



## Original article

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# STRESS AND DURATION OF PREGNANCY

## SUMMARY

The aim of the study was to prove that during the three-month-long bombing of FR of Yugoslavia the pregnancy period was shorter and the incidence of prematurity was not increased. Retrospective studies were based on the data obtained from medical histories of the newly born in the Neonatal Department of the Hospital of the Health Centre in Leskovac. The hospital includes a maternity department with 2300 deliveries annually per 250.000 residents of the Jablanica District which was bombed for 78 days. The study involves 1448 newly born babies born in the period from March 24 till June 9, a year before, during, and a year after the bombing in 1999. On the whole, the results show that the perinatal outcome was better during the bombing with significantly fewer post-dated deliveries. Such, at first glance, paradoxical results remind us of the times when life was harder and deliveries easier. Stress shortens the length of pregnancy but synchronizes development of the embryo with an earlier delivery, so that it does not increase the incidence of prematurity.

*Key words:* war, stress, pregnancy, post-dated, prematurity

## INTRODUCTION

The first informal observation related to prenatal results during the bombing of the FR of Yugoslavia was surprising. During the bombing, which mainly affected towns, their infrastructure and communications, we urgently needed incubators. The terrible situation we found ourselves in obviously did not have negative effects on the perinatal outcome.

We will mention some of the metabolic changes occurring under the influence of the "fear hormone" that pregnant women and fetuses were exposed to during the bombing:

- Increased concentration of blood glucose
- Induction of gluconeogenesis in the liver
- Possibility of acquiring adrenalin-diabetes
- Decreasing of the usage of glucose in the

cells

- Protein supply decreasing

- Influence on the lipo-genesis and adipogenesis of the fat tissue

Adeno-hypophysis increasingly secretes corticotrophin releasing hormone and stimulates the production of trophoblast prostaglandins, which leads to the contraction of the uterine muscle. Other metabolic changes occurred due to the effect of the corticosteroids known to influence the lung maturity of the fetus (1).

Stimulating effect of prostaglandin on the miometrium can lead to a miscarriage or premature delivery. However, the same mechanisms can shorten duration of pregnancy with a delivery which is still in the stated period. Since stressful situations the mother is subjected to rush the embryo for an "out-of-uterus life", the increased incidence of deliveries before defined period can be accompanied by a good prenatal result.

Because of the killing of a pregnant woman in Nis, bus-attacks, train-attacks and buildings near Health Institutions, pregnant women mostly spent their time in basement shelters during the bombing and rarely went to regular medical check-ups. Yet, in these results, we expect data which confirm good prenatal results during the bombing, even better then the year before or the year after the bombing.

**Aims**

The established working hypothesis is that with pregnant women subjected to longer period of stressful situations pregnancy lasts shorter and the fetus reaches a stage of full readiness for an out-of-uterus life, which makes the delivery easier and safer. Therefore, in the period of bombing, we expected a lower incidence of postdated deliveries and overall better prenatal results compared to the same period of the year before and the year after. Such an influence of stress will be confirmed by answering the following questions:

1. Were there fewer deliveries after the expected date during the bombing?
2. Was the incidence of prematurity lowered during the bombing, according to the following parameters of bad prenatal results:
  - a) Duration of hospital stay at the neonatal department more than five days
  - b) Number of babies sent to higher health institutions
  - c) Prenatal death rate?

**MATERIAL AND METHODS**

The data have been assembled retrospectively from medical histories of the babies born in the same period a year before, during and a year after the bombing between March 24 - June 9, 1999. The research was conducted at the Gynecology Department and Perinatology of the Regional Hospital in Leskovac. The hospital has a maternity ward with 2300 deliveries annually per 250.000 residents of the Jablanica District which was bombed for 78 days.

The data have been statistically processed by  $\chi^2$  test. The results are presented graphically by using programs for statistical data processing.

**RESULTS**

**1. Has stress during the bombing lowered the percentage of postdated deliveries?**

By examining the important differences in the number of postdated deliveries in the period of 1998, March 24 - June 9, 1999 and 2000, and overall

Table 1. Delivery in relation to the expected amenorrhoea gravidarum before, during and after the war

Number of deliveries	March 24 - June 9, 1998 N = 559		March 24 - June 9, 1999 N = 432		March 24 - June 9, 2000 N = 457	
	Count	Percentage	Count	Percentage	Count	Percentage
Before the set date	308	55.10%	273	63.19%	252	55.14%
On the set date	27	4.83%	31	7.18%	23	5.03%
Postdated	184	32.92%	93	21.53%	160	35.01%
Unknown date	40	7.16%	35	8.10%	22	4.81%

