

# The Role of Oral Glucose Intolerance Test in Reducing Pregnancy Complications

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## ABSTRACT

*The influence of glucose monitoring during pregnancy on newborn body weight, and complications during pregnancy and labor was assessed. We performed a retrospective analysis of macrosomal children, fetal growth, caesarean sections, malformations, still-births and the number of oral glucose tolerance test (OGTT) carried out in a five-year period. The proportion of women participating in OGTT tests increased from 20% to 40% ( $p < 0.05$ ) between 2000 and 2004. Gestation diabetes mellitus (GDM) proportions among pregnant women seen at the Department of Obstetrics and Gynecology at Slavonski Brod General Hospital, Croatia increased from 1% to 6.7% ( $p < 0.05$ ) during the observed period. Proportion of births identified as macrosomal decreased from 13.3% to 12.2% ( $p < 0.05$ ). Additionally, infant mortality and stillbirths along with other fetal and maternal complications declined during the same period. These results suggest that regular measurements of glucose tolerance during pregnancy may prevent preterm birth, decrease the proportion of macrosomal newborns, lower mortality and decrease fetal and maternal complication incidence during pregnancy and delivery.*

**Key words:** gestation, diabetes mellitus, oral glucose tolerance test, pregnancy, complications

## Introduction

New data suggest that gestation impaired glucose tolerance (GIGT) has direct impact on beta cell dysfunction and insulin resistance<sup>1,2</sup>. Excessive transfer of glucose from mother induces fetal hypoglycemia, leading to fetal pancreatic islet hypertrophy and beta cell hyperplasia with consequent rise in insulin secretion<sup>3</sup>.

Insulin secretion and resistance are some of the major contributing factors in appearance of macrosomal infants (defined as a birth weight at or above 4 kg, or when sex-specific birth weight for gestational age is above the 90th percentile of fetal growth curves), which increases the chance of birth trauma, preterm birth, stillbirths, shoulder dystocia, bone fracture or nerve palsy<sup>4</sup>. It has direct influence on the number of caesarean section, neonatal jaundice, respiratory complication and perinatal mortality<sup>5</sup>. Early detection of glucose intolerance can prevent all complications in maternal and fetal outcomes<sup>6</sup>.

## Materials and Methods

At the Department of Obstetrics and Gynecology, Slavonski Brod General Hospital, Croatia, we performed a retrospective analysis of the number of OGTT performed in pregnant women and fetal characteristics during the years 2000 and 2004. Data on body mass index (BMI) of pregnant women, their age and familiar anamnesis of diabetes mellitus (DM) or GDM were collected. Fetal characteristics assessed in the study were the numbers of macrosomal children and their fetal growth, preterm birth, congenital malformations, stillbirths, and caesarean sections. According to the American Diabetes Association (ADA) criteria (fasting: 5.3 mmol/l, 1 h: 10 mmol/l, 2 h: 8.6 mmol/l, 3 h: 7.8 mmol/l) GDM was defined when more than two plasma glucose measurement were equal to or higher than the cut-off points.

Data were tested for conformity to the normal distribution using the Kolmogorov-Smirnov test. Statistical

significance was assessed using  $\chi^2$  test, and set to  $p < 0.05$ . All analyses were performed with the Statistical Package for Social Scientist 11.5.

## Results

An increase of 20% in the number of performed OGGT was noted during the studied period. In addition, there was also an increase in the number of pathological OGTT in pregnant women, with no differences in BMI and family history (Table 1).

**TABLE 1**  
WOMEN'S PARAMETERS OVER OBSERVED PERIOD

Parameter	Start year	End year
Age (X±SD, years)	33.7±10	35.2±8
BMI (X±SD, kg/m <sup>2</sup> )	25.2±1.2	25.1±1.6
Weight increase (X±SD, kg)	7±3.5	6.5±4
Performed OGTT	20%	40%
Pathological OGTT	1%	6.7%
Familiar anamnesis of DM	21%	22%

OGTT – oral glucose tolerance test, BMI – body mass index

During the same period positive changes in all observed fetal characteristics were noted. Numbers of macrosomic infants and infants with faster growth decreased significantly ( $\chi^2$ ,  $p < 0.05$ , Table 2) over the observed period. There were also less preterm births in the last observed year, although this difference was not significant (Table 2). Number of observed fetal malformations decreased over the observed period, but not significantly. Lower fetal mortality was also noted in the last studied year, but that difference was not statistically significant (Table 2).

