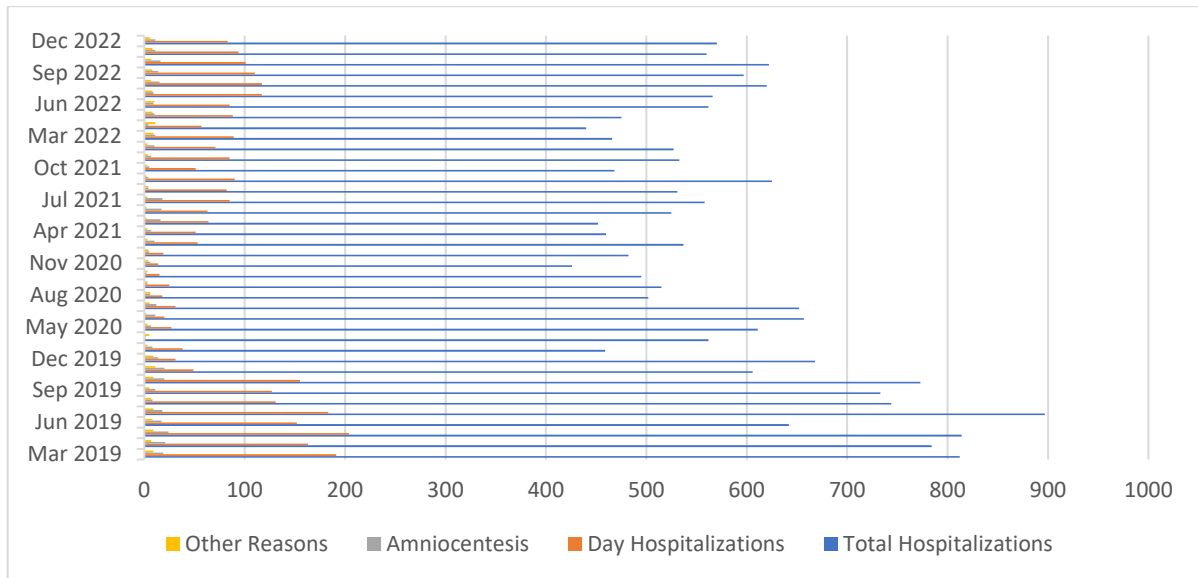
The hospitalizations rates in 23528 cases of the studied period, 2019-2022, were found as following (figure 2): 13,73% day hospitalizations; 1,87% amniocentesis; 37,02% vaginal births; 19,47% cesarean section deliveries; 1,42% premature births; 1,09% spontaneous abortions; 4,29% imminence/threat of abortion; 0,46% necessitated cerclage; 6,5%

threat of premature birth; 1,18% placenta praevia; 0,34% moderate preeclampsia; 0,75% gestational hypertension; 1,57% growth restriction; 2,24% significant thrombophilia assessment; 0,19% severe preeclampsia; 6,35% anemia in pregnancy; 0,38% diabetes in pregnancy; 0,15% hyperemesis gravidarum, and other indications were identified in 0,99%



