

## Screening of gestational diabetes in Tuscany: results in 2000 cases

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**Summary.** - According to the guidelines of the "Third international workshop conference on GDM", we have examined 2000 pregnant women. The glucose challenge test (GCT) was positive in 408 cases (20.4%) and negative in 1592 (79.6%). The OGTT (Carpenter and Coustan's criteria) was performed in 647 pregnant women. GDM and IGGT prevalence was of 6.25% and 5.5% respectively and normal glucose tolerance (NGT) 88.25%. The GCT effectiveness for GDM and IGGT diagnosis is: sensibility 75.1%, specificity 44%, positive predictive value 46.4% and negative predictive value 74%. GDM and IGGT compared with NGT women were significantly older ( $p < 0.05$ ) and prepregnancy BMI was higher ( $p < 0.01$ ); the prevalence of previous macrosomia ( $p < 0.01$ ), previous gestational diabetes ( $p < 0.01$ ) and family history for diabetes mellitus ( $p < 0.05$ ) was greater in GDM and IGGT. The prevalence of preterm delivery was higher in both GDM and IGGT (GDM 12.5% and IGGT 15.4% vs NGT 6%;  $p < 0.01$ ), as well as the prevalence of cesarean sections (GDM 31.6% vs IGGT 23.5% and NGT 20.3%;  $p < 0.02$ ), and the occurrence of macrosomia (GDM 27.6%, IGGT 16.6% and NGT 16.2%). In addition a higher prevalence ( $p < 0.01$ ) of hyperbilirubinaemia, hypoglycemia and hypertrophy cardiomyopathy was observed in newborns from GDM women. Our data show that: GCT has a good specificity for GDM diagnosis, prevalence of GDM in our population is about 6%, GDM is still correlated to an elevated maternal and neonatal morbidity.

**Key words:** gestational diabetes, screening test, prevalence.

**Riassunto** (*Screening del diabete gestazionale in Toscana: risultati in 2000 casi*). - Seguendo le indicazioni del "Third international workshop conference on GDM", abbiamo esaminato 2000 donne in gravidanza. Il test di screening (GCT) è risultato positivo in 408 casi (20,4%) e negativo in 1592 (79,6%). 647 donne sono state sottoposte ad OGTT. La prevalenza del GDM e della ridotta tolleranza glucidica (IGGT) è risultata rispettivamente del 6,25% e del 5,5 %, il restante 88,25% era normale (NGT). La sensibilità del GCT è risultata del 75,1%, e la specificità del 44%; il suo valore predittivo per risultato positivo è stato del 46,4%, mentre quello per risultato negativo del 74%. GDM e IGGT rispetto alle donne con NGT erano significativamente più anziane ( $p < 0,02$ ), avevano un peso pre-gravidico maggiore ( $p < 0,01$ ), una maggiore incidenza di precedenti nati macrosomici ( $p < 0,01$ ), una maggiore familiarità diabetica ( $p < 0,05$ ). I parti pretermine erano più frequenti nel GDM (12,5%) e nell'IGGT (15,4%) rispetto a NGT (6%), così come più frequente era il taglio cesareo (GDM 31,6% vs IGGT 23,5% e NGT 20,3%;  $p < 0,02$ ), e l'incidenza della macrosomia ( $p < 0,05$ ) (GDM 27,6%, IGGT 16,6% e NGT 16,2%) in aggiunta una maggiore frequenza ( $p < 0,01$ ) di iperbilirubinemia, ipoglicemia e di cardiomiopatia ipertrofica si osservava nei nati da donne con GDM. I dati di questo studio mostrano che l'efficacia del test di screening per la diagnosi di GDM è soddisfacente. Inoltre, la prevalenza di GDM, è circa il 6% e si associa ad una elevata morbidità materno-fetale.

