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Results of the Implementation of a Diet with Low Content of Carbohydrates for the Treatment of Glucose Intolerance during Pregnancy

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Abstract

Diabetes gestational (DG), is defined as any degree of intolerance to carbo hydrates (CH) that begins or is diagnosed during the pregnancy [1], being its prevalence estimated in around the 4 to the 7% of the pregnancies. It is recommended the individualization of the therapy nutritional (TN) according to the weight and the maternal height. The diagnostic and therapeutic protocol employed, allowed an adequate management of the studied population. Given the importance that acquires the intolerance to the CH in this study, is the proposal to investigate about that in patients whose 1st load with 50g is < 140 mg %, receive a 2nd load with 50g of glucose after week 20 and every 2 weeks, in the hypothesis to evaluate when it starts to give a result > = 140 mg % to allow a more rapid addition to the treatment protocol, in addition to assessing the costs that this behavior would generate.

Keywords: *Pregnancy-gestational; Diabetes; diet; Glycose charge*

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Introduction

Diabetes gestational (DG), is defined as any degree of intolerance to carbo hydrates (CH) that begins or is diagnosed during the pregnancy [1], being its prevalence estimated in around the 4 to the 7% of the pregnancies. At the present time, there are a sort of differences in the incidence of DG according the populations evaluated. For example, the Netherland population, present almost a half of the prevalence in USA [7] which is about 9%. All patients with DG, should receive nutritional advice by a nutritionist specialized in DG according to the recommendations of the American Association of Diabetes (ADA) (1-2-5). Is recommended the individualization of the therapy nutritional (TN) according to the weight and the maternal height. For patients with a body mass index (BMI) > 30 kg/m^2, the ADA recommends a caloric restriction of between the 30 and the 33%, while is not observed increase in the production of ketone in urine samples. This

restriction, has shown decreasing maternal glucose levels and improved maternal, fetal and neonatal outcomes and fetal [3]. In the year 2000, Jovanovic communicates a nutritional strategy for the treatment of patients with DG, based on a moderate caloric restriction, calculation based on a particular intake according to the patient is not exceeded in their theoretical weight according to size and age. But the particular fact of this TN, is the proposal of reducing the contribution of CH, from 50% to 40% of the total caloric value [4]. Their objective of such caloric reduction, is to achieve a decrease in the oscillations in the levels of maternal glucose levels and by this way, probably reduce the requirement of maternal insulin during pregnancy, as well as also probably decrease the incidence of macrosomic newborns [6]

Objective

1. Evaluate the requirement of insulin and the percentage of macrosomic newborns, after the patients were randomized to receive a diet with 40 or 50% of CH, to treat the intolerance to the glucose during the pregnancy.
2. Relate diagnostic data and follow-up of patients according to the degree of intolerance to the CH, to try to establish the correlation found between diagnosis, evolution and pregnancy outcome.

Material and Methods

Between the years 2001 and 2002, the patients who were assisted at the Obstetrics Service of the German Hospital for prenatal care, conducted according to guide procedures for the detection of intolerance to the carbohydrates, a load with 50g of glucose and blood glucose measurement 60' after the charge, between 15 and 20 weeks of gestational age [2]. It was considered abnormal, a result of more or equal than 140 mg %. The measurements of glucose levels were done with a Hitachi Modular P glucosymeter. The patients with blood sugar less than 140, performed a second load with 50g glucose after it 25 weeks of gestational age. Those patients with a result in the first test over 140 mg %, were admitted to a protocol of nutritional therapy. Patients whose first load was normal and the second was greater than 140 mg %, entered nutritional therapy. The patients were selected according to table of random numbers obtained by computer, to receive a diet with 40 or 50% of CH. The total caloric income was 30 Kcal/kg of weight if its weight was between 80-120% of the theoretical weight for their height and age; 24 Kcal/Kg if their weight was located between the 120 and the 150% of their theoretical weight; and 12 Kcal/Kg if their weight was greater to the 150% of their theoretical weight [4]. Neither the patient nor the physician knew the caloric content and carbohydrate content.

Diet therapy was initiated, the patients attended initially in a weekly schedule and performed glycemic levels control every day at Hospital in ambulatory scheme. It was evaluation of blood glucose in fasting state and 60' after breakfast, lunch and snack. It was used for the measurements, Alpha Accutrend alpha of Boehringer-Mannheim glucosymeter strips, and the ketonuria was measured with test strips Multistix (Bayer). Maximum limit of blood sugar considered a value of up to 90 mg % in fasting state and 140 mg % at 60' of postprandial time. The average total daily glycemic levels were considered in cases adjacent to the maximum values, using as criteria of insulin those averages exceeding 100 mg %.

The insulin began with micro doses of insulin (Humulin-Lilly) human NPH at bed time schedule with daily glycemic controls up to the metabolic stabilization of the patient. When there was not achieved the metabolic stabilization, the patient was admitted to obtain this goal. Once obtained the metabolic regulation, the patient returned to the ambulatory monitoring. The frequency of ambulatory monitoring, was designed according to the metabolic stability of the patient and the gestational age of the pregnancy.

All patients, between 28 and 30 weeks of gestational age, gave up the diet for 3 to 5 days, for a free CH diet and after 72 hours of this diet, they underwent to an oral tolerance test with an overload with 100 g glucose (CTOG) using method glucose oxidase to check the glycemic levels. According to the criteria of the ADA, the limits maximum for this curve, were to 110 mg % in fasting state, 185 mg % at 60', 155 mg % at 120' and 140 at 180' [2]. Patients with two or more values equal or over the normal values were classified as gestational

diabetes, patients with only a value higher than normal, as intolerance of CH; while the patients with no values superior to the maximum, were classified as normal. After the oral test, all patients recovered previous diet therapy and control of glycemic levels as previously described.

The patients under insulin therapy initiated the fetal health control with non-stress tests from the 32nd week in weekly frequency and from week 34 in a twice a week frequency. The way to end the pregnancy, was under the medical treating criteria with regard to time and via of delivery. Not were given special instructions about how to anticipate the birth for the prevention of the macrosomia fetal.

Results

Objective 1 There were incorporated to the study 82 patients, from a base of the total of 1640 births that occurred during the period of study, which indicates an incidence of intolerance to CH of the 5%. The patients were grouped according to the randomization at the rate of 42 cases in Group 1 (50% of CH) and 40 cases in Group 2 (40% of CH).

There was no difference in average maternal age (table 1). For the Group 1 the age was 33.07 + -4.33 years and for the Group 2, 32.50 + -5.10 (P = 0.595 T Student). There were no differences in the number of previous births of each group (Group 1, 1.26 and group 2, 0.9), the index of body mass at the beginning of the pregnancy (23.48 + -3.66 in Group 1 and 23.32 + -3.95 in the Group 2 P = 0.853 T Student), or in the frequency of previous macrosomic newborn (7.1% in Group 1 and 5.1% in Group 2).

	Group 1 n:42	Group 2 n:40	P
	50% of CH	40% CH	
Maternal age (years)	33.07 + -4.33 (23-45)	32.5 + -5.1 (21-52)	0.595 Student
Previous Births	1.26 + -1.32 (0-6)	0.9 + -1.23 (0-4)	
BMI	23.48 + -3.66	23.32 + -3.95	0.853 Student
Previous Macrosomic	3 (7.1%)	2 (5%)	
Macrosomic NB	5 (11.9%)	1 (2.5%)	RR 1.69 CI 1.10-2.58
Gestational age at birth	38.28 + -1.60 (31-40)	38.31 + -1.31 (35-41)	0.928 Student
Insulin	13 (31%)	3 (7.5%)	1.82 RR CI 1.27-2.61
G DBT	12 (28.6%)	15 (35%)	0.21 DP
CH Intolerance	14 (33.3%)	14 (35%)	0.06 DP
Normal	16 (38.1%)	12 (30%)	0.21 DP
Average wheigt at birth	3277.85 + -584.85g (1680-4530)	3176.87 + -486.44 g (1920-4150)	0.410 Student

Table 1: *General data of both groups.*

DP: difference between proportions

In the Group 1, developed diabetes gestational the 28.6% of the cases, while in the Group 2 the 35% (P = 0.21); in Group 1 developed intolerance to the CH the 33.3% of cases and 35% in Group 2 (P = 0.06). Finally, the oral tolerance test was negative in 38.1% of patients from Group 1 and in 30% of cases in Group 2 (P = 0.21).

Required insulin to control the levels of blood sugar 13 patients in the Group 1 (31%) and 3 patients in the Group 2 (7.5%) 1.82 RR CI 1.27-2.61. The average weight to the newborns was 3277 + -584.85 g in the Group 1 and 3176 + -486 in the Group 2 (P = 0.410 T Student). The percentage of macrosomic newborn (defined as newborn of 4000g or more at term) was 11.90% in Group 1 and 2.5% in Group 2, RR 1.69 (CI 1.10-2.58).