**Figure 2. The admission rates of the obstetrical conditions during the study period.**

## 2. Prenatal screening and diagnosis

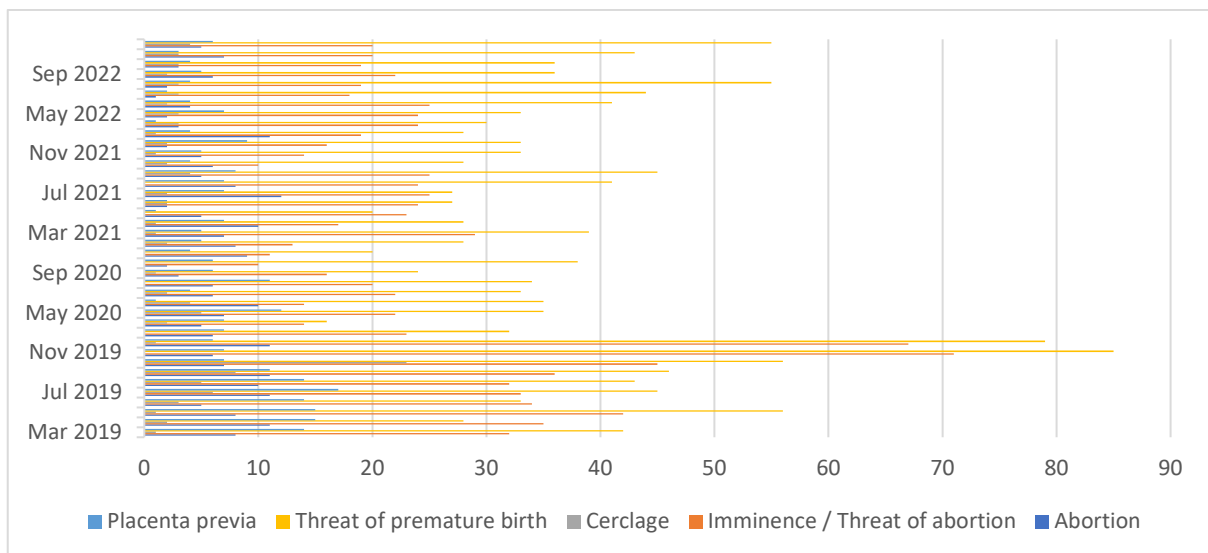


**Figure 3. The monthly evolution of ambulatory admissions for standard pregnancy blood tests, genetic screening and diagnosis (amniocentesis) and admissions for other conditions, during the study period.**

Figure 3 presents the ambulatory admissions for standard pregnancy blood tests, genetic screening, and diagnosis (amniocentesis) and for other conditions, compared to the total hospitalizations. We noted a downward trend, as can be seen from table 1 and 2. Ambulatory admissions decreased by 85% in 2020, by 49% in

2021 and by 32% in 2022, respectively, compared to 2019. Ambulatory admission represented 13,73% out of the total number of admissions. Amniocentesis decreased by 64% in 2020, by 43% in 2021 and by 36% in 2022. Amniocentesis represents 1,87% out of the total number of admissions.

## 3. Vaginal bleeding obstetrical conditions.



**Figure 4. The monthly evolution during the study period of emergency admissions for obstetrical conditions accompanied by vaginal bleeding (such as abortion, imminence/threat of abortion, threat of premature birth, placenta praevia or uterine contractions in the settings of cervical cerclage).**

As can be seen from figure 4, there is a dramatic decrease in the number of hospitalizations for all the conditions accompanied by vaginal bleeding. The number of abortions decreased in 2020 compared to 2019 by 29%, maintained this trend in 2021 and dropped

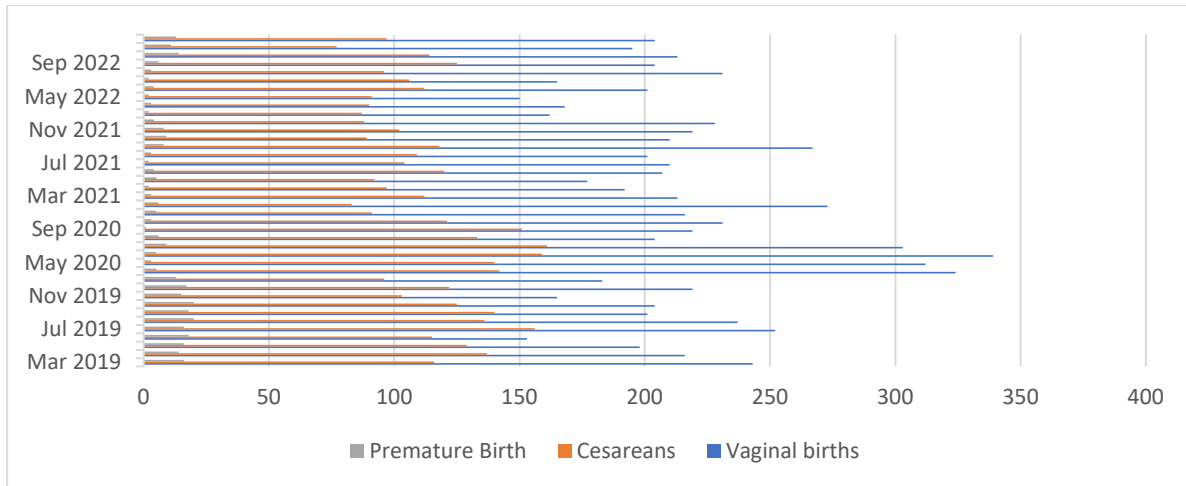
by 50% in 2022. Abortion represents 1,09% out of all admissions during the study period. We noted a decrease of up to 61% regarding imminence/threat of abortion in 2020 compared to the previous year, by 51% in 2021 and by 50% in 2022, respectively. The imminence/threat of

abortion totaled 4,29% out of all admissions during the study period. Hospitalization for placenta praevia, decreased by up to 47% in 2020, 54% in 2021 and up to 66% in 2022. Placenta praevia admissions involved 1,18% out of all cases during the study period. The hospitalizations of patients who required a cerclage, decreased by up to 68% in 2020, 70%

in 2021 and up to 46% in 2022, respectively, compared to 2019. Cervical cerclages represented 0,46% out of all admissions.

