Weight gain during pregnancy and the probability of macrosomia in women with gestational diabetes

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Abstract

Objective. To analyze the association between gestational weight gain in women with gestational diabetes and an increased risk of macrosomia. **Materials and methods.** Cohort study with 139 pregnant women screened by a single-step oral glucose tolerance curve between 24-28 weeks of gestation were confirmed with gestational diabetes and sent to a hospital. Pre-pregnancy body mass index (BMI) was calculated from pre-pregnancy weight. Weight was measured at each prenatal consultation. The reference category was women with normal prenatal BMI who gained appropriate weight during pregnancy. At each visit, medical nutrition therapy (MNT) consisted of nutritional counseling, physical activity plan, and insulin therapy. Compliance with MNT was measured by capillary glucose measurements taken by each participant at home. **Results.** 74.8% were primiparous, and 28.8% had normal pre-pregnancy BMI. The no linear logistic regression model showed women with normal pre-pregnancy BMI had twice (OR= 2.08, 95%CI: 1.07,4.05) the possibility of macrosomia, compared to mothers with overweight or obesity, adjusting for Capurro index, number of children in the family, and percent of compliance MNT. Macrosomia was the most prevalent childhood complication (12.3%). **Conclusion.** Women with normal pre-pregnancy BMI who gained more weight during pregnancy were at higher risk of having macrosomic infants.

Keywords: gestational diabetes mellitus; fetal macrosomia; pregnancy weight gain

Parra-Cabrera MS, Delgado-Ramírez JZ, Ángeles-Llerenas AR, Hurtado-Salgado E, Méndez Gómez-Humarán I.
Ganancia de peso en el embarazo y probabilidad de macrosomía en mujeres con diabetes gestacional.
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Resumen

Objetivo. Analizar la asociación entre ganancia de peso gestacional en mujeres con diabetes mellitus gestacional y riesgo de macrosomía. **Material y métodos.** Estudio de cohorte a 139 embarazadas tamizadas con curva de tolerancia oral a glucosa, de entre 24-28 semanas de gestación, que tuvieron confirmación de diabetes gestacional y fueron enviadas al hospital. El peso fue obtenido del expediente clínico y la talla se midió en cada consulta médica. La categoría de referencia fueron mujeres con índice de masa corporal (IMC) prenatal normal que ganaron peso apropiado. La terapia médica nutricia consistió en asesoramiento nutricional, plan de actividad física y terapia con insulina en cada visita. El cumplimiento de la terapia se calculó mediante mediciones de glucosa capilar tomadas por cada participante en casa. **Resultados.** 74.8% fueron primíparas y 28.8% presentaron IMC normal antes embarazo. El modelo de regresión logística no lineal mostró que las madres con IMC pregestacional normal tuvieron dos veces (RM= 2.08, IC95%: 1.07,4.05) la posibilidad de macrosomía, comparado con las madres con sobrepeso u obesidad, ajustando por índice de Capurro, número de hijos en familia y porcentaje en cumplimiento de TMN. Macrosomía fue la complicación infantil más prevalente (12.3%). **Conclusiones.** El aumento de peso fue determinante en la aparición de macrosomía. Mujeres con IMC normal antes del embarazo, que aumentaron más peso durante embarazo, tuvieron mayor riesgo de tener infantes macrosómicos.

Palabras clave: diabetes mellitus gestacional; macrosomía; ganancia de peso en el embarazo

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Gestational diabetes mellitus (GDM) is the most common metabolic disturbance during pregnancy, affecting 4 to 10% of all pregnancies worldwide.[1] Most women with GDM seem to have β-cell dysfunction that appears on a background of chronic insulin resistance before pregnancy,[2] and transfer of glucose to the fetus across the placenta due to glucose being the most abundant nutrient transferred to the fetus.[3,4] The etiology of GDM is complex, with genetic and environmental factors implicated in mechanistic and epidemiological studies. In recent decades, the growing prevalence of GDM has been concurrent with the global increase in maternal obesity. The percentage of mothers who received a diagnosis of gestational diabetes during pregnancy in Latin America is 8.5% (95%CI: 3.9,14.7)[5] and in the USA has increased from 6.0% in 2016 to 8.3% in 2021. This increase has been observed in all maternal age groups, with rates rising steadily with maternal age. In 2021, the rate for mothers over 40 years (15.6%) was almost six times higher than the rate for mothers under 20 years (2.7%).[6]