Among the patients in each group whose CTOG was normal (but with a load of 50g altered) (table 2) (group 1: 16 cases y group 2: 12 cases), the body mass index of Group 1 at the beginning of the pregnancy was 23.01 + -4.28,

	Group 1	Group 2	P
N	16/42 (38.1%)	12/40 (30%)	
BMI	23.01 + -4.28	22.26 + -2.57	0.330 Student
Prior macrosomic	2 (12.5%)	0	
Macrosomic NB	2 (12.5%)	0	0.317 DP
Gestational age at birth	38.43 + -0.89 (37-40)	38 + -1.47 (35-40)	0.103 Student
Insulin	1 (6.3%)	0	0.571 DP
Average weight NB	3346 + -505.80g (2580-4530)	2950 + -515 42g (1920-3700)	< 0.001 Student

Table 2: *Data of patients with normal oral tolerance test with 100g.*

DP: difference between proportions

While in Group 2 was 22.26 + -2.57 (P = 0.330). The Group 1, presented 2 macrosomic newborns (12.5%), while there were not cases of macrosomia in the Group 2 (Test of Fisher P = 0.317) (average gestational age Group 1: 38.43 +-0.89 weeks and group 2: 38 + -1.47 weeks) (P = 0.103). One patient of Group 1 (6.3%) required insulin, while among the patients of Group 2, none should receive insulin (Fisher Test P = 0.571). The average weight of the newborns of the Group 1 was 3346 + -505.8g and in the Group 2, 2950 + -515.42g (P < 0.001).

The patients of both groups with a diagnosis of CH intolerance (table 3) (Group 1:14 cases and group 2:14 cases), at the beginning of pregnancy body mass index was 23.09 + -2.96 in Group 1 and 23.22 + -3.35 in Group 2 (P = 0.914). In Group 1, there were 3 cases of fetal macrosomia (21.4%), while there were no cases of macrosomia in Group 2 (Fisher Test P = 0.111) (average gestational age Group 1: 38.59 + -1.39 weeks and group 2: 38.08 + - 0.99 week´s) (P = 0.274). In Group 1, 4 cases required insulin (28.6%), whereas in the Group 2, required insulin only 1 case (Fisher P 7.1%) (Test = 0.162). The average weight of the newborns of the Group 1 was 3398.57 + -656.10 g and in the Group 2: 3229.28 + -473.59g (P = 0.441).

	Group 1	Group 2	P
N	14/42 (33.3%)	14/40 (35%)	
BMI	23.09 + -2.96	23.22 + -3.35	0.914 Student
Prior macrosomic	0	1 (7.1%)	
Macrosomic NB	3 (21.4%)	0	0.111 DP
Gestational age	38.59 + -1.39 (35-40)	38.08 + -0.99 (36-40)	0.274 Student
Insulin	4 (28.6%)	1 (7.1%)	0.162 dp
Average weight	3398.57 + -656.10g (2160-4410)	3229.28 + -473.59g (2360-3870)	0.441 Student

Table 3: *Data of patients with CH intolerance.*

DP: difference between proportions

Finally, in the Group 1, 12 patients developed gestational diabetes (28.6%), while in the Group 2, this occurred in 14 patients (35%) (table 4) (P = 0.21). At the beginning of pregnancy body mass index was 24.60 + -3.63 in Group 1 and 24.34 +-5.28 in Group 2 (P = 0.895). Among the patients of the Group 1, there were not cases of fetal macrosomia, and there was only 1 case in the Group 2 (7.1%) (gestational age average in the Group 1: 37.7 + -2.37 weeks and the Group 2: 38.8 + -1.39 weeks) (P = 0.186). In Group 1, 8 patients required insulin (66.7%), while in Group 2 required insulin 2 cases (Fisher P 14.3%) (Test < 0.009). The average weight of the infants in the Group 1 was 3045 + - 576 78g, and the Group 2: 3311.42 + -440.94 (P = 0.229).

	Group 1	Group 2	P
N	12/42 (28.6%)	14 / 40 (35%)	
BMI	24.60 + -3.63	24.34 + -5.28	0,895 Student
Prior macrosomic	1 (8.3%)	1 (7.1%)	
Macrosomic NB	0	1 (7.1%)	
Gestational age	37.7 + -2.37 (31-40)	38.8 + -1.39 (36-41)	0.186 Student
Insulin	8 (66.7%)	2 (14.3%)	< 0.009 DP
Average weight	3045 + -576.78g (1680-3720)	3311.42 + -440.94g (2900-4140)	0.229 Student

Table 4: *Data of the patients with GD*

DP: difference between proportions

Objective 2: For this second analysis, the population was reduced from 82 to 74 cases, by collecting incomplete data. Table 5, shows data of the mothers, of the evolution of the pregnancy and the newborn (NB), patients admitted to the study for first or second load of 50g > = 140 mg %. In 26 cases (35.1%) the curve was normal, in 23 (31.1%) the oral test was abnormal but not pathological (ANP) and in 25 cases (33.8%), the oral test was pathological. We can see that the highest value of blood glucose after the charge with 50g of glucose, correspond to patients with pathologic (CTOG) tolerance in which the 1st load of 50g was altered. There are not differences in the average value of the 2nd load of 50g among patients with normal test, to ANP or pathological, although all values are greater than 140mg %. There were not differences between the maternal ages in the 3 groups analyzed. Is possible to see a direct correlation between the degree of CH intolerance and

	Normal test n:26 (35.1%)	ANP n:23 (31.1%)	Pathological test n 25 (33.8%)	P
Average 1st load (mg %)	146.96 + -32.6	136.3 + -36.31	158.92 + -24.9	
Average 2nd load (mg %)	154.85 + -14.63	155.83 + -15.3	150.71 + -22.64	
Patient age (years)	32.57 + -4.39	33.7 + -5.3	31.64 + -4.15	
BMI	22.71 + -3.7	23.26 + -3.35	24.6 + -4.6	
Gest. Age at birth (week´s)	38.15 + -1.15	38.53 + -1.1	38.35 + -1.9	
Average weight of NB (g)	3186.7 + -552.2	3326.1 + -563.6	3188.4 + -526.2	
Insulin	1 (3.8%)	5 (21.7%)	9 (36%)	0.004/0.27
Units	18	12 + -9.6	15.33 + -9.43	
Macrosomia	2 (7.6%)	3 (12.9%)	1 (4%)	0.51/0.27
Fasting test value (mg %)	84.46 + -7.64	86.8 + -8.9	91.4 + -12.7	
1 hour test value (mg %)	152.15 + -19.05	171.8 + -28.26	198.04 + -16.36	

2nd hour test value (mg %)	121.11 + -18.5	144.5 + -21.5	165.8 + -21.4	
3rd hour test value(mg %)	91 + -23.2	112.26 + -20.1	124.14 + -30.9	
Gest age ar test (week´s)	30.67 + -3.45	29.33 + -2.46	29.24 + -3.7	
Fasting profile(mg %)	78.97 + -7.63	81.7 + -7.65	82.9 + -6.3	
Breakfast profile (mg %)	96.74 + -14.5	105.2 + -11.8	111.6 + -13.2	
Lunch profile (mg %)	99.82 + -11.7	104.9 + -13.7	108.6 + -10.6	
Snack profile (mg %)	100.34 + -9.13	105.1 + -7.9	105.4 + -9	
Preinsulin fast (mg %)		85.7 + -7.8	84.43 + -11.9	
Postinsulin fast (mg %)		86.9 + -7.4	84.6 + -7.6	
Preinsulin breakfast (mg %)		119.9 + -11.1	130.4 + -9.9	
Postinsulin breakfast (mg %)		115.2 + -13.75	117.4 + -14.4	
Preinsulin lunch (mg %)		115.32 + -16.7	109.5 +-16.45	
Postinsulin lunch (mg %)		108.6 + -9.4	113.95 + -8.63	
Preinsulin snack (mg %)		106.1 + -7.9	116.53 + -9.9	
Postinsulin snack (mg %)		104.9 + -4.86	110.3 + -10.65	

Table 5: *Results of the oral tolerance test with 100g according to any load of 50g pathological n: 74*

The value of the body mass index (IMC). The gestational age at birth was similar between the groups, the same happen with the average weight of the NB. Insulin requirements, increased as it worsened the degree of intolerance to CH, being statistically significant difference in insulin requirement between patients with normal oral test and pathological oral test (chi square P < 0.004) and non-significant difference in insulin requirement between patients with ANP test and Pathologic test (chi square P = 0.27).The greater percentage of fetal macrosomia, was presented in the Group of the patients with test ANP. The percentage difference of fetal macrosomia among patients with normal test and those with pathological test was not significant (Chi-square, P = 0.51), as well as neither the percentages of macrosomia among patients with ANP test and Pathological test (chi square P = 0.27). The analysis of the average values of the oral tolerance test, showed a correlation quantitatively positive with the grade of intolerance to CH. The same can notice is to the analyze the averages glycemic values. Among the patients with insulin, it is observed that the time of day of greater resistance to insulin according to the degree of hyperglycemia is 60' after breakfast, in case of intolerance to the CH as in the case of gestational diabetes (GD).