Threat of premature birth hospitalizations, decreased by up to 42% in 2020, by 37% in 2021 and by 21% in 2022, respectively, compared to 2019. This condition was present in 6,5% of the cases admitted during the study period.

#### 4. Birth



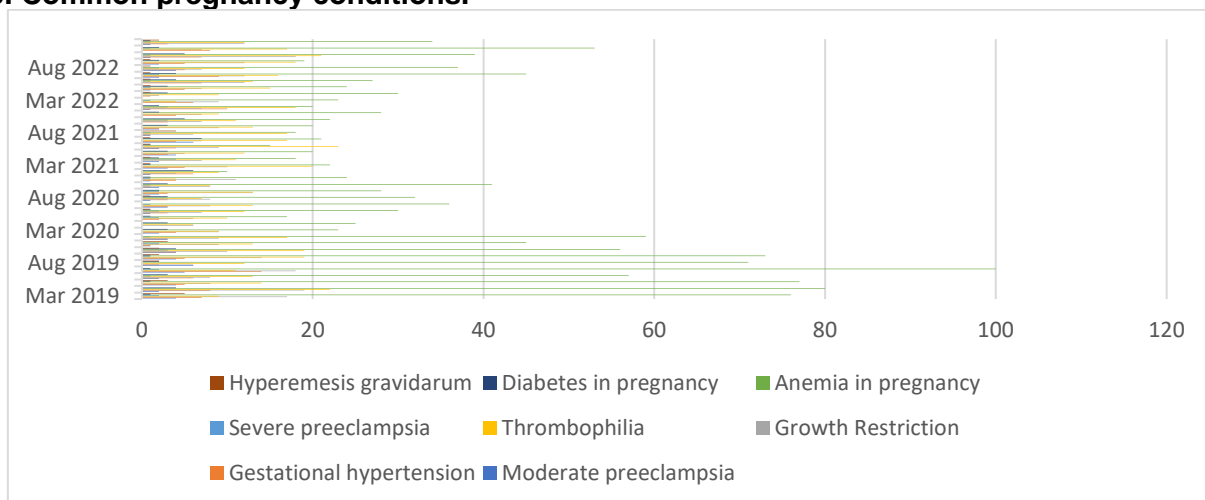
**Figure 5. Monthly admissions for births (vaginal births, cesarean births and premature births) during the study period.**

During the pandemic and the lockdown period can be observed an increase in the number of births, but this was concomitant with closing of many obstetrics units in our area, or their transformation to COVID services only, as can be seen in figure 5. Compared to 2019, the number of vaginal births increased during 2020 by 24%, by 1,7% in 2021, and decreased in 2022 by 9,3%. Vaginal births represented 37,02% out of all obstetrical admissions. Cesarean section births

decreased by 0,2% in 2020, by 19% in 2021 and by 22% in 2022, compared to 2019. Cesarean deliveries comprised 19,47% out of all admissions.

Premature birth rate markedly decreased during pandemics, by 67% in 2020, by 71% in 2021 and by 64% in 2022, respectively, compared to the pre-pandemic year 2019. Premature births represented 1,42% out of the total number of obstetrical admissions.

#### 5. Common pregnancy conditions.



**Figure 6. Monthly admissions for common pregnancy related conditions such as mild and severe preeclampsia, gestational hypertension, growth restriction, thrombophilia, anemia, gestational diabetes and hyperemesis gravidarum.**



