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**THE EXPERIENCE OF CONTINUOUS SUBCUTANEOUS INSULIN  
INJECTIONS APPLICATION IN TREATMENT OF WOMEN WITH  
DIABETES MELLITUS**

**Resume**

The successful course and outcome of pregnancy complicated by diabetes depends on many factors, the most important of which is to achieve diabetes compensation. The usage of continuous subcutaneous insulin therapy allows the disease to seek compensation in a shorter period of time.

The aim of the study is to evaluate the effectiveness of the treatment of pregnant women with diabetes by continuous subcutaneous insulin infusion (CSII).

**Material and methods.** In the period between 2013 and 2015 at the Diabetes Center of KazNMU named after Asfendiyarov more than 20 women with pregestational diabetes were transferred from multiple subcutaneous injections of insulin to treatment by continuous insulin pump therapy. Patients were observed during the whole preparation for pregnancy, during pregnancy and two months after delivery. HbA1c level measurements were taken before transfer to CSII method and every month after transfer.

**Results and discussion.** Studies have shown that the level of HbA1c ranged from 6.2% to 13.5% ( $8.4 \pm 1.89$ ) in the study group of pregnant women under multiple insulin injections method. After the transfer to CSII HbA1c levels fluctuated in a range from 5.5% to 10.0% ( $6.78 \pm 1.03$ ). Moreover, the average level has been reduced absolutely in all observed cases. The high negative correlation between the level of HbA1c and term delivery ( $r = -0.85$ ), and a high negative correlation between HbA1c and Apgar scores of newborns ( $r = -0.63$ ) were established.

**Conclusion.** Preliminary results show the clinical effectiveness of insulin pump therapy in treatment of pregnant women with diabetes mellitus.

**Key words:** pregnancy, diabetes, insulin pump therapy.

It is well-known that the full diabetes compensation has a significant impact on safekeeping of pregnancy among women with diabetes mellitus. One of the main indicators of adequate compensation of diabetes is the level of glycosylated hemoglobin (HbA1c) in the blood of patients. The level below 6.0% [1, p.77] is required for the normal development of fetus. Different researches show that the high level of HbA1c during the first trimester of pregnancy (when the genesis of viscera take place) correlates with the high rate of congenital defects in development of infant, as well as with the high rate of miscarriage [2,p. 39–41;3, p. 945–958; 4, p.10–14, 5].

The use of insulin pump by pregnant women allows decreasing the level of glucose in blood significantly. Similar researches [6, p. 37-43] show that 94.7 per cent of women who started using insulin pumps during pregnancy period, continued to use them after accouchement, explaining that it allows the best monitoring of glucose level and improves the quality of life.

The aim of our study is to evaluate the effectiveness of treating pregnant women suffering from diabetes mellitus via continuous subcutaneous insulin infusion method (CSII).

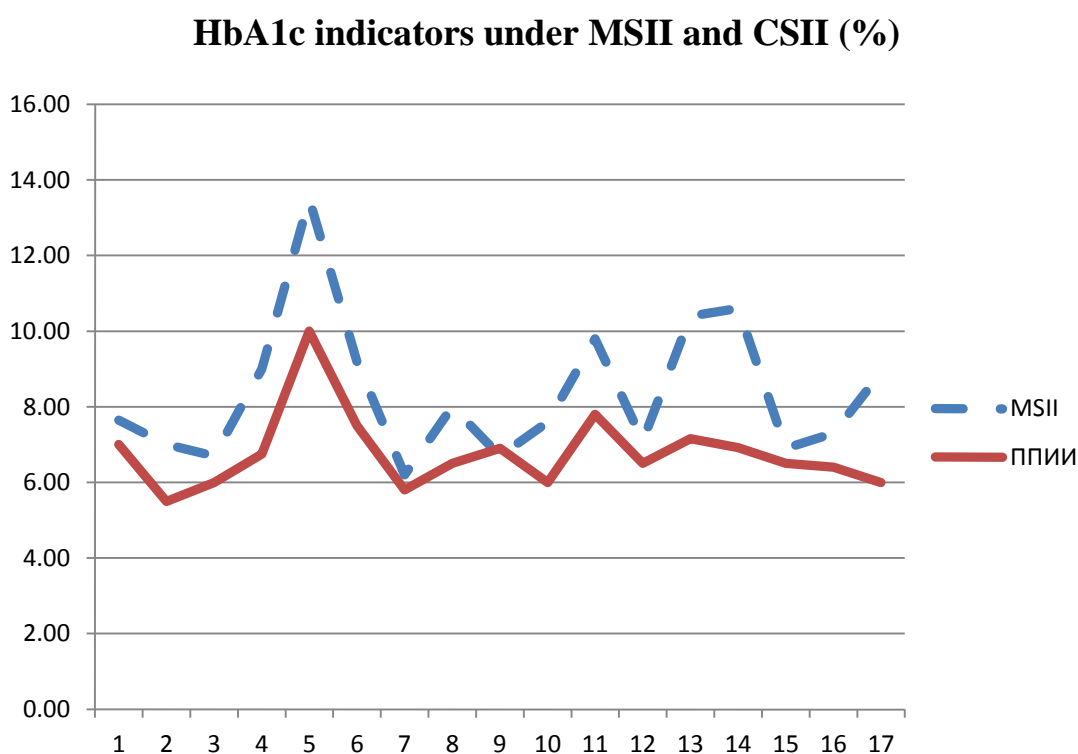
Since 2013, women with diabetes mellitus living in Almaty have an opportunity to receive the required qualified stationary service at the Diabetes Center of KazNMU named after Asfendiyarov.