In the table 6, is showed the data of the 56 patients that entered to Protocol because was abnormal the 1° load of 50g. In 21 cases the test was normal (37.5%), in 13 cases ANP (23.2%) and in 22 cases (39.3%) pathological.

	Normal oral test n 21 (37.5%)	**ANP Test n:13 (23.2%)**	**Pathological test n 22 (39.3%)**	**P**
Average load 50g (mg %)	158.85 + -22.83 (140-225)	160.9 + -19.04 (144-205)	166.1 + -14.95 (142-190)	
Patient age (years)	32.66 + -4.87	33.30 + -6.36	31.54 + -4.06	
BMI	23.04 + -3.95	23.41 + -3.1	25.2 + -4.6	
Gest age at birth (week´s)	38.04 + -1.16	38.7 + -1.03	38.17 + -2.03	
Average weight NB (grames)	3127.4 + -528.6 (1920-4350)	3356.53 + -527.8 (2300-4240)	3149.1 + -544.75 (1680-4150)	
Insulin	1 (4.8%)	3 (23.1%)	9 (40.9%)	0.005/0.24

Units	18	9.33 + -7.57	15.33 +-9.43	
Macrosomia	1 (4.8%)	1 (7.7%)	1 (4.5%)	0.74/0.61
Fasting test value (mg %)	83.71 + -7.8	86.77 + -6.11	90.57 + -13.23	
1 hour value (mg %)	152.9 + -19.8	169.77 + -32.7	199.52 + -17.14	
2nd hour value (mg %)	123.3 + -18.45	138.1 + -15.6	169 + -20.8	
3rd hour value (mg %)	94.71 + -22.85	113 + -19.8	126.44 + -32.4	
Gest age at test (week´s)	30.64 + -3.75	28.51 + -2.35	28.9 + -3.9	
Profile fasting (mg %)	79.88 + -7.14	82.4 + -5.8	82.32 + -6.46	
Profile breakfast (mg %)	99.6 + -13.32	105.75 + -13.6	11.75 + -13.98	
Profile lunch (mg %)	102.3 + -10.8	107.64 +-11.44	108.6 +-10.9	
Profile snack (mg %)	100.63 + -9.46	103.3 + -9.9	106.06 + -9.44	
Preinsulin fast (mg %)	86	82.86 + -4.21	84.43 + -11.98	
Postinsulin fast (mg %)	97.2	83.83 + -7.9	84.63 + -7.57	
Preins. breakfast (mg %)	117	122.33 + -13.6	130.37 + -9.9	
Postins. breakfast (mg %)	114.2	112.6 + -18.63	117.4 + -14.42	
Preinsulin lunch (mg %)	146	115+ -16.6	109.54 + -16.45	
Postinsulin lunch (mg %)	121.9	110.63 + -7.84	113.95 + -8.6	
Preinsulin snack (mg %)	157	109.56 + -8.95	116.53 + -9.87	
Postinsulin snack (mg %)	120.5	105.16 + -6.4	110.27 + -10.65	

Table 6: *Result of the oral tolerance test with 100g in patients with the first load of 50g > = 140 mg % n:56*

There was a positive quantitative relationship between the result of blood glucose after the load with 50g and the degree of intolerance to CH, being the highest value corresponding to the patients who developed GD. There was not observed differences in the ages of the mothers among the 3 groups. The BMI, was similar between the patients with normal oral test and ANP test, being clearly higher the BMI of the patients with GD. The gestational age to the birth was similar between the groups. The average weight of newborns at birth, was higher in the group of patients with ANP oral test. Insulin requirement was consistent with the degree of pathology, being statistically significant differences between patients with normal oral test and pathological test (chi square $P < 0.005$), and no significant insulin requirement differences between patients with AN P and Pathologic tests (chi square $P = 0.24$). The percentage of macrosomic newborns was similar between the groups. The values of the oral tolerance test, were directly proportional to the level of intolerance to CH. Also in this group of patients, the higher glycemic value was the of 60' after the breakfast in patients with GD. When the value of the glycemic control in patients with insulin glycemic control is analyzed, in patients with ANP and GD, high glycemic value is not after breakfast.

In table 7, analyzed data from first pathologic charging patients who developed GD, divided as they had required (n: 9-40.9%) or not (n 13-59.1%) insulin. It average value of the glucose after the load with 50g of glucose, was higher in the group of patients that required insulin. The age of the mothers were similar. BMI, was also higher among the patients who required insulin. Gestational age at birth was similar between groups, while the average weight of the NB, was higher in the group without insulin. There was a macrosomical rate of 7.7% in the group that did not received insulin. The values of glucose of the oral tolerance test, were higher in the patients that received insulin. Those glycemic daily values, were always higher in the group with insulin, and the largest value observed, was after the breakfast. This trend was kept after the insulin.

	With insulin n 9 (40.9%)	Without insulin n:13 (59.1%)	P
Average load 50g (mg %)	178.55 + -8.15	157.46 + -12.2	
Maternal age (years)	31.22 + -3.6	31.76 + -4.5	
Body mass index	26.42 + -4.84	24.43 + -4.43	
Gest. Age birth (week´s)	37.4 + -2.54	38.71 + -1.46	
Average weight NB (g)	3031.1 + -674.2	3230.8 + -445.7	
Macrosomia	0	1 (7.7%)	--
Fasting (mg %)	96.33 + -14.9	87.9 + -12.1	
1 hour (mg %)	207.16 + -21.6	196+ -14.3	
2nd hour (mg %)	155.66 + -27.3	175.15 + -14.4	
3rd hour (mg %)	132.6 + -27.57	124.1 + -34.8	
Gest age test (week´s)	30.4 + -3.22	28.22 + -4.1	
Profile fasting (mg %)	84.77 + -7.6	80.6 +-5.15	
Profile breakfast (mg %)	122.58 + -10.47	104.26 + -10.96	
Profile lunch (mg %)	112.15 + -9.64	106.2 + -11.41	
Profile snack (mg %)	112.24 + -7.54	101.8 + -8.34	
Preinsulin fast (mg %)	84.43 + -11.98		
Postins fasting (mg %)	84.63 + -7.57		
Preins breakfast (mg %)	130.37 + -9.9		
Postins breakfast (mg %)	117.4 + -14.42		
Preins lunch (mg %)	109.54 + -16.45		
Postins lunch (mg %)	113.95 + -8.6		
Preins snack (mg %)	116.53 + -9.87		
Postins snack (mg %)	110.27 + -10.65		

Table 7: *Patients with 1st load > = 140 mg % and pathological 100g test n:22.*

In the table 8, is analyzed the data of the group of patients that entered to protocol after the 2° load of 50 g > = 140 mg % (whose 1° load was normal). In 5 cases (27.7%) the oral test was normal, in 10 (55.5%) ANP and 3 (16.6%) pathological. The ages of the patients were similar. As for BMI, there is the higher value arose in the group with ANP tolerance test, but the lowest value was observed among patients with pathological oral test. The gestational age to the birth was similar between the groups.

	Normal test n:5 (27.7%)	ANP n 10 (55.5%)	Pathological test N:3 (16.6%)	P
1st load 50g (mg %)	97 + -13.17	104.3 + -26.94	106.33 + -2055	
2° load 50g (mg %)	156 + -17.76	152.4 + -7.57	145.66 + -4.04	
Gest age. 1st load (weeks)	18.8 + -5.35	19.85 + -3.8	19 + -2	
Gest age. 2° load	28 + -2.34	28.3 + -3.35	27.6 + -1.15	
Patient age (years)	32.2 + -1.3	34.2 + -3.73	32.3 + -5.68	
Body mass index	21.4 + -2.23	23.1 + -3.82	20.43 + -1.52	
Gest age birth	38.6 + -1.14 sem	38.33 + -1.15 sem	39.66 + -0.57 sem	

Average weight NB (g)	3436 + -642	3286.5 + -634.1	3476 + -255.4	
Insulin	0	2 (20%)	0	--
Units	0	16 + -14.14	0	--
Macrosomia	1 (20%)	2 (20%)	0	--
Fasting (mg %)	82.4 + -7.76	86.83 + -12.67	96.66 + -7.76	
1 hour (mg %)	148.8 + -17	174.83 + -22.56	188.66 + -3.78	
2nd hour (mg %)	112 + -17.6	154 + -26.8	145.66 + -14.57	
3rd hour (mg %)	75.4 + -19.36	111.16 + -22.3	110.33 + -19	
Gest age test (week´s)	30.8 + -2.04	30.8 + -2.1	31.36 + -0.8	
Profile fasting (mg %)	75.32 + -9.27	80.8 +-9.9	86.98 + -3.63	
Profile breakfast (mg %)	85.32 + -14.57	104.5 + -9.6	110.62 + -6.43	
Profile lunch (mg %)	89.86 + -10.73	104.5 + -9.6	110.62 + -6.43	
Profile snack (mg %)	99.2 +-8.52	107.42 + -3.62	100.8 + -1.72	
Preins. fasting (mg %)		89.9 + -12.3		
Postins. fasting (mg %)		91.5 + -4.66		
Preins. breakfast (mg %)		116.15 + -8.7		
Postins. breakfast (mg %)		119+ -3.81		
Preins. lunch (mg %)		115.75 + -23.68		
Postins. lunch (mg %)		105.5 + -14.14		
Preins. snack (mg %)		101+ -0.99		
Postins. snack (mg %)		104.7 + -3.53		

Table 8: *Results of the tolerance test in patients with first load of 50g normal and second load > = 140 mg %. n:18.*

The average weight of the NB was similar between the patients with normal oral test and pathological oral test, being something less in the case of ANP oral test. Only required insulin two patients in the group with ANP oral test and there was not observed macrosomic newborns between the patients with pathological oral test, while the incidence of macrosomic newborns was the same for patients with normal oral test and ANP oral test. Glycemic profiles analysis, shows that the time of increased insulin resistance is after breakfast, especially in patients with pathologic oral test. This observation was maintained in the group of patients that required insulin.