In the 4 years period that we have studied we noted a decrease in the numbers for moderate preeclampsia by 62% in 2020, by 40% in 2021 and by 68% in 2022 compared to the pre-pandemic period 2019. On the other hand, we noted a similar number of admissions for severe preeclampsia in 2019 and in 2020 and just a slight decrease in 2021 only by 8% and by 16% in 2022. 0,34% of the obstetrical admissions were due to moderate preeclampsia and 0,19% for severe preeclampsia. Gestational hypertension rates of admission decreased by 47% in 2020, by 34% in 2021 and increased with 1.8% in 2022, compared to 2019. Gestational hypertension represents 0,7% out of the total number of admissions. Regarding growth restriction cases, we noted a decrease by 32% in 2020, by 37% in 2021 and by 16% in 2022, respectively, compared to 2019. Growth restriction represents 1,57% out from the total number of admissions. For thrombophilia condition, a decrease of 38% is observed in 2020, followed by an increase of 1.3% in 2021, and a decrease of 8.1% in 2022. Thrombophilia conditions included 2,24% out of the total number of admissions. The numbers for pregnancy anemia dropped by 61% in 2020, by 70% in 2021 and by 52% in 2022, compared to 2019. Anemia in pregnancy represented 6,35% from the total number of admissions. For gestational diabetes we observed a different trend compared to the other pathologies with a 26% increase in 2020, a 39% increase in 2021 and by 30% in 2022, compared to 2019. Diabetes in pregnancy was diagnosed in 0,38% from the total number of admissions. We noted a major decrease of hyperemesis gravidarum by 88% in 2020, by 52% in 2021 and by 52% in 2022. This condition comprised only 0,15% out of the total number of obstetrical admissions. All this is highlighted in Figure 6.

## Discussion

According to this study, the mean number of hospitalizations per month during the COVID19 pandemic (2020, 2021 and 2022) significantly decreased compared with the pre-pandemic year (2019). This fact is probably due to the turn to other, private units, where the patients went for more safety, for fear of the public hospital, requested by the pandemic and the cases of COVID [14-16]. This shift was maintained, even if anxiety considerably decreased in the population after the first vaccination campaign, and even after, when the lockdown and alert state were suspended. This is due probably to the fact

that the vaccine safety was not investigated initially in pregnancy, and its safety was uncertain during 2021, with recommendations balancing between the risk and benefit of vaccinating pregnant women [17-18]. At the beginning of 2022, the vaccine was approved as safe for pregnant women by the WHO and the addressability increased [19].

Our data show that, despite the fact that the total number of hospitalizations decreased in the first pandemic year compared to pre-pandemics (2019), the number of vaginal births increased with 24% in the first pandemic year 2020, with 1,7% in 2021, and decreased the following year (2022) by 9,3%. This increasing trend can also be seen in other studies [20-21]. The number of Cesarean deliveries slightly decreased by 0,2% in the first pandemic year (2020), and markedly decreased in 2021, by 19% and in 2022 - by 22%. The main reason for vaginal deliveries increased numbers is that many of the low-risk maternities from our area hospitals were closed because of reduced capabilities or were converted into COVID-19 support units from March 2020, until April 2021, forcing pregnant women to address to our facility to seek medical care and to give birth. Another reason is due to the fear of the Covid-19 infection; thus, many patients related that they avoided to address to the small hospitals from or county where the capabilities to fight infection were less advanced.

A downward trend was noted, for ambulatory admissions regarding obstetrical conditions with a 85% decrease by in 2020 compared to 2019, by almost half (49%) in 2021 and still by almost one third (32%) in 2022. This may highlight the fear of addressing the hospital for bloodwork and the preference to access medical services in the private system [23]. The downward trend can also be observed in the number of daily admissions for amniocentesis that decreased by 64% in 2020, by 43% in 2021 and by 36% in 2022. This can be explained by the patient's preference to perform these investigations and procedures at smaller private clinics where they felt safer. As suggested by Apostolopoulos et al, the backdrop of a failing public health system, was that private healthcare entrepreneurship thrived and had a profoundly positive societal impact during COVID-19 pandemic [24].

The conditions associated with vaginal bleeding, such as abortion, imminence/threat of abortion, threat of premature birth, placenta praevia were much less present during the pandemics. The abortions admissions decreased in 2020-2021 compared to 2019 by almost one

third, and halved in 2022. Similarly, imminence/threat of abortion decreased by almost two-thirds (61%) in 2020 compared to the previous year, and halved in 2021 (51%) and 2022 (50%). Threat of premature birth admissions decreased by almost half (42%) in 2020, and remained low in the following years (decrease by 37% in 2021 and 21% in 2022, compared to pre-pandemic period). This may represent a valuable proof to demonstrate the correlation between physical rest and/or less quotidian stress and the abortion conditions rates [25].