Other Mexican authors also found that an obesity epidemic started in 1999, and since 2012, obesity levels have reached 73% prevalence.[7] According to *Encuesta Nacional de Salud y Nutrición* (Ensanut) performed in 2022, diabetes prevalence in women was 13.6% (95%CI: 11.2,16.5), the diagnosis is delayed in individuals with low socioeconomic status and lack of access to healthcare.[8] Unhealthy diet, along with other factors, is one of the leading causes of this condition.[9] GDM poses essential short- and long-term health risks for the mother, developing fetus, and offspring. It includes an increased likelihood of subsequent maternal type 2 diabetes and possible adverse cardiometabolic phenotypes in the offspring.[10]

A key risk factor for GDM is women's weight gain during pregnancy. Women who gain more weight than the Institute of Medicine (IOM) recommended weight tend to experience negative outcomes for themselves and their children.[11] In addition, the offspring of women with GDM who gain more than recommended weight experience a higher risk of neonatal complications, such as being born large for gestational age, macrosomia, shoulder dystocia, hyperbilirubinemia, hypocalcemia, and cardiopathy. During childhood, infants from diabetic mothers are also at a higher risk of becoming obese.[3,12-17,10] Medical nutrition therapy is an effective tool to diminish these health risks. There is enough literature on weight gain as a risk factor for GDM and macrosomia, but there has been little attention on how weight gain relates to birth outcomes among women with GDM.[18-21]

Therefore, we aimed to analyze how gestational weight gain among those with GDM relates to the risk of macrosomia as a neonatal complication in the perinatal period.

Materials and methods

Study population

We conducted a prospective and longitudinal cohort study for three years (Healthy Pregnancy Means Future Study) from August 2015 to June 2018, which followed a group of women aged 18 to 49 from Yautepec County, Morelos state, during their pregnancy and childbirth.

The Research Ethics Committee approved the study protocol at the *Instituto Nacional de Salud Pública* (ID number 1292).

All women who attended prenatal health care centers financed by the Mexican Ministry of Health were invited to participate in education sessions at 17 primary health care centers (PHCC). The education sessions were based on the Mexican Standards for diagnosing, treating, and controlling gestational diabetes mellitus.[22] Trained nurses used an educational video developed for this project by medical sociology experts, and a nutritionist provided them with counseling about dietary patterns and physical activity at every prenatal visit to the Health Care Facility.

Women could participate in the study if they entered prenatal care before the 28th week of gestation. Participants recruited at each PHCC were provided with a screening blood test at the Yautepec´s Health Care Center laboratory. A signed informed consent was obtained from each study participant. In addition, participating women filled out the first questionnaire to define their level of risk for gestational diabetes (Finrisk adapted for the Mexican population).[23] At each healthcare center, a trained nurse collected participants' health information. Patients were followed from recruitment until their offspring were three months old.

We excluded six women with missing information on pre-pregnancy weight and those not insured by the "Population Health Insurance" (*Seguro Popular* in Spanish) because this type of insurance allowed them free access to prenatal care and delivery.[24]

If the screening test was positive (defined by the oral glucose tolerance test [OGTT]) according to the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria, they were referred to the Women´s Tertiary level hospital to take a second OGTT to confirm a GDM diagnosis with an O´Sullivan one-step test with a 50-gram dose of glucose. Criteria include having at least two of the four glucose values above the glucose cut-off points fasting at 95 mg/dl, 1 hour >180 mg/dl, and 2 hours > 155 mg/dl.[20] Women

with confirmed GDM constituted the study cohort treated at the Women´s Hospital.