In a period between 2013 and 2015 more than 20 women with pregestational diabetes were transferred from multiple subcutaneous insulin injections to continuous pump insulin therapy, under the supervision of specialists from the Center. Currently we have a data on a group of 17 women who were followed by endocrinologists from the Center of Diabetes during both pregnancy and post-pregnancy periods. All women have passed through necessary diagnostics on the presence of diabetes complications and associated diseases. Neither absolute nor relative contraindications

to pregnancy were identified in all cases. Moreover, every woman has participated in individual training course. During the whole period of pregnancy patients were keeping diaries of self-control and were measuring glucose level at least 6-8 time a day via personal meters just before and one hour after eating. The evaluation of preliminary results of insulin therapy usage showed that pregestational diabetes experience in the study group fluctuated between 1 and 20 years, with average experience being equal to 12 years. The average age of women was  $28.2 \pm 5.6$ . The transfer from multiple subcutaneous injections method to pump insulin therapy took place on 11<sup>th</sup> week of pregnancy on average.

The study of HbA1c level showed that under multiple subcutaneous injections method it fluctuated in the range from 6.2% to 13.5 % ( $8.39 \pm 1.89$ ). After the transfer to CSII, the range of fluctuation was from 5.5% to 10.0 % ( $6.78 \pm 1.03$ ). It is shown that the level of glycated hemoglobin has decreased in all observations (Picture 1).

**Picture 1**



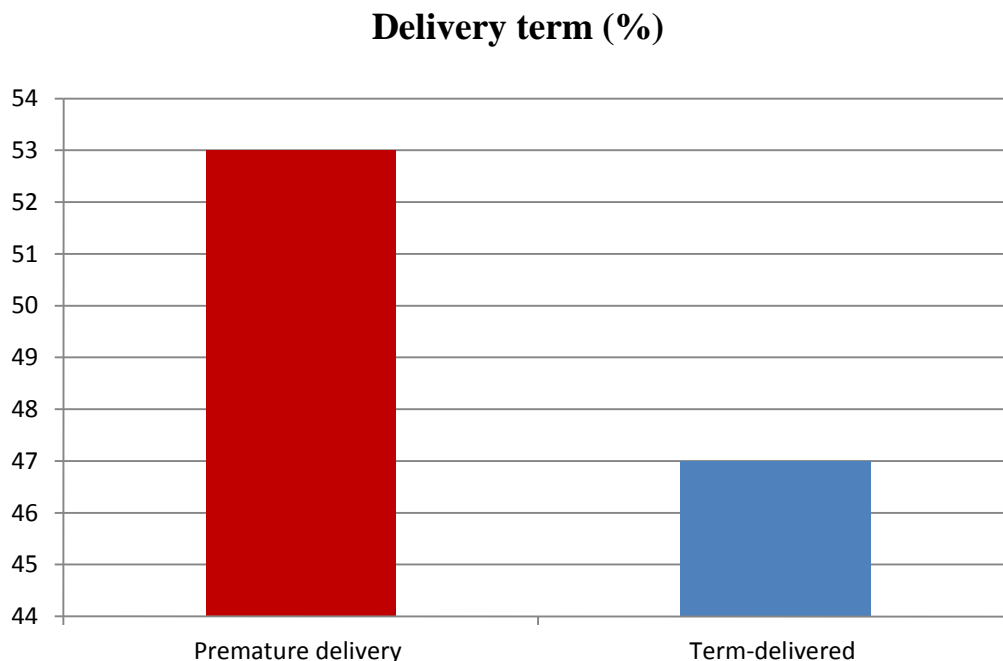
We have checked the statistical significance of decrease in average value of HbA1c after the transfer to CSII. The average decrease was 1.6 with the standard deviation of change being equal to 1.18. If the null hypothesis assumes that change equals to 0, then the t-value is 5.59. Given that  $df = 16$  and p-value under one-sided

test less being less than 0.01, t-value is sufficiently large to reject the null hypothesis. Therefore, we can conclude that the transfer to CSII method indeed leads to the decrease in average level of HbA1c.

The evaluation of preliminary results of insulin therapy usage among pregnant women with diabetes mellitus showed the high correlation between the level of HbA1c and delivery period ( $r=-0.85$ ). At the same time there is relatively strong negative correlation between HbA1c level and Apgar score ( $r = -0.63$ ).

As it was expected the Apgar scores were higher among term-delivered newborns (scores around 7-8) than among newborns delivered urgently, before planned time (scores around 4-6). Premature delivery was observed in 53 per cent of cases, while 47 per cent of observations were term deliveries. There was no statistical evidence to believe that results of delivery were significantly different between women experienced Cesarean operation and women who have given birth vaginally (Picture 2).

**Picture 2**



Only 3 patients have given birth vaginally (17.6%), while 14 (82.4%) women have experienced delivery through Caesarean operation.

Eventually, all 17 women gave birth to 17 newborns alive, with the average weight  $3324.0 \pm 568.5$  gram, while the average Apgar scored obtained was  $6.8 \pm 1.2$ .

Overall, the preliminary result shows the clinical effectiveness of insulin pump therapy in treatment of pregnant women with diabetes mellitus. There is evidence that on the basis of Diabetes Center it is possible to develop more effective control and improve results of women with diabetes giving birth.

Nowadays, the deep study of insulin pump therapy's effectiveness is continued in our center.

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