**Parole chiave:** diabete gestazionale, test di screening, prevalenza.

### Introduction

Universal screening for gestational diabetes mellitus (GDM) has been recommended for all pregnant women. An early diagnosis of GDM is important to obtain the reduction of maternal and fetal morbidity during and after pregnancy [1-3].

The incidence of GDM ranges from 1% to 20%; this large variability is probably due to differences in the methods used for collecting data, low response rates, non random selection of subjects and different diagnostic criteria adopted.

Implementation of screening's programs for GDM is recommended by various international consensus

conferences and the defense of diabetic pregnant women is one of the aims of the "St. Vincent declaration" [4]. Moreover, currently few data are available on the prevalence of GDM in Italy. Accordingly, aim of this study is to establish the prevalence of GDM in Tuscany and to identify the main correlated risk factors.

## Methods

This study was performed according to guidelines of the "Third international workshop conference on GDM" (1995-1998). The first phase "pilot study" was limited to 8 health care districts in North-West Tuscany. Subjects recruited were submitted to a glucose challenge test (GCT) between 24th-28th week of gestation (14th-18th in presence of one or morespecific risk factors for GDM). When blood glucose concentrations after GCT were above or equal to 140 mg/dl (positive GCT), pregnant women were submitted to a 100 g oral glucose tolerance test (OGTT) according to Carpenter and Coustan's criteria. Women with only one abnormal value during OGTT were considered intolerant (IGGT) [3].

GDM or IGGT patients received a diet (28-30 kcal/kg/desiderable body weight), providing sufficient calories to allow a weight gain of 9-12 kg during pregnancy. Insulin treatment started when fasting plasma glucose and/or 1 h postprandial plasma glucose were higher than 95 mg/dl and 130 mg/dl respectively.

All data about obstetric and metabolic parameters, time and mode of delivery, birth weight and neonatal morbidity were collected in a specific clinical record. The results were centralized three times a year. Statistical evaluation was performed using Student's test for paired and unpaired data,  $\chi^2$  test or Fisher exact test.

## Results

2000 pregnant women (mean age  $29.5 \pm 4.7$  years) were examined. A positive history of diabetes in first-degree relatives was reported in 352 (17.9%) women. 745 (37.2%) women showed at least one risk factor for GDM. The GCT, executed at  $23.7 \pm 5.6$  gestational week, was positive (GCT+) in 408 (20.4%) and negative (GCT-) in 1592 (79.6%) pregnant women.

The OGTT was performed at  $26.6 \pm 4.7$  gestational week in 647 pregnant women: 408 GCT+ and 329 GCT- with one or more risk factors for GDM. 102 GCT+ women with (25%) and 23 GCT- (9.6%) were affected by GDM, 229 GCT+ (56.1%) and 183 GCT- (76.6%) were normal (NGT), while the remaining 110 women (77 GCT+ and 33 GCT-) showed a borderline OGTT (IGGT) (Fig. 1). These results show that GCT effectiveness for GDM and IGGT diagnosis is: sensibility 75.1%, specificity 44%, positive predictive value 46.4% and negative predictive 74%.

Moreover, the screening for GDM in our population showed that GDM and IGGT prevalence was 6.25% and 5.5% respectively.

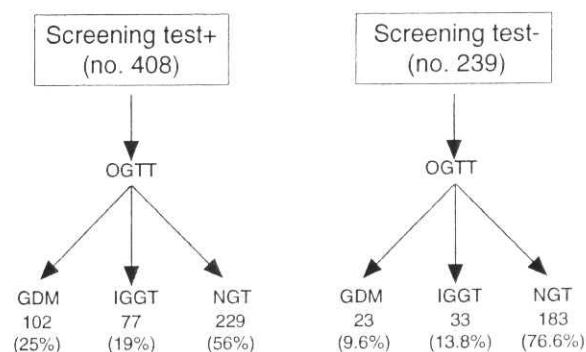
Patients with GDM and IGGT compared with NGT women (Table 1) showed a higher mean age ( $p < 0.05$ ) and prepregnancy BMI ( $p < 0.01$ ); more frequent in GDM and IGGT were age  $> 35$  years ( $p < 0.05$ ), previous macrosomia ( $p < 0.01$ ) and previous gestational diabetes ( $p < .01$ ). Family history for diabetes was observed in 32.8% of GDM population. Family history for diabetes was observed in 32.8% of GDM population.