Hospitalizations for placenta praevia halved in the first pandemic years (by up to 47% in 2020, and 54% in 2021) and by more to two-thirds (66%) in 2022. Similarly-hospitalization of patients who required a cerclage, markedly decreased by 68% in 2020, 70% in 2021 and up to 46% in 2022. Abel et al. and Dell'Utri et al. found similar results, with a significant decrease in the numbers of admissions [22,26]. A possible explanation would be the fact that the patients worked from home, adopted a quieter lifestyle, avoided going out of the house and physical activity, reducing physical stress to a minimum.

The incidence of gestational diabetes, significantly increased in 2020 (by 26%), 2021 (by 39%), and 2022 (by 30%) compared to 2019. This can be explained by disruption of diabetes self-management routines, sedentary and home-based everyday routine because of the fear of leaving the house and the difficulty to maintain a healthy behaviour during the lockdown [27-29].

Admission for hypertensive disorders dropped by 47% in 2020, and were one-third-reduced in 2021 by 34% and remained stationary in 2022 (1,8% increase), compared to 2019. For the year 2022 we noted that the incidence of this condition returned to the initial pre-pandemic rates. It could be assumed that the lifestyle imposed by the lockdown would have decreased the risk for the development of such complications, or because they went undiagnosed due to the lack of antenatal care [30]. Contrary to our data, Salsi et al. and Carbone et al. observed how hypertensive disorders have been increased during Covid-19 pandemic [20,31]. On the other hand, Dell'Utri et al. revealed constant admission rates for hypertensive diseases [22]. Mild preeclampsia has declined in admission numbers in 2020 (62%), 2021 (40%), and 2022 (68%). However, the stationary numbers of severe preeclampsia admissions suggest that these conditions did not necessarily decrease but only went undiagnosed during the pandemic [32]. Still, there can be

observed that the admission rate for severe preeclampsia haven't changed at all in 2020, and only slightly decreased in 2021 (8,3%), and 2022 (16,7%). Thus, we can draw the conclusion that mild to moderate preeclampsia was treated in private healthcare ambulatory settings.

A markedly decrease of premature births incidence was noted, by more than two-thirds, during the pandemics (2020, 67%, 2021, 71% and 2022, 64%). This finding can be correlated with the behavioural changes of the pregnant woman during pandemics, as the stress, fatigue, prolonged physical effort and orthostatism, also decreased during lockdown [33]. Therefore, we have to consider the importance of the newly adopted lifestyle, in which many women worked from home, spent more time with their families in a safe space, and having better family dynamics and less exposure to stress [28,33].

Regarding hematological conditions like thrombophilia and anemia in pregnancy, we observe a decrease in their numbers and incidence during the pandemic years, more evident for anemia cases (52-70%). It is logical to assume that the pandemics could not greatly influence the incidence of such conditions, therefore it was the lower addressability to public hospital that influenced the rates during lockdown period. The low addressability for these conditions during the pandemic can also explain some of the significant dropping in intrauterine growth restriction admissions with about one third in 2020 and 2021 (32% and 37%, respectively). It is commonly known that thrombophilia and anemia can lead to intrauterine growth restriction [34,35].

In the case of hyperemesis gravidarum, the admissions dropped dramatically, by 88% in 2020, and by 52% in 2021 and 2022. This can only be attributed to the fear of going to the hospital, because the pandemic cannot influence the manifestations of this pathology, unless rest indeed may have a role. Also, the hyperemesis symptoms may sometimes be overrepresented by pregnant women due to widespread concern for the health of the fetus, leading to more medical visits and hospitalizations than are actually necessary. This overreacting did not occur in 2020 due to hospital phobia. Probably, pregnant women with this condition preferred to be examined in private practices and treated at home for the nausea that occurred during pregnancy instead of addressing to the hospital. Salsi et al. also investigated this pathology and observed the same decreasing trend of admissions during Covid-19 pandemic [20,31].

## Conclusions

The Covid-19 pandemic has impacted not only the healthcare system worldwide, but also the pregnant women conception and habits regarding medical care. As presented in our study, pregnant women avoided hospitalizations during Covid-19 pandemic, and addressed to the hospital services only when mandatory. This study findings suggest that either before pandemics we experienced a large number of unjustified admissions or there is an important shift of the pregnant women toward the private healthcare system, which is improbable in the setting of Covid and post-Covid economic crisis from our society. The only aspect related to pregnancy that the Covid pandemic could not change was the birth rate, independent of external factors or the mother's choice.

## Conflict of interests

None to declare

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