## Discussion

The small number of performed OGTT during the first year of observation (year 2000) had a strong influ-

**TABLE 2**  
NEWBORN PARAMETERS OVER OBSERVED PERIOD

Parameter	Number (%)	
	Start year N=1615	End year N=1165
Macrosomic	215 (13.3%)	131 (11.2%)*
Faster grow up	209 (13%)	131 (9%)*
Preterm birth	315 (19.5)	215 (18.5%)
Malformations	11 (0.79%)	9 (0.73%)
Mortality	14 (0.95%)	9 (0.73%)

\* Significantly lower than in the start year ( $\chi^2$ ,  $p < 0.05$ )

ence on preterm birth rate and accelerated fetal grow up, but during the year 2004 the number of performed OGTT increased almost twofold.

In the first studied year there were only 1% of women with GDM, with a constant increase in numbers of women with GDM during the observational period. That is explained with more frequent controls of blood glucose during pregnancy, and increasing incidence of type 2 diabetes mellitus. Consequently, positive changes in all observed fetal characteristics were noted, with significant decrease in numbers of macrosomal infants, and infants with faster growth. The continued observation during pregnancy can improve fetal and maternal state and diminishing fatal and unwanted outcome during and after delivery<sup>7,8</sup>.

In comparison to other countries, the prevalence of GDM in Croatia is between 2% and 6%. According to ADA criteria, the prevalence of GDM in Spain is 11, 6% (Toronto TRI-Hospital Gestational Diabetes Project). A preliminary review showed a prevalence of GDM to be around 4%.

Prevalence of GDM in Croatia is similar to other countries, but the main problem is the raising incidence and prevalence of diabetes mellitus type 2, since it raises the possibility of GDM. For that reason we conclude that laboratory screening for glucose intolerance should be a standard element of the prenatal evaluation<sup>9</sup>.

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## RANO OTKRIVANJE INTOLERANCIJE GLUKOZE I KOMPLIKACIJE U TRUDNOĆI

### S A Ž E T A K

Istražen je utjecaj praćenja tolerancije glukoze tijekom trudnoće na fetalni rast, te na komplikacije u trudnoći i porodu. Provedena je retrospektivna analiza broja makrosomne novorođenčadi, carskih rezova, malformacija, mrtvorodne djece i fetalnog rasta, u odnosu na broj učinjenih testova oralnog opterećenja glukozom (OGTT) tijekom petogodišnjeg razdoblja. Postotak trudnica koje su bile podvrgnute OGTT značajno je porastao s 20% na 40% u razdoblju od 2000. do 2004. godine ( $\chi^2$ ,  $p < 0.05$ ). Udio trudnica s gestacijskim dijabetes melitusom (GDM) na Odjelu za porodništvo i ginekologiju Opće bolnice »dr. Josip Benčević« Slavonski Brod, Hrvatska u istom promatranom razdoblju porastao je značajno s 1% na 6,7% ( $\chi^2$ ,  $p < 0.05$ ). Istovremeno, udio novorođenčadi identificiranih kao makrosomna, značajno je smanjen s 13,3% na 12,2% ( $\chi^2$ ,  $p < 0.05$ ). Također je smanjena stopa mortaliteta novorođenčadi, zajedno sa smanjenjem udjela mrtvorodne djece, te drugih fetalnih i maternalnih komplikacija. Rezultati istraživanja pokazuju kako redovito praćenje tolerancije glukoze tijekom trudnoće može prevenirati prijevremeni porod, smanjiti udio makrosomne djece, te smanjiti incidenciju fetalnih i maternalnih komplikacija tijekom trudnoće i poroda.