Pregnant women's demographic characteristics included age (years), parity, pre-pregnancy weight (Kg) obtained from medical records and height (meters) was measured on-site pre-pregnancy body mass index (BMI) (Kg/m^2), gestational age at recruitment, weight at each prenatal visit during the third trimester of pregnancy (Kg), and total gestational weight gain (GWG) (in Kg). Family history of diabetes, twin pregnancies, type of delivery in previous pregnancies, socioeconomic factors like marital status (single/married), occupation, and years of education (number of years attended school). Maternal complications included gestational hypertension, preeclampsia, and a previous history of delivering macrosomic infants.

We called the women, and some visited them at home to remind them of the medical appointment and ensure their permanence in the study. The sample size was 8 021 women to be sensitized about the risk of gestational diabetes (figure 1).

Pregnancy weight gain

Maternal weight was measured with a Seca scale at each prenatal visit. Weight gain was calculated as the difference between subsequent measures. Height was measured in centimeters using a Seca Toise stadiometer, with women asked to maintain an upright posture with their feet together and the back of their heels close to the stadimeter's pole.

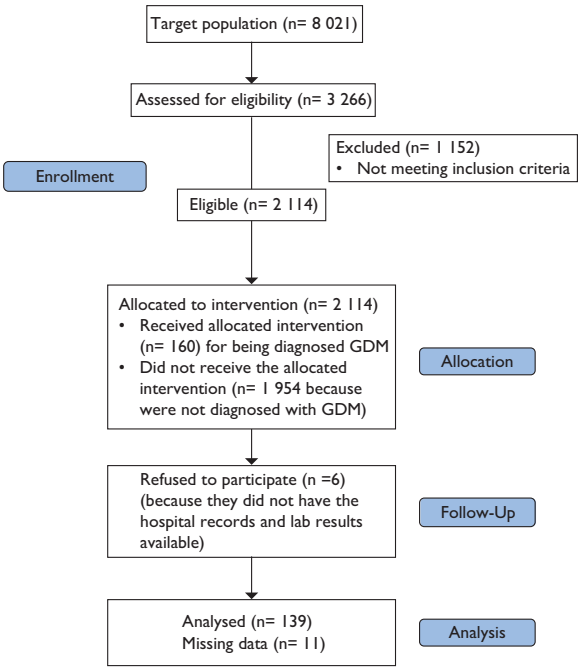
Pre-pregnancy BMI

Pre-pregnancy weight (Kg) was self-reported, and pre-pregnancy BMI was calculated using the self-reported pre-pregnancy weight and height measured at the first hospital visit. Pre-pregnancy weight status was classified using BMI as normal (18.5-24.9 Kg/m^2), overweight (25-29.9 Kg/m^2), and obese (> 30 Kg/m^2).[11,25] Adequacy of total weight gain was classified according to IOM recommendations specific to each category of BMI.[11,26,27]

Therefore, according to IOM, the mean incremental weight gain during the second and third trimesters in kilograms per week is as follows: underweight 0.51 (0.44,0.58), normal weight 0.42 (0.35,0.50), overweight 0.28 (0.23,0.33), and obese 0.22 (0.17,0.27).[11]

Macrosomia

According to the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study guidelines, macrosomia was defined as above the 90th percentile of the population distribution.[28]



GDM: gestational diabetes mellitus

FIGURE 1. SAMPLE SIZE OF THE STUDY POPULATION. STUDY FLOW DIAGRAM HEALTHY PREGNANCY MEANS A FUTURE FROM AUGUST 2015 TO JUNE 2018. MORELOS, MEXICO

Additional variables

Gestational hypertension was defined according to the HAPO study as a diastolic blood pressure ≥ 90 mmHg on at least two measurements.[28] The patients had a blood pressure measure in each prenatal control visit. Preeclampsia was specified as blood pressure exceeding ≥140/90 mm Hg, measured on two occasions, at least two hours apart. Other signs and symptoms include proteinuria or edema, severe headaches, vision changes, upper abdominal pain, nausea or vomiting, and decreased urine output.[3,29,30] Neonatal complications were considered according to the ones specified in the protocol of the HAPO, Prenatal care and delivery, neonatal care and anthropometrics, and birth weight >90th percentile.[28]