N= total number of cases in the examined group

results for the period of three years (Table 1) by  $\chi^2$  test, a statistically significant difference has been established. By comparing 1998 - the year before the war, and 2000 - the year after the war, statistically, there is no important difference on this issue. Therefore, the postdated deliveries are statistically rarer in the period of the bombing (Figure 1).

$$(1998;1999):\chi^2 = 15.971 > \chi^2$$

$$(1 \text{ and } 0.001) = 10.827; p < 0.001$$

$$(1999;2000):\chi^2 = 19.905 > \chi^2$$

$$(1 \text{ and } 0.001) = 10.827; p < 0.001$$

$$(1998;1999;2000):\chi^2 = 18.489 > \chi^2$$

$$(2 \text{ and } 0.001) = 13.815; p < 0.001$$

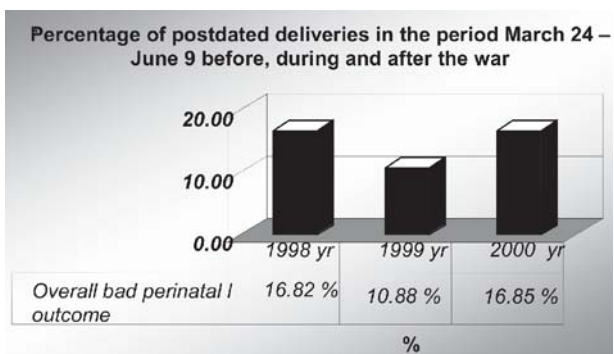


Figure 1. Percentage of postdated deliveries from March 24 till June 9 in the year before, during and after the war

**2. Was the incidence of parameters of bad prenatal results that affect the prematurity lowered during the bombing?**

Table 2. Parameters of prematurity and overall bad prenatal outcomes before, during and after the war of 1999

Parameters of bad prenatal results	March 24 - June 9, 1998 N = 559		March 24 - June 9, 1999 N = 432		March 24 - June 9, 2000 N = 457	
	Count	Percentage	Count	Percentage	Count	Percentage
Staying in hospital longer than 5 days	85	15.21 %	44	10.19 %	68	14.88 %
Late fetal death	3	0.54 %	2	0.46 %	6	1.31 %
Early neonatal death	2	0.36 %	0	0 %	2	0.44 %
Sent to clinics	4	0.72 %	1	0.23 %	1	0.22 %
<b>Total bad outcome</b>	<b>94</b>	<b>16.82 %</b>	<b>47</b>	<b>10.88 %</b>	<b>77</b>	<b>16.85 %</b>

N= total number of cases in the examined group

By testing the importance of the total bad prenatal outcomes (Table 2) for the period from March 24 till June 9, 1998 and 1999, and 1999 and 2000, and the total of three years using  $\chi^2$  test, a statistically significant difference has been proven. There is no difference regarding the period of 1998 and 2000. The number of deliveries with completely bad outcomes, measured by the aforementioned parameters, statistically speaking, is significantly lower during the bombing (Figure 2)

$$\begin{aligned} (1998-:1999-):S &= 6.601 > \chi^2 \\ (1 \text{ and } 0.05) &= 3.841; p < 0.05 \\ (1999-:2000-):\chi^2 &= 6.342 > \chi^2 \\ (1 \text{ and } 0.05) &= 5.991; p < 0.05 \\ (1998-:1999-:2000-):\chi^2 &= 8.361 > \chi^2 \\ (2 \text{ and } 0.05) &= 5.991; p < 0.05 \\ (1998-:2000-):\chi^2 &= 0! \end{aligned}$$

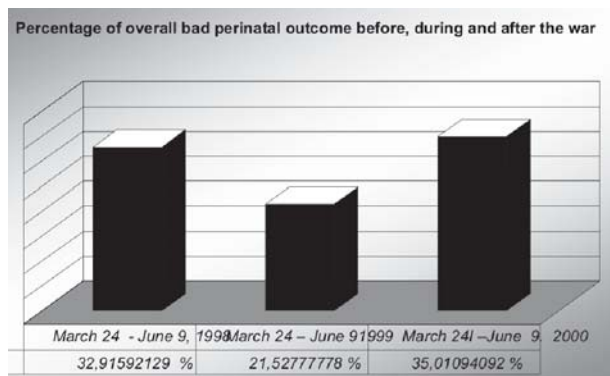


Figure 2. Overall bad prenatal outcome in the period before, during and after the bombing

## DISCUSSION

The expected and real duration of pregnancy show the same ratio before and after the bombing, which coincides in only 5%. The pregnancy developed under the same conditions and some coincidental influences can be the reason that these two variables overlap. During the bombing in 1999, however, the percentage of women having deliveries after the set date was significantly lower.