In the table 9,it is analyzed the data of patients with ANP oral test, according to out > = 140 mg % the 1° or 2° load with 50g of glucose. Blood glucose post 1° load was greater than after the 2nd charge. Maternal ages were comparable, as well as the value of BMI and gestational age at birth. The average weight of the NB, was slightly higher when was abnormal the 1° load. The percentage of patient with insulin was similar (Chi-square, P = 0.63), but the insulin requirement was greater for patients with second abnormal load. The incidence of macrosomic newborns was 3 times higher in the second group, though not reached statistical significance (chi square P = 0.39). The values of the time and second time oral tolerance test, were higher in the 2nd group. Glycemic averages are similar, but in the insulinized group, the values were higher after breakfast with respect to other values.

	1° load > = 140 mg % n:13 (56.3%)	**2° load > = 140 mg % n 10 (43.6%)**	**P**
Average load 50g (mg %)	160.9 + -19.04 (144-205)	152.4 + -7.57 (145-172)	
Patient age (years)	33.3 + -6.36	34.2 + -3.73	

Body mass index	23.41 + -3.1	23.1 + -3.82	
Gest. Age at birth (week´s)	38.7 + -1.03	38.33 + -1.15	
Average NB (g)	3356.53 + -527.8 (2300-4240)	3286.5 + -634.1 (2360-4410)	
Insulin	3 (23.1%)	2 (20%)	0.63
Units	9.33 + -7.57	16 + -14.14	
Macrosomia	1 (7.7%)	2 (20%)	0.39
fasting (mg %)	86.77 + -6.11	86.83 + -12.67	
1 hour (mg %)	169.77 + -32.7	174.83 + -22.56	
2nd hour (mg %)	138.1 +-15.6	154 +-26.8	
3rd hour (mg %)	113 + -19.8	111.16 + -22.3	
Gest age at test (week´s)	28.51 + -2.35	30.8 + -2.1	
Profile fasting (mg %)	82.4 + -5.8	80.8 + -9.9	
Profile breakfast (mg)	105.75 + -13.6	104.5 + -9.6	
Profile lunch (mg %)	107.64 + -11.44	101.36 + -16.1	
Profile snack (mg %)	103.3 + -9.9	107.42 + -3.62	
Preins. fasting (mg %)	82.86 + -4.21	89.9 + -12.3	
Postins. fasting (mg %)	83.83 + -7.9	91.5 + -4.66	
Preins. breakfast (mg %)	122.33 + -13.6	116.15 + -8.7	
Postins. breakfast (mg %)	112.6 + -18.63	119+ -3.81	
Preins. lunch (mg %)	115+ -16.6	115.75 + -23.68	
Postins. lunch (mg %)	110.63 + -7.84	105.5 + -14.14	
Preins. snack (mg %)	109.56 + -8.95	101+ -0.99	
Postins. snack (mg %)	105.16 + -6.4	104.7 + -3.53	

Table 9: *Comparison of outcomes in patients with ANP test as first or second charge was atypical with 50g.*

The table 10, show us the data of the patients with oral pathological test according to out abnormal it 1° or 2° load of 50g of glucose. Post-load blood glucose was greater in the first group. Maternal ages were similar. The BMI is clearly superior in the 1° group. Gestational age at birth is similar, but the average weight of the NB is superior in the 2nd group. However, there was not in the 2nd group or macrosomic or requirement of insulin. It is also noteworthy that except the value in fasting state, all values of the curve are higher in the 1st group. The levels, show a higher value after the breakfast, but the difference is not as marked as in other comparisons.

	1° load > = 140 mg % n 22 (88%)	**2° load > = 140 mg % n:3 (12%)**	**P**
Average load 50g (mg %)	166.1 + -14.95	145.66 + -4.04	
Patient age (years)	31.54 + -4.06	32.3 + -5.68	
Body mass index	25.2 + -4.6	20.43 + -1.52	
Gest. Age at birth (week´s)	38.17 + -2.03	39.66 + -0.57	
Average weight NB (g)	3149.1 + -544.75 (1680-4150)	3476 + -255.4 (3230-3740)	

Insulin	9 (40.9%)	0	--
Units	15.33 + -9.43	0	--
Macrosomia	1 (4.5%)	0	--
fasting (mg %)	90.57 + -13.23	96.66 + -7.76	
1 hour (mg %)	199.52 + -17.14	188.66 + -3.78	
2nd hour (mg %)	169 +- 20.8	145.66 + -14.57	
3rd hour (mg %)	126.44 + -32.4	110.33 + -19	
Gest age test (week´s)	28.9 + -3.9	31.36 + -0.8	
Profile fasting (mg %)	82.32 + -6.46	86.98 + -3.63	
Profile breakfast (mg %)	111.75 + -13.98	110.62 + -6.43	
Profile lunch (mg %)	108.6 +-10.9	108.38 + -9.35	
Profile snack (mg %)	106.06 + -9.44	100.8 + -1.72	
Preins. fasting (mg %)	84.43 + -11.98		
Postins. fasting (mg %)	84.63 + -7.57		
Preins. breakfast (mg %)	130.37 + -9.9		
Postins. breakfast (mg %)	117.4 + -14.42		
Preins. lunch (mg %)	109.54 + -16.45		
Postins. lunch (mg %)	113.95 + -8.6		
Preins. snack (mg %)	116.53 + -9.87		
Postins. snack (mg %)	110.27 + -10.65		

Table 10: *Comparison of outcomes in patients with pathological oral test according to out > = 140 mg % it first or second load.*

In table 11, we analyzed data from all patients according to the result of the oral tolerance test. There were 26 cases with normal test (35.1%), 23 cases with ANP test (31.1%) and 25 cases with pathological oral test (33.8%). In the group of patients with normal oral test, the 75% presented a blood glucose > = 140 mg % post 1° load, in the group of patients with ANP test, the 53.6% presented glucose post 1° load normal and the 46.4% glucose post 1° load abnormal. Among the patients with pathological oral test, the 84.6% had one 1st load greater than 140 mg %. The ages of the patients were similar.

The BMI shows an increase associated to the degree of intolerance to the CH. Gestational age at birth was similar in the three groups. The average weight to the birth was slightly higher in the Group of ANP oral test. The percentage of patients that required insulin, was very high between the patients with pathological oral test, difference statistically significant between patients with normal test and pathological test (chi square $P < 0.001$) and not significant between patients with ANP test and pathological test (chi square $P = 0.17$), but was necessary to administrate insulin to the 17.9% of the patients with ANP test.

Macrosomic newborns were higher among the patients with ANP test, although the differences between patients with normal test and pathological test were not significant (Chi-square $P = 0.5$) neither were differences between the percentage of macrosomia among patients with ANP test and pathologic test (chi square $P = 0.27$).) The glycemic averages showed relationship with the degree of intolerance to the CH, noticing is more clearly between them patients insulinized, the trend to greater resistance to the insulin in it tomorrow and noon.