Medical nutrition therapy consisted of providing the patient with pharmacological treatment according to women's needs (insulin or oral hypoglycemic medications) prescribed by the physician. Dietary and physical therapy is advised and supervised by a certified nutritionist.[10] Pregnant women performed self-monitoring of blood glucose (SMBG) through a glucometer analysis

and recorded their results in a template. An obstetrician reviewed the pregnant woman´s capillary blood glucose levels that women wrote. This measurement was the closest to serving to estimate percent compliance with their dietary and physical recommendations, compliance defined as the percentage of adequate weekly glucose levels at each prenatal visit.[31]

Gestational age (GA) was determined by assessing the newborn infant's maturity using the International Capurro Index. Also, by examination of the newborn infant using this Index this recommendations to categorize the newborns according to their gestational age,[32] which consisted in somatic and neurologic findings correlated well with gestational age as estimated by the day of onset of amenorrhea.[33]

GA has been considered useful regarding neonatal outcomes; three groups have been classified and utilized according to delivery following the onset of the last menstrual period. *Pre-term*: less than 259 days (37 weeks), *term*: 259-293 days (37-41 weeks), *post-term*: 294 days (42 weeks) or more.[34]

The maternal information about marital status, occupation, number of family members, and house characteristics were recorded during the baseline visit at the Yautepec´s primary health care center.

Statistical analyses

Data was expressed as mean ± standard deviation (SD) or percentages. Differences between groups of macrosomia were tested for statistical significance by using Student's t-test or one-way ANOVA and multiple comparisons. The chi-squared test compared recommended weight gains, less than recommended weight gain, and more than recommended for each BMI category. We analyzed the Finrisk index at the PHHC's first visit to evaluate the maternal risk for developing gestational diabetes.[35] The reference category was women with normal prenatal BMI who gained appropriate weight during pregnancy.

We calculated the measurement closest to net gestational weight gain per week (netGWG) as the difference between weight measured after delivery, reported weight before pregnancy, and newborn´s weight, divided by the number of weeks of gestation and expressed in g/week. The net GWG was categorized into three groups.

A logistic regression model was used to determine if there was an association between maternal gestational weight gain (GWG) and macrosomia. The medical nutrition therapy percent compliance during the third trimester of gestation was included as a covariate, adjusted by offspring's Capurro score, pre-gestational BMI, and gravidity including an interaction between pre-gestational BMI for overweight women and pregnancy weight gain. We also included the socioeconomic tertiles. Stata software version 15 was used for analysis.*

Results

Table I shows that maternal age ranged from 18 to 44 years, with a mean of 29.1 years. 71.2% of women were overweight or obese before conception, with a mean glucose of 89.7 mg/dL. Of these women, 73.4% had a family history of type 2 diabetes mellitus. Only 4.3% had a history of previous macrosomia children (36.8%) during their first pregnancy, 22.3% had a history of prior abortions, and 71.2% had C-sections in the study. Newborn characteristics included the gestational age mean being 38.9 weeks, according to the Capurro Index; the gestational age range was 32-42. 94.9% obtained an adequate Apgar score at five minutes, and 90.3% had adequate weight and height for gestational age, respectively. Among the infant´s complications, the most prevalent was macrosomia, followed by prematurity and respiratory stress syndrome. The Finrisk Index mean was 5.31 ± 3.73. Only thirteen pregnant women needed insulin medical therapy (8.44%) (data not shown).

Of all participants, only one woman was <18.5 for pregestational BMI. They were included in adequate categories for the analysis. The weight gain (mean ±SD) during the third trimester of pregnancy for each BMI category was normal: 2.3 ± 2.7 Kg (n= 40); overweight: 2.1 ± 2.2 Kg (n= 54); obese: 1.6 ± 3.2 Kg (n= 36). Participants remained for 8.2 weeks on average from entry to delivery. All women were weighed on average at the same time intervals. We realized a calculated weight gain as close to "net" weight gain according to BMI. In the category of adequate BMI, we observed a net GWG of 250 grams per week; for women in the overweight BMI category, we observed a net weight gain of 96 grams per week. In the obesity BMI category, no net weight gain was observed. The medical nutrition therapy was successful since 82.01% of the study participants remained within the accepted glucose concentration values in the last trimester.