As the moment of conception of all examined pregnant women was in the period prior to bombing, this new relation shows that duration of pregnancy in women exposed to bombing was shortened under the influence of stress in the last trimester.

Schenker and Mor-Yosef think that fear that pregnant women felt in Israel during the Gulf War (when Israel was the target of Iraqi missiles) also did not cause changes in the number of premature deliveries (2).

After the terrorist attack on New York on September 11, the Americans did not succeed in

proving the influence of stress on increased incidence of prenatal deliveries (3).

We had a different approach to this question and we searched for data supporting a different pregnancy response to stress. Fewer deliveries after the expected date and good prenatal outcome during the bombing prove that pregnancy biologically lasts shorter during exposure to stress; that its duration is as variable as any other biological phenomena and is dependable on the quality of life of a pregnant woman.

Though they have the same etiology, an early neonatal death rate can point to prematurity as its most common cause, while a late fetal death can be attributed to worsened pregnancy control under war conditions. However, the results were better during the bombing in both cases. None newly born baby was sent to a higher health institution and quite a small number was kept in hospital for more than five days after the birth.

We had in mind the prolonged hospital stay caused by these parameters in all three groups, so that we did not take into consideration babies born by cesarean section and those who stayed longer because of duration of recovery of the mothers after delivery. This parameter, though very generalized, convincingly indicate easier delivery and lower incidence of prematurity during bombing.

Begic et al. also point out good results of delivery and prenatal outcomes in Sarajevo and Livno but only after the war in Bosnia, since they have no data of any direct influence of stress on pregnant women during the war (4, 5).

Perhaps due to permanent dislocations of population in Bosnia, it was impossible for them to collect valid data for certain territories. It is also possible, however, that the pregnant women were spared from the risk by timely evacuation. On the other hand, civilians in Yugoslavia were exposed to significant health risks due to the sudden bombing of the whole territory, leaving them without any safe place to evacuate to (6).

Flogel and Lanc also proved that the stress during the war in Croatia damaged human health severely. If we disregard the war propaganda about who the real aggressor was, and who ethnically cleansed whom in their missions, they have a good idea that stress is more dangerous than depleted uranium even in the etiology of malignant diseases (7).

Selten JP and associates examined the incidence of schizophrenia in children that were prenatally exposed to stress during the war in Israel (8).

Murphy BP, proved that corticosteroids in premature babies accelerate development of the lungs but reduce the brain mass (9).

These reports show how the quality of life of

pregnant woman can influence development of the fetus and the consequences of such influence on its future quality of life regardless of lower overall bad perinatal outcome during the bombing.

## CONCLUSION

Stress during pregnancy affects pregnancy as well. While exposed to stress, the fetus develops

faster due to metabolic changes induced by corticosteroids. Completely ready for the out-of-uterus life with a smaller body mass at birth, it initiates an earlier delivery, making it faster, with less risk and mostly with good prenatal outcome.

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## STRES I DUŽINA TRAJANJA TRUDNOĆE

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### SAŽETAK

**Cilj ovog rada bio je dokazati da je tokom tromesečnog bombardovanja SR Jugoslavije skraćeno trajanje trudnoće, a da nije povećana incidenca prematuriteta. Retrospektivna studija podataka iz istorija bolesti novorođenčadi sa Neonatalnog odeljenja bolnice Zdravstvenog centra Leskovac. U ovoj bolnici nalazi se porodilište sa oko 2300 porođaja godišnje za 250.000 stanovnika Jablaničkog okruga koji su bombardovani 78 dana. Studija uključuje 1448 novorođenčeta rođenih u periodu 24. mart 9. jun, godinu dana pre, tokom i godinu dana posle bombardovanja 1999. godine.**

**Rezultati pokazuju ukupno bolji perinatalni ishod tokom bombardovanja i značajno manji broj postdatumskih porođaja. Ovakvi, na prvi pogled paradoksalni rezultati podsećaju nas na vremena kada je život bio teži a porođaji lakši.**

**Stres skraćuje trajanje trudnoće, ali sinhronizuje razvoj ploda sa ranijim porođajem tako da ne povećava incidencu prematuriteta.**

***Ključne reči:* rat, stres, trudnoća, postdatumska, prematuritet**