	Normal test n:26 (35.1%)	Test ANP n:23 (31.1%)	Pathological test n 25 (33.8%)	P
1st load normal	7 (25%)	15 (53.6%)	4 (15.4%)	
1° load > = 140 mg %	21 (75%)	13 (46.4%)	22 (84.6%)	
Patient age (years)	32.96 + -4.84	33.71 + -5.03	31.61 + -4.1	
Body mass index	22.7 + -3.6	23.16 + -3.1	24.45 + -4.54	
Gest age birth (week´s)	38.25 + -1.17	38.33 + -1.21	38.3 + -1.95	
Average weight NB (g)	3180.53 + -537.2	3313 + -568.05	3188.46 + -515.6	
Insulin	1 (3.6%)	5 (17.9%)	10 (38.5%)	0.001/0.17
Units	18	12 + -9.6	18.4 + -13.15	
Macrosomia	2 (7.2%)	3 (10.8%)	1 (3.8%)	0.51/0.27
fasting (mg %)	83.1 + -7.5	89.8 + -16.4	91.4 + -12.7	
1 hour (mg %)	149.46 + -20.8	170.25 + -25.9	198.04 + -16.36	
2nd hour (mg %)	118.9 + -19.6	146.05 + -20.23	165.8 + -21.4	
3rd hour (mg %)	90.85 + -22.34	114.05 + -18.84	124.14 +-30.99	
Gest age test (week´s)	30.63 + -3.4	29.9 + -2.4	29.24 + -3.71	
Profile fasting (mg %)	78.9 + -7.3	81.17 + -8.2	83.03 + -6.24	
Profile breakfast (mg %)	95.94 + -14.34	104.54 + -11.26	112.53 + -13.8	
Profile lunch (mg %)	99.15 + -11.61	104.65 + -13.3	109.7 + -11.8	
Profile snack (mg %)	100.3 + -8.8	106.14 + -10.1	106.9 +-11.56	
Preins. fasting (mg %)	86	85.7 + -7.84	85.6 + -11.9	
Postins. fasting (mg %)	97.2	86.9 + -7.36	84.8 + -7.15	
Preins. breakfast (mg %)	117	119.86 + -11.1	133.74 + -14.15	
Postins. breakfast (mg %)	114.2	115.2 + -13.75	119.03 + -14.54	
Preins. lunch (mg %)	146	115.2 + -13.75	119.03 + -14.54	
Postins. lunch (mg %)	121.9	108.6 + -9.41	116.3 + -11.01	
Preins. snack (mg %)	157	106.14 + -79	119.28 + -4.02	
Postins. snack (mg %)	120.5	104.9 + -4.9	113.6 + -14.51	

Table 11: *Total results according to result of the oral tolerance test n:74.*

The table 12 shows the data of the population according to the 1st or 2nd load with 50g glucose out > = 140 mg %. 1st load was > = 140 mg % in 56 patients (75.8%) and 2nd in 18 cases (24.2%). The absolute value of glucose was greater, when the pathological glycemic value corresponded to the 1° load. When after the 1st load the glycemic value was > = 140 mg %, 37.5% of patients had a normal CTOG, while the 27.8% of the oral test were normal after 2nd charge pathological.

The test was to not pathological in the 23.2% of the cases after 1° load altered and in the 55.6% of cases with 2° load altered. The oral test was pathological in the 39.3% of cases whose 1st load was > = 140 mg % and 16.7% of cases whose 2nd load was > = 140 mg %. The age of the mothers, was slightly higher in the group with 2nd abnormal load. The BMI was greater when was abnormal the 1° load. The gestational age at birth was similar. The average weight of the NB was higher in the group whose load abnormal was the 2°.

The insulin requirement was greater when the 1st load was abnormal (23.2%), although this difference did not reached statistical significance (Chi-square, P = 0.22). However, was necessary to give insulin to the 11.1% of patients with abnormal load 2. The percentage

of macrosomia, was three times higher in case of 2° load pathological, although without get to achieve significance statistics (chi square P = 0.15). The values of the oral tolerance test were higher in case of 1° load pathological, as well as the average glycemic levels. You can see in the average glycemic levels, that the values are higher after breakfast.

	1° load > = 140 mg %	2° load > = 140 mg %	P
n	56 (75.8%)	18 (24.2%)	
Average pathological load (mg %)	162.17 + -19.09 (140-225)	152.3 + -10.9 (141-187)	
Average normal load (mg %)	----------	102.6 +-22.1 (63-135)	
Normal oral test	21 (37.5%)	5 (27.8%)	
Curve ANP	13 (23.2%)	10 (55.6%)	
Pathological test	22 (39.3%)	3 (16.7%)	
Maternal age (years)	32.37 + -4.93	33.3 + -3.54	
Body mass index	23.96 + -4.08	22.17 + -3.22	
Gest. age birth (week´s)	38.24 + -1.53	38.6 + -1.13	
Average weigth NB (g)	3189.1 + -533.31	3359.7 + -569.9	
Insulin	13 (23.2%)	2 (11.1%)	0.22
Units	14.15 + -8.77	16 + -14.14	
Macrosomia	3 (5.4%)	3 (16.8%)	0.15
fasting (mg %)	86.93 + -10.34	87.35 + -10.91	
1 hour (mg %)	174.1 + -30.11	168.5 + -23.42	
2nd hour (mg %)	143.73 + -28.03	137.21 + -28.2	
3rd hour (mg %)	110.04 + -29.62	98.21 + -25.9	
Gest age test (week´s)	29.58 + -3.65	30.9 + -1.73	
Profile fasting (mg %)	81.44 + -6.56	80.32 + -9.41	
Profile breakfast (mg %)	105.91 + -14.43	100.2 + -14.1	
Profile lunch (mg %)	106.1 + -11.2	99.34 + -14.74	
Profile snack (mg %)	103.43 + -9.67	104.03 + -6.3	
Preins. fasting (mg %)	84.19 + -9.97	89.9 + -12.3	
Postins. fasting (mg %)	85.41 + -7.83	91.5 + -4.66	
Preins. breakfast (mg %)	127.49 + -10.9	116.15 + -8.69	
Postins. breakfast (mg %)	116.1 + -14.2	119+ -3.81	
Preins. lunch (mg %)	113.6 + -18.1	115.75 + -23.68	
Postins. lunch (mg %)	113.8 + -8.24	105.5 + -14.14	
Preins. snack (mg %)	118+ -14.9	101+ -0.99	
Postins. snack (mg %)	109.9 + -9.9	104.7 + -3.53	

Table 12: *Results according to 1° or 2° load 50g > = 140 mg %*

In table 13, we analyze the relationship between the outcome of the oral tolerance test according to the result of the 1st or 2nd load with 50g of glucose. Both the result > = 140 mg % of the 1st or the 2nd load, associated with intolerance to the CH, however, a 1st load > = 140mg %, associated with the largest percentage of pathological oral tolerance test (chi square P = 0.84), while the 2nd load > = 140

mg %, it is strongly associated with ANP (chi square P < 0.01). If we regrouped these patients according to the tolerance test would have been normal or with any of both alteration (altered test), a 1st load > = 140 mg % associated with a 62.5% of altered test (chi square P < 0.008) and a second load > = 140 mg % associated with a 72.3% of altered test (chi square P < 0.007). It is remarkable that in the case of the 1° load > = 140 mg % the association with pathology is to expense of the development of GD and for the 2° load > = 140 mg %, the association with pathology is to expense of intolerance to them CH.

	Normal test	AN P	Pathological test	P
	N %	N %	N %	
1st load > = 140 mg % n:56	21 37.5	13 23.2	22 39.2	0.84/0.06
2nd load > = 140 mg % n:18	5 27.7	10 55.4	3 16.6	0.34/0.01

	Normal test	Altered test	P
	N %	N %	
1st load > = 140 mg % n:56	21 37.5	35 62.5	0.008
2nd load > = 140 mg % n:18	5 27.7	13 72.3	0.007

Table 13: *Result of the oral tolerance test according to be > = 140 mg % the 1° or the 2° load of 50g.*

The table 14, details the comparison of the maternal ages according to the different results of the oral tolerance test and of the load with 50g. Increased maternal age, was associated with cases of ANP.

	Normal test	Test ANP	Pathological test	P
1st load > = 140 mg % n:56	32.66 + -4.87	33.30 + -6.36	31.54 + -4.06	
2nd load > = 140 mg % n:18	32.2 + -1.3	34.2 + -3.73	32.3 + -5.68	

Table 14: *Relationship between tolerance depending on load of 50g altered and maternal age (years).*

In the table 15, analyze the data related to the BMI. In the case of 1st load > = 140 mg %, the BMI is clearly greater in the group of patients who developed GD. Instead, in case of 2° load > = 140 mg %, the higher BMI it presented the patients with test ANP.

	Normal test	Test ANP	Pathological test	P
1st load > = 140 mg % n:56	23.04 + -3.95	23.41 + -3.1	25.2 + -4.6	
2nd load > = 140 mg % n:18	21.4 + -2.23	23.1 + -3.82	20.43 + -1.52	

Table 15: *Relationship between tolerance curve depending on the load of 50g altered and maternal body mass index.*

The table 16, shows the averages of weight of the NB. When the 1st load was > = 140 mg %, the highest average weight was observed in the group of patients with ANP. When the 2° load was > = 140 mg %, the greater average weight is observed between the patients with normal test and pathological test.