Table II describes maternal reproductive characteristics stratified by macrosomia. In general, there was a higher percentage of women with obesity and overweight, with 69.9% developing better adherence to medical nutrition therapy, 89.5% of the sample performed a c-section, and 15.8% of newborns were in the intensive care unit. The type of delivery and the infants at an intensive care unit were statistically different between macrosomia groups.

* StataCorp. Stata Stadistical Software 15. Collage Station, TX: StataCorp LLC, 2015.

Table I
POPULATION CHARACTERISTICS, FROM AUGUST 2015 TO JUNE 2018. MORELOS, MEXICO

Variables	*n*	%*	*mean*	*SD*	*min*	*max*
Maternal characteristics						
Age (years)	139	100	29.1	05.7	18.0	44.0
Pregestational weight (kg)	139	100	65.8	11.7	42.0	97.1
Pregestational BMI (kg/m^2)‡,27	139	100	27.6	04.2	18.4	38.4
Pregnancy weight gain during the last trimester (kg)	134	96.4	03.3	07.0	-09.6	28.9
Fasting glucose (mg/dL)	111	79.8	89.7	11.2	58.0	118.0
Diabetes type 2 in family members (%)						
Yes	102	73.4				
No	37	26.6				
Previous macrosomia infants (%)						
Yes	06	04.3				
No	133	95.7				
Parity						
Multiple pregnancies	35	25.2				
Primiparous	104	74.8				
Previous abortions (%)						
Yes	31	22.3				
No	118	77.7				
Type of delivery (%)						
Vaginal	48	28.8				
C-section	90	71.2				
Newborn characteristics						
Weeks of gestation at birth	139	100	38.7	1.7	32.0	41.7
Weeks of gestation at birth by Capurro index	139	100	38.9	1.8	31.0	42.0
Apgar at 5 minutes	139	100	08.9	0.3	07.0	9.0
Birth weight (kg)	139	100	03.2	0.5	01.3	4.4
Birth length (cm)	139	100	50.0	2.3	40.0	55.0
Newborn complications§						
Macrosomia	19	52.8				
Hypoglycemia	02	05.5				
Respiratory syndrome	05	13.9				
Hyperbilirubinemia	02	05.5				
Prematurity	05	13.9				
Cephalo-pelvic disproportion	02	05.5				
Dead due to cardiopathy	01	02.8				

* Percentages do not reach 100% due to missing values and an infant died.
‡ Pregestational body mass index (BMI) by World Health Organization classification.
§ Neonatal complications were considered according to the protocol of Hyperglycemia and Adverse Pregnancy Outcomes.

Among these pregnant women, 12.3% had macrosomic infants, and 89.5% had C-section delivery, compared to those without macrosomic offspring (*p* value= -0.001). Mothers who had macrosomic infants were admitted more often to the Intensive Care Unit and were statistically significantly different from those who did not (*p* value= 0.04). However, no differences were found among socioeconomic variables between these two groups, macrosomic vs. not.

Table III presents the logistic model, showing the association level between macrosomic offspring and pregnancy weight gain. We found a twofold possibility for maternal pregnancy weight gain (Kg) (OR= 2.08, 95%CI: 1.07,4.05). The interaction term for pregnancy maternal weight gain and overweight shows a significant reduction in macrosomia risk (OR= 0.34, 95%CI: 0.13,0.86), and the interaction term for pregnancy maternal weight gain and obesity shows a non-significant reduction trend for mac-

rosomia (OR= 0.57, 95%CI: 0.27,1.23). Capurro index also almost shows a twofold risk (OR= 1.97, 95%CI: 1.07,3.62). Several children in the family (more than four). Figure 2 shows the percent risk for macrosomia according to pre-pregnancy BMI. Women who had normal BMI at the beginning of the third trimester of pregnancy but gained an excessive amount of weight had a higher risk of having offspring with macrosomia even though they underwent medical nutrition therapy.