Delivery data, relative to 770 women (659 NGT, 51 IGGT, 60 GDM), showed a higher prevalence ( $p < 0.02$ ) of preterm deliveries in GDM (12.5%) and IGGT (15.4%) in respect to NGT (6%). Also cesarean sections (GDM 31.6% vs IGGT 23.5% and NGT 20.3%;  $p < 0.01$ ) resulted increased in GDM and IGGT. Prevalence of macrosomia in relation to large for gestational age (LGA) was significantly ( $p < 0.05$ ) higher in newborn from GDM (27.6%) than in those from IGGT (16.6%) and NGT (16.2%); moreover LGA prevalence is higher in women suffering from prepregnancy obesity than in those with normal weight (24.2% vs 16.1%  $p < 0.01$ ). Neonatal morbidity calculated on 304 newborns (41 GDM, 43 IGGT and 226 NGT) show an higher prevalence ( $p < 0.01$ ) of hyperbilirubinaemia, hypoglycemia and hypertrophic cardiomyopathy in newborns from GDM women.

## Conclusions

Our data show that GCT has a good effectiveness for GDM diagnosis.

The prevalence of GDM in Tuscany may be estimated about 6%. Although this figure necessitate to be confirmed with larger scale evaluation, this value is in



**Fig. 1.** - Screening test and OGTT.

OGTT: oral glucose tolerance test. GDM: gestational diabetes mellitus; IGGT: impaired glucose gestational tolerance; NGT: normal glucose tolerance; GCT (glucose challenge test) effectiveness for GDM and IGGT diagnosis is: sensibility 75.1%, specificity 44%, positive predictive value 46.4% and negative predictive 74%.

**Table 1.** - Risk factors for GDM in women subjected to OGTT (no. 647)

	GDM	IGGT	NGT	P
no. cases	125	110	412	
Mean age	31.6 ± 5.6	31.4 ± 5.4	29.2 ± 4.6	0.02
Age > 35 years (%)	25.9	29.9	17.6	0.05
Parity (%)	12.5%	6.6%	4.34%	ns
Abortions (%)	18.1	17.5	15.1	ns
DM familiarity (%)	32.8%	16.5%	21.9%	0.05
Previous GDM (%)	12.5	1.2	1.34	0.01
Previous LGA (%)	10.5	3.3	4.6	0.01
Prepregnancy BMI (kg/m <sup>2</sup> )	25.1 ± 4.8	23.5 ± 4.3	22.6 ± 3.5	0.01
BMI > 30 kg/m <sup>2</sup>	17.3%	7.2%	4.1%	0.01
Weight gain (kg)	9.32 ± 6.1	8.9 ± 3.7	8.3 ± 4.3	ns

GDM: gestational diabetes mellitus; IGGT: impaired glucose gestational tolerance; NGT: normal glucose tolerance; BMI: body mass index; LGA: large for gestational age; ns: not significant.

Data are presented as mean ± standard deviation.

Statistical evaluation is performed using Student's test for paired and impaired data,  $\chi^2$  test or Fisher exact test.

keeping with those from other Italian studies [5-8] indicating that prevalence of GDM in Italy probably lies between 3% and 10%.

Our study also shows that important predicting factors for GDM are: maternal age, prepregnancy BMI, familiarity for diabetes mellitus.

GDM is still correlated to an elevated maternal and newborns morbidity: such as preterm deliveries, cesarean sections, neonatal macrosomia.

A higher prepregnancy BMI seems to be an important predictor of increased frequency of LGA, as just observed in our previous retrospective study [9].

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