	Normal test	Test ANP	Pathological test	P
1st load > = 140 mg % n:56	3127.4 + -528.6	3356.53 + -527.8	3149.1 + -544.75	
2° load > = 140 mg % n:18	3436 + -642	3286.5 + -634.1	3476 + -255.4	

Table 16: *Relationship between oral tolerance test according to load 50g altered and average weight of the newborn (grams).*

The table 17 shows the macrosomic association among the three groups, according to the result of the load of 50g. 1st load > = 140 mg %, it produced comparable incidences regardless of the result of the test. The 2° load > = 140 mg %, is associated to greater incidence of macrosomic that the 1° load, with similar incidence in case of test ANP, noting macrosomia among them patients with pathological oral test. If we grouped the patients in normal or altered oral test (the sum of ANP and pathologic test), 1st load > = 140 mg % was associated with higher incidence of macrosomic NB in group with altered oral test (chi square P = 0.5), but again the association is greater in the case of 2nd load > = 140 mg % (chi square P = 0.5).

	Normal test	Test ANP	Pathological test	P
1st load > = 140 mg % n:56	1 (4.8%)	1 (7.7%)	1 (4.5%)	
2nd load > = 140 mg % n:18	1 (20%)	2 (20%)	0	

	Normal test	Altered test	P	P
1° load > = 140 mg % n:56	1 (1.78%)	2 (3.56%)	0.5	
2nd load > = 140mg % n:18	1 (5.55%)	2 (11.10%)	0.5	

Table 17: *Relationship between of oral tolerance test according to load of 50g altered and incidence of newly macrosomic NB (> 4000 g to term).*

The table 18, allow us to observe the requirement of insulin according to the result of the load with 50g. clearly is observed a greater requirement insulin in the patients whose 1° load was > = 140 mg %, with significance statistics between the percentage of requirement between patients with normal and pathological oral tests (chi square P < 0.008) and a percentage very close to it statistically significant between the requirement of insulin between patients with ANP test and patients with pathologic test (chi square P = 0.06), but it was necessary to insulinized to the 11.10% of patients with 2 load > = 140 mg % and altered test. If the patients are grouped according to the tests proved to be normal or altered, the insulin requirement was statistically significant among the patients with altered test (chi square P < 0.001).

	Normal test	Test ANP	Pathological test	P
1st load > = 140 mg % n:56	1 (4.8%)	3 (23.1%)	9 (40.9%)	0.008 0.06
2nd load > = 140 mg % n:18	0	2 (20%)	0	--

	Normal test	Altered test	P
1st load > = 140 mg % n:56	1 (1.78%)	12 (21.4%)	0.001
2nd load > = 140 mg % n:18	0	2 (11.10%)	--

Table 18: *Relationship between oral tolerance test depending on load of 50g altered and insulin requirements.*

In table 19, we observed data from the pregnancy, according to the NB weighed 4000g or more (n:6-7.3%) or less than 4000g (n: 76-92.7%). Maternal age was higher in the group of macrosomic NB. Not be observed differences in the value of the BMI. Oral tolerance test was normal between the macrosomic in the 33.3% cases and 34.2% of not-macrosomical, it was to no pathological in 50% of the macrosomic and 32.9% of the NB's with proper weight was pathological in 16.7% of the macrosomic and 32.9 of normal weight NB. The values of the oral test does not show substantial differences and glycemic averages are slightly higher among the NB no macrosomics.

	Weight > = 4000g	Weight < 4000g	P
n	6 (7.3%)	76 (92.7%)	
Maternal age (years)	35.33 + -2.8 (31-38)	32.59 + -4.77 (21-52)	
Body mass index	23.84 + -2.04 (21.1-26.18)	23.37 + -3.88 (18-34.9)	
Average weight NB (g)	4283 + -184.57	3145.32 + -463.17	
Insulin	0	16 (21.1%)	
Normal test	2 (33.3%)	26 (34.2%)	
Test ANP	3 (50%)	25 (32.9%)	
Pathological test	1 (16.7%)	25 (32.9%)	
fast (mg %)	87.83 +-4.49	87.59 + -13.14	
1 hour (mg %)	172.83 + -25.49	170.46 + -29.78	
2nd hour (mg %)	138.33 + -25.57	141.70 + -28.75	
3rd hour (mg %)	97.66 + -24.80	108.66 + -28.43	
Profile fast (mg %)	80.62 + -6.08	81.05 + -7.55	
Profile breakfast (mg %)	101.61 + -6.82	104.45 + -15.1	
Profile lunch (mg %)	101.74 + -9.73	104.66 + -13.1	
Profile snack (mg %)	100.02 + -8.86	104.79 + -10.57	

Table 19: *Pregnancy outcomes according to weight of the newborn major or minor of 4000g.*

In the table 20, we divided to the population according to the maternal age were < = 30 years (n: 24-29.2%) or > 30 years (n: 58-70.8%). BMI was slightly higher among the patients of < = 30 years. There was a macrosomic NB in the Group of patients of > 30 and the weight average to the birth, also was slightly higher among them of > 30 years. The insulin requirement was greater between the of < = 30 (chi square P < 0.04), as well as also was the absolute value of blood glucose after the charge with 50g. The result of the test was normal in the 29.2% of the patients of < = 30 and in the 36.2% of the of > 30 (chi square P = 0.54), to not Pathological in 33.3% of < = 30 and 34.5% between them of > 30 (chi square P = 0.92) and pathological in the 37.5% with < = 30 years and 29.3% in patients with > 30 years (chi square P = 0.46). The values of the test were higher among the patients of < = 30 years, as well as the glycemic average levels. Among the patients < = 30 years, the highest levels were in the morning.

	Age < = 30 years	Age > 30 years	P
n	24 (29.2%)	58 (70.8%)	
Average age (years)	27.62 + -2.53	34.93 + -3.60	
Body mass index	24.29 + -4	23.02 + -3.66	
Macrosomia	0	6 (10.3%)	
Average weight NB (g)	3105 + -568.85	3279.74 + -521.47	
Insulin	8 (33.3%)	8 (13.8%)	0.04
Load 50 g average (mg %)	152.50 + -27.49	141.61 + -35.74	
Normal test	7 (29.2%)	21 (36.2%)	0.54
ANP test	8 (33.3%)	20 (34.5%)	0.92
Pathological test	9 (37.5%)	17 (29.3%)	0.46
fast (mg %)	88.47 + -13.27	87.29 + -12.49	

1 hour (mg %)	175.21 + -34.72	168.98 + -27.18	
2nd hour (mg %)	143.84 + -28.07	140.51 + -28.66	
3rd hour (mg %)	122.94 + -25.17	101.92 + -27.24	
Profile fast (mg %)	82.54 + -7.61	80.41 + -7.33	
Profile breakfast (mg %)	107.66 + -15.16	102.88 + -14.34	
Profile lunch (mg %)	102.25 + -14.94	105.31 + -11.98	
Profile snack (mg %)	105.54 + -8.9	104 + -11.08	

Table 20: *Results of the pregnancy according to maternal age younger or more than 30 years.*

The table 21, us shows the information according to the BMI maternal is < 25 (n: 61-74.4%) or > = 25 (n: 21-25.6%). The maternal ages were similar. Macrosomic incidence was higher in the group of > BMI (chi square P = 0.48), the same is true with the average weight of the NB, the insulin requirement (chi square P < 0.01) and the value of glycemic in response to the load with 50g. The percentage of patients with normal test was lower in the group of > BMI and the percentage of patients with pathological test was higher among the patients with > BMI (Chi-square, P = 0.24-0.92-0.20). The values of the test were higher among the patients of > BMI, as well as also were the glycemic average levels. The glycemic values higher were after the breakfast.

	BMI < 25	**BMI > = 25**	**P**
n	61 (74.4%)	21 (25.6%)	
Maternal age (years)	32.83 + -5.06	32.66 + -3.58	
Body mass index	21.54 + -1.72	28.62 + -3.03	
Macrosomia	4 (6.4%)	2 (9.6%)	0.48
Average weight NB (g)	3211.23 + -505.28	3279.04 + -635.25	
Insulin	8 (13.1%)	8 (38.1%)	0.01
Average load 50g (mg %)	139.96 + -33.88	159.26 + -29.78	
Normal test	23 (37.7%)	5 (23.8%)	0.24
ANP test	21 (34.4%)	7 (33.3%)	0.92
Pathological test	17 (27.9%)	9 (42.9%)	0.20
fast (mg %)	86.59 + -13.16	91.06 + -10.21	
1 hour (mg %)	168.29 + -27.22	178.68 + -35.19	
2nd hour (mg %)	140.66 + -29.04	143.93 + -26.56	
3rd hour (mg %)	107.75 + -28.58	107.56 + -27.56	
Profile fast (mg %)	79.60 + -7.27	85.33 + -6.25	
Profile breakfast (mg %)	102.22 + -14.74	110.38 + -12.83	
Profile lunch (mg %)	103.66 + -10.79	108.82 + -10.49	
Profile snack (mg %)	103 + -13.22	106.82 + -9.31	

Table 21: *Results of the pregnancy according to the mother´s BMI.*

Discussion

Objective 1

The patients of both groups did not differ in age, parity, BMI or in the frequency of previous, macrosomic infants, therefore, the results obtained, do not seem to have been influenced by these parameters.