Discussion

Greater weight gain during the third trimester of pregnancy in women with a normal pre-pregnancy BMI increased the probability of macrosomia in their infants compared to those who were overweight and obese. Our results are similar to those obtained in a more recent Mexican study,[36] and in a large study conducted in Portugal.[37] In our study, the macrosomia prevalence was 12.3, much higher than that reported for the country five years earlier in 2013 (3.8%), probably due to the screening service offered.

Moreover, in our study, the interaction term between pregnancy maternal weight gain and overweight showed a significant reduction in macrosomia risk. Meaning that overweight mothers were not the ones having macrosomic infants. Furthermore, a meta-analysis by Horvath, and colleagues[38] showed that treating gestational diabe-

Table II
Gynecology/Obstetric characteristics by macrosomia, from August 2015 to June 2018. Morelos, Mexico*,‡

Characteristics	Macrosomia				Overall		P-value
	Yes		No				
	n	%	n	%	n	%	
Prenatal overweight and obesity§,27							
No	08	42.1	32	26.7	40	28.8	
Yes	11	57.9	88	73.3	99	71.2	0.16
Compliance with maternal nutrition and medical therapy#							
≤ 90%	05	27.8	18	16.4	23	18.0	
90-100%	13	72.2	92	83.6	105	82.0	0.24
Parity							
0	07	36.8	34	28.3	41	29.5	
1	10	52.6	46	38.3	56	40.3	
2 or more	02	10.6	40	33.3	37	30.2	0.66
Newborn gender							
Male	13	68.4	59	49.2	72	51.8	
Female	06	31.6	61	50.8	67	48.2	0.11
Type of delivery							
Vaginal	02	10.5	46	38.3	48	34.5	
C-section	17	89.5	74	61.7	91	65.5	<0.01
Infants at the intensive care unit							
No	15	83.3	104	86.7	119	86.2	
Yes	03	16.7	16	13.3	19	13.8	0.46
Previous abortions							
No	16	84.2	92	76.7	108	77.7	
Yes	03	15.8	28	23.3	31	22.3	0.34
Preeclampsia							
Absent	17	89.5	112	93.3	129	92.8	
Present	02	10.5	08	06.6	10	07.2	0.40

* Percentages do not reach 100% due to missing values and an infant died.
‡ Fisher Exact in a cell with less than fiveobservations.
§ Prenatal body mass index: (Weight/length)^2 by World Health Organization classification.
# Maternal nutrition and medical therapy compliance indicates the percent of adequate glucose levels by a visit pregnant women's logs presented to the gynecologist at each antenatal.

Table III
ASSOCIATION BETWEEN MACROSOMIC OFF-SPRINGS AND MATERNAL WEIGHT GAIN, FROM AUGUST 2015 TO JUNE 2018. MORELOS STATE, MEXICO

	OR	*SE*	*95%CI*
Maternal pregnancy weight gain (Kg)	2.08	0.71	1.07,4.05
Prepregnancy overweight (Kg/mts^2)*,[27]	13.54	24.90	0.37,497.25
Prepregnancy obesity (Kg/mts^2)*,[27]	16.79	31.34	0.43,650.65
Interaction pregnancy maternal weight gain and overweight	0.34	0.16	0.13,0.86
Interaction pregnancy maternal weight gain and obesity	0.57	0.22	0.27, 1.23
Maternal nutrition and medical therapy compliance (>90%)	0.24	0.20	0.05,1.24
Capurro Index (weeks gestation)	1.97	0.61	1.07,3.62
Number of children in the family	0.52	0.24	0.21,1.30

SE: Standard error
CI: Confidence Intervals
* Prepregnancy body mass index according to World Health Organization cut-off points.