Neither there were differences between the percentages of patients of the study that presented a result normal or altered of the oral tolerance test. The requirement of insulin between the patients of the Group 1, was significantly superior to the of the patients of the Group 2 (31% vs 7.5%) (RR 1.82 IC 1.27-2.61) and, while the difference in the average weight of NB at birth was discreetly upper in the patients of the Group 1, the percentage of macrosomic NB, was significantly high between the patients of the Group 1 (11.9% vs 2.5%) (RR 1.69 IC 1.10-2.58).

In the case of patients whose oral tolerance test was also normal, there were benefits in caloric restriction. Although it was not statistically significant, the incidence of macrosomia for Group 1 patients was 12.5%, while there was no macrosomics between the patients in Group 2. A patient of the Group 1 required insulin. The weight average of the NB of the Group 1, was clearly superior to the of the Group 2 ($P < 0.001$).

Among the patients with oral tolerance test with one altered value, there was a 21.4% of macrosomia in Group 1 and there were no macrosomic NB in group 2. The requirement of insulin was 4 times greater among the patients of the Group 1 (28.6% vs 7.1%). The average weight at birth, was also higher among the newborns of the patients of Group 1 ($P = 0.441$).

Among the patients with pathologic oral tolerance test, although there were cases of macrosomic NB in Group 1 and only one case in Group 2, the insulin requirement was significantly higher in Group 1 (66.7% vs. 14.3%)($P < 0.009$). The lack of difference in the average weight of the newborn babies, may be due to the influence of newborn preterm infants in Group 1, since the weight of this group range ranges between 1680 and 3720g.

These results seems to confirm the observations of Jovanovic regard that a discrete caloric restriction in CH of patients with intolerance to the CH, not only allows a more stable management of patients during pregnancy, but it is clearly observed an important and significant reduction in the percentage of insulin requirement for metabolic regulation, with the additional benefit of a significant decrease in the percentage of macrosomic NB.

In addition, the Group of patients whose oral tolerance test was normal, presented in the case of Group 1 a 12.5% of fetal macrosomia and a patient must have been insulinized. Obviously, the load with 50g and the CTOG represent a complementary diagnostic to take in to account, in such a way that both tests should be done to increase the operational capacity of the alterations of tolerance to the CH during pregnancy.

Objective 2

The analysis of the patients whose 1° load was > = 140 mg % has a logical predictability according the pregnancy evolution. In these 56 patients (table 6), the response to the load with 50g was worse in cases in which subsequently the oral tolerance test was pathological (22%) and BMI was also higher in these patients. The requirement of insulin also was greater for the patients with pathological oral test , but is important that the need of insulin was statistically significant among the patients with normal and pathological oral tolerance test ($P < 0.004$), but not was significant the difference observed in the need of insulin between patients with ANP and pathological oral test ($P = 0.27$). The values of the glycemic averages kept relationship with the degree of intolerance to them CH and the higher levels were at of 60' after the breakfast.

However, the same correlation of predictability in terms of the average weight of the NB could not been established in the incidence of macrosomic NB. In fact, both indicators were higher in the Group of patients with ANP test, which makes that the importance of load with 50g of glucose as screening of intolerance to the CH, because if the 50g oral test had not be done, they would had not done the oral tolerance test with 100g of glucose and these patients would had not diagnosed or treated. We recognize that these results, especially that refers to average weight and incidence of macrosomia, may have been influenced by the nutritional treatment.

The analysis of the 22 patients whose 1° load was > = 140 mg % and it 100g oral test was pathological (table 7), allows observe that the patients that required insulin, presented a worse glycemic response to it load of 50g, a greater BMI and logically, glycemic values greater both in the oral test as in the average values of blood glucose during the pregnancy. There was not observed association with the maternal age, although both groups were of patients of 30 or more years. On the other hand, the increased average weight was observed in the group not insulinized and the same happens with the presence of macrosomic NB. It is very likely that these results were due to nutritional treatment and the same insulin. Possibly a more aggressive approach in the insulin, would have modified these results, but at the expense of significantly increase costs and the inconvenience to patients, perhaps not with greatest sense, that despite the differences between the groups, the average weight of the insulinized group was not optimal and the incidence of macrosomia was low.

The analysis of the patients whose 1° load was normal and was > = 140 mg % it 2°, appears as more complex. The age of the patients is similar, but the patients with ANP test were older. The same happens with the BMI. This group of patients, presented the lowest average weight at birth and only patients of this group, however, required insulin, noting a high incidence of macrosomia (20%). The group with normal oral test, also presented a 20% of macrosomia, even though it was only a case between 5. Those glycemic average levels of the patients with ANP test, were superior to the patients with normal test and minor levels to the patients with pathological test.

However, only in patients with ANP was necessary to administrate insulin. If we observe in detail glycemic levels in these patients compared with the levels of patients with pathologic test, you will be noticed that in all cases the Standard deviation is much larger in patients with ANP, suggesting that he were less metabolically stable patients. Not believe that is should to less compliance of the therapy nutritional, since all the patients adhered properly to the protocol and there were not defections at the time entered to the same. In this group, we also noticed that the higher glycemic values, were those of the 60' post breakfast. These data reinforce the concept of repeated load of 50g if the 1st load was normal in patients with risk criteria. Of not having made the 2nd load, the pathology observed in table 8 would have remained undetected.

Patients with curve ANP (intolerance to the CH) were not assessed as it were > = 140 mg % the 1st or 2nd load (table 9). These patients showed no differences in maternal age, BMI or average weight of the NB. Both groups presented a similar percentages of need of insulinization to obtain metabolic stabilization (P = 0.63), but the patients of the group with 2° load > = 140 mg %, required greater amount of units of insulin to achieve the metabolic stability, as well as also presented a higher percentage of macrosomia (P = 0.39). Among both groups, glycemic test values were higher in patients whose 2nd load was > = 140 mg %, excluding the value of the third hour. Glycemic averages shows values higher than 60' after breakfast, especially among patients insulinized of both groups.

The same type of analysis was performed between patients with pathologic test according to 1st or 2nd load > = 140 mg %. The value of blood glucose after the 1st charge with 50g was superior to blood glucose after the 2nd load > = 140 mg %. Maternal ages were similar, although the average age was again more than 30 years. The BMI was clearly higher in the group with 1° load > = 140 mg %. However, the NB average weight was higher in the group with 2 load > = 140 mg %, although this may have been influenced by a newly born low birth weight in the 1st group load > = 140 mg %. However, only needed insulin patients with 1° load > = 140 mg %, and in that group are found the unique case of macrosomia. Except for the value of blood glucose in fasting state, other values of the oral test were higher in the group of patients with 1st load > = 140 mg %. In both groups of patients, the higher levels corresponded to the value found 60' after breakfast.

The 74 patients grouped according to the result of the oral tolerance test with 100g of glucose, allow performing the following analysis (table 11). Among the patients with ANP test, in the 53.6% it 1° load turned out normal, what gives us indication to the realization of the 2° load in patients with risk factors. Among the 25 patients with GD, the 84.6% had a 1st load > = 140 mg %, and in 4 cases (15.4%), were diagnosed after a 2nd load > = 140 mg %. Maternal ages were similar, in average always older than 30 years, but there was a discreet increasing age among patients with intolerance to the CH. BMI, presented a value correlate to the metabolic imbalance, but the average weight of the NB was higher among patients with intolerance to the CH, presenting this group increased frequency of macrosomia, which gives importance to incorporate nutritional therapy and insulin therapy protocols if necessary, patients with intolerance to the CH precisely , the need of insulin was greater in patients with GD (P < 0.001), followed by the patients with intolerance to the CH. The values of the levels average, is correlated with the level of intolerance to the CH, noting is that the higher values were obtained 60' after the breakfast.

Also performed an evaluation of results by grouping the patients as it was > = 140 mg % 1st load (n: 56-%) or the 2nd load (n: 18-%) (table 12). Quantitatively, even taking into account the range of variation, after the 1st load Glycemic value, was superior to that obtained after the 2nd charge. Between the patients with 1° load > = 140 mg %, observed the greater percentage of patients with GD, but between the patients with 2° load > = 140 mg %, observed the greater percentage of patients with CH intolerance. More forward will deepen the discussion about this topical. Maternal age was slightly higher in the case of 2nd load > = 140 mg %, instead BMI was higher among the patients with 1st load > = 140 mg %. (the average weight of the NB was high in the group with 2° load > = 140 mg %, and even this group presented the greater incidence of macrosomia (P = 0.15), despite the greater requirement insulin observed in the group with 1° load > = 140 mg % (P = 0.22). Is not easy to conclude whether these results are the consequence of the evolution of the intolerance to the CH, or are modified by both treatment and late entry into the Protocol in the case of patients with 2 load > = 140 mg

%. However, we insist in the importance of the detection even late in pregnancy, since of other mode, the patients would had been without diagnosis or treatment and they were really carriers of pathology with potentiality of perinatal complications. The values of the oral test were higher among the patients with 1° load > = 140 mg % and something similar occurs with the glycemic average levels. The highest levels among the patients insulinized, there were 60' after breakfast.