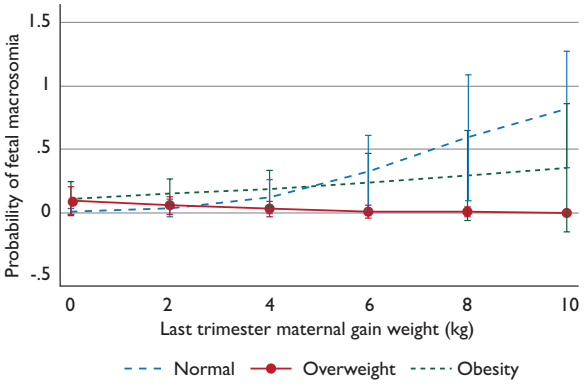


FIGURE 2. MATERNAL WEIGHT GAIN IN GESTATIONAL DIABETES, FROM AUGUST 2025-JUNE 2018, MORELOS, MEXICO

tes (with diet or insulin) was associated with a lower risk of macrosomia, including in obese pregnant women.[38]

In many cases, MNT has been an effective intervention in women diagnosed with GDM,[3] because it was associated with an offspring decreased risk of being macrosomic compared to those without it. Dietary interventions during pregnancy produced better maternal glycemic control and favorable infant birth weight outcomes than usual nutritional advice for GDM.[39] In a previous study conducted in Mexico, MNT was associated with better glycemic control during pregnancy and fewer hospital admissions for complications derived from GDM.[40]

Higher weight gain during pregnancy, which is already a hyperglycemic state, increases the deposition of maternal fat mass, exacerbating insulin resistance. This increases the fetus´s uptake of excess glucose and will deposit excess glucose as fat, leading to macrosomia. This pathway occurs through the uptake of maternal excessive free fatty acids, maternal circulating amino acids, and triglycerides.[37] In the HAPO-FUS birth cohort study,[28] high glucose concentrations *in utero* were significantly associated with high infant blood glucose concentrations and insulin resistance, regardless of maternal and child BMI.

Inadequate weight gain during pregnancy increased the probability of GDM in other studies.[13,25,30,41] This is the most common complication reported in the literature.[42] In a meta-analysis, pregnant women evaluated under the IADPSG criteria had a higher risk of more significant weight gain in those with normal pregestational BMI and lower in overweight women.[13] This weight gain during pregnancy was associated with the incidence of macrosomic products, regardless of pre-pregnancy maternal BMI.[14,17,25] Santos Monteiro and colleagues also found that in more than 18 000 pregnant women who entered pregnancy with a normal BMI, there was an OR= 2.01 (1.23,3.27) for having macrosomic offsprings. These women gained over 3 kg above the IOM-recommended weight gain during pregnancy.[37]

Gestational weight gain, especially in the last trimester of pregnancy in the women in our study, added up to high rates of a sedentary lifestyle and poor-quality foodstuffs, increased the risk of suffering chronic diseases, mainly type 2 diabetes mellitus since 5% remained diabetic after delivery. This is with the consequences implied for individual health and the healthcare system.[43] Women were 40% more likely to be obese and 60% more likely to be diagnosed with diabetes.[44] Only 3.9% reported having a macrosomic child in a prior pregnancy.

One of the main limitations of our study was the lack of glycated hemoglobin (Hb1Ac) tests, the gold standard for adequately measuring GDM control in the participants. However, the high compliance to MNT benefited the participants' maternal and child health status. Another limitation was the loss of 10% of participants during follow-up and the fact that pre-pregnancy weight was self-reported. However, it is proven that self-reporting is accurate during reproductive ages.

The fact that some of the participants didn´t gain too much weight during pregnancy is because they were under MNT, very motivated to diminish their weight gain given their gestational diabetes diagnosis and were conscious by our clinic physician of the dangers of gaining too much weight given the short d long-term consequences to them and their infants. We consider that our finding is supported by other results in other population cohorts, including one in Latin America.[15-17,36-38]

Updating the IOM gestational weight gain standards could benefit pregnant women and their attending physicians. It is recommended that pregnant women record their weight gain in their clinical records throughout pregnancy, particularly in women with risk factors for GDM. This would improve their prenatal glycemic control and prevent the birth of macrosomic children.

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Declaration of conflict of interests. The authors declare that they have no conflict of interests.

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