A 1° load > = 140 mg %, is associated with the greater percentage of patients with GD (39.2%) (table 13). And a result > = 140 mg % after 2nd load, associated with a 16.6% of cases with GD. However, after a 2nd load > = 140 mg %, more than half of the patients developed intolerance to the CH (55.4%) (P < 0.01) that as we have seen, is an entity to deal sometimes even presenting need for insulin. If we grouped the patients according to the result of the oral test been normal or not, 62.5% of the tests were not normal after a 1st charge > = 140 mg % (P < 0.008) and the 72.3% of the tests were not normal after a 2nd load > = 140mg % (P < 0.007). The 1° load > = 140 mg % is associated to greater percentage of GD and the 2° load > = 140 mg % (the 1° load was normal) is associated to intolerance to the CH. Therefore, in this study, each 3 results > = 140 mg % after the 1° load, in two cases was developed pathology and each 4 results > = 140 mg % after the 2° load, in 3 cases pathology was developed.

The requirement of insulin depending on the degree of intolerance to the CH which patients develop, showed as it expected a significant difference between patients with normal test and pathological test (P < 0.008), but the important thing is to point out that this difference was not statistically significant among patients with ANP and patients with pathologic test (P = 0.06).

The association between the development of GD and increased frequency of macrosomia in relation to maternal age more than 30 years has been reported. Our results show higher age averages, associated with intolerance to the CH. The age of the patients with GD was similar to cases whose oral tolerance test with 100g of glucose turned out normal.

High BMI average clearly was associated with GD development after a 1st load > = 140 mg %, on the other hand, the largest BMI in patients with 2 load > = 140 mg % associated with the development of intolerance to the CH even in this last group, the patients who

developed DBT G showed lower BMI. The analysis of the averages of weight of the NB, is difficult given the similarity between them same. Note the average of weight of the NB of mothers with GD after it 1° load > = 140 mg %, with an incidence of macrosomia in this group of the 4.5%. However, this group of patients presented the highest percentage of need for insulin (40.9%), so impressed that these indicators are the result of nutritional treatment appropriate in addition to insulin action.

Among the patients whose 1st load was > = 140 mg %, the highest incidence of macrosomia was ranked among the patients with intolerance to CH and between patients whose 2nd load was > = 140 mg %, there were 20% of macrosomia among patients with normal curve and 20% among the patients with intolerance to CH. Again, these data reinforce the concept of the importance of detection of intolerance to the CH.

Now well, if grouped the percentages of macrosomia in patients with normal or altered tests (the sum of test to not pathological and pathological), notice that after a 1° load with 50 g > = 140 mg %, the patients with altered tests presented more than the double of incidence of macrosomia that between the patients with normal test(P = 0.5). But to his time, this incidence of macrosomia was almost three times lower that the incidence of macrosomia that is observed between the patients with altered test after a 2° load > = 140 mg % (P = 0.5).

These data may be due to the effects of the treatment, since in one case, the treatment begins earlier than the other. Observe that the lower rate of macrosomia is associated with the largest percentage of requirement insulin (21.4% vs 11.10%). One could speculate that patients with 1st load > = 140 mg %, have an increased susceptibility to metabolic imbalance or are carriers of a prior condition unmasked by the load with 50g of glucose. But, to the start early intensified nutritional therapy (TNI) and eventually insulin therapy, presented averages of weight right in the NB with low rate of macrosomia. In the second group, not unmasked by 1st load, probably to the predisposition, add the influence of pregnancy and with this additional stimulus, have altered the 2nd load. But to this time, this group shows an average weight to the birth higher that the group above and an incidence of macrosomia also superior.

The first group, supports the anti-insulinic effect of pregnancy under treatment and the second group no. This may be the explanation of the results. Would be interesting perform another study repeating the 2° load with advance to the 25 weeks, ie every 2 weeks after the week 20 and evaluate in that percentage and when begins to result > = 140 mg % it 2° load, since of that mode, that group of patients could enter before to TNI.

When the population is analyzed according to the NB with macrosomia or not, is noted an association between macrosomia and maternal age, instead the BMI was similar among them mothers of macrosomic and NB of normal weight. The percentages of normal oral tests were similar and the frequency of GD was higher in the Group of patients who did not have a macrosomic. However, the incidence of intolerance to CH was very high among the mothers of a macrosomic. Again appears the concept of the importance of proper diagnosis and treatment of patients with intolerance to CH.

If the population is analyzed according to the maternal age was < = 30 to > 30 years, BMI was slightly higher in the younger patients, but all cases of macrosomia are found among the patients of > 30 years, despite the fact that the highest percentage of GD was diagnosed in patients of < 30 years.

To the divide to the patients according to the BMI out < 0 > = 25, the greater percentage of macrosomia is associated to greater BMI (P = 0.48), however the averages of weight of the NB were similar. Patients with major BMI, presented a much higher requirement of insulin (P < 0.01), the lowest percentage of normal oral tests and the highest percentage of GD, being similar among the groups the frequency of CH intolerance (P = 0.24-0.92-0.20).

Conclusions

1. The TNI in patients with intolerance to the CH and especially a diet with low content in CH (40%), allows greater stability metabolic, reduces significantly the requirement of insulin and reduces also significantly the incidence of macrosomia.
2. The test with load of 50g of glucose > 140 mg % is associated to an increase in the development of intolerance to the CH, despite present a normal oral test with 100g of glucose, according to it shows the 12.5% of macrosomic in that group of patients.
3. A blood glucose > = 140 mg % after a load with 50g of glucose before the 20th week of gestation, was associated with the highest percentage of pathological oral test (39.2%). A blood glucose > = 140 mg % after a 2° load between the week 25 and 30 of gestation (if the 1° load was normal), is associated with the greater percentage of intolerance to the CH (55.4%) ($P < 0.01$). Both a 1° as a 2° load of 50g > = 140 mg %, is associated statistically to the presence of any type of intolerance to the CH ($P < 0.008$ and $P < 0.007$ respectively).
4. Each 3 results > = 140 mg % of the 1° load, in two cases was developed metabolic pathology. Each 4 results > = 140 mg % after the 2nd load, in three cases developed metabolic pathology.
5. A pathological oral test after 1st or 2nd load with 50g of glucose > = 140 mg %, was associated with a probability of statistically significant insulin requirement for metabolic stability.
6. The BMI in case of 1st load > = 140 mg % was associated with pathological oral test. In the case of a 2nd load > = 140 mg %, BMI associated with the development of intolerance to CH.
7. Occurrences of macrosomia, were found among the patients with intolerance to the CH, regardless of if it was > = 140 mg % the 1st or 2nd load. The incidence of macrosomia was 3 times higher among the patients with altered after the 2nd charge curve > = 140 mg %.
8. The incidence of macrosomia, presented a positive association with maternal age > = 30 years and a BMI > 25.
9. The CH intolerance was associated with average weight of the NB and high percentage of macrosomia. For this reason, we consider relevant to the early detection of these patients and their early inclusion in a protocol of TNI.
10. It was found in coincidence with other authors, that the time of day of greater resistance to insulin according to blood glucose values, is the morning and noon. This fact is of relevant importance for nutritional schedule to the TNI, with one greater reduction of content in calories and CH in that time period.
11. he diagnostic and therapeutic protocol employed, allowed an adequate management of the studied population. Given the importance that acquires the intolerance to the CH in this study, is the proposal to investigate about that in patients whose 1st load with 50g is < 140 mg %, receive a 2nd load with 50g of glucose after week 20 and every 2 weeks, in the hypothesis to evaluate when it starts to give a result > = 140 mg % to allow a more rapid addition to the treatment protocol, in addition to assessing the costs that this behavior would generate.

References

1. American Diabetes Association. "Standards of medical care for patients with diabetes mellitus". Diabetes Care 26.Suppl. 1 (2003): 103-105.
2. American Diabetes Association. Diabetes Care 2003; 26 (suppl1): 4-20.
3. American Diabetes Association. Diabetes Care 2003; 26 (Suppl. 1): 51-61.
4. Jovanovic L. "Medical nutritional therapy in pregnant women with pregestational diabetes mellitus". *The Journal of Maternal-Fetal Medicine* 9.1 (2000): 21-28.
5. Sacks D., *et al*. "Fasting plasma glucose test at the first prenatal visit as to screen for Gestational Diabetes". *Obstetrics & Gynecology* 101.6 (2003): 1197-1203.
6. Schaefer-Graf U., et al. "Determinants of fetal growth at different periods of mommy complicated by gestational diabetes mellitus or impaired glucose tolerance". *Diabetes Care* 26.1 (2003): 193-198.

7. Lomain-de Ruiter M., *et al.* "Models to Predict Risk of Gestational Diabetes Mellitus". *BMJ* 354 (2016): 354: i4338