Assessment and specific nutritional recommendations for women during and after pregnancy of twins
Avaliação e recomendações nutricionais específicas para a gestante e puérpera gemelar

Natalia Mira de Assumpção Werutsky¹, Vera Silvia Frangella², Débora Pracanica³, Ariane Nadolskis Severine⁴, Cristiane Tonato⁵

ABSTRACT
Objective: To update and adjust nutritional recommendations for twin pregnancy during prenatal and postpartum periods in order to improve care provided to these women and ensure their quality of life, as well as to assess the practices adopted by the Institution and referral hospitals, in view of what was learned in specialized literature.

Methods: This literature review was conducted by searching scientific papers in databases (SciELO, Pubmed, Sibi, Medline, Lilacs), published from 1964 through 2006, as well as by surveying some authors directly by e-mail. Results: In studies selected, the age of pregnant women with twins was > 27, and the subjects were divided into three gestational periods (< 20 weeks, 20 to 28 weeks, and > 28 weeks gestational age). The nutritional program recommends: the intake of 3.000 to 4.000 kcal/day according to the pregnant body mass index (BMI), distributed as: proteins (20%), carbohydrates (40%), and fat (40%); in addition to the supplemental intake of 3 g of calcium, 1.2 g of magnesium, and 45 mg of zinc, with the prescription of two tablets of multivitamin per day after week 20. The daily diet must be divided into three meals and three snacks. The few studies found about these puerperal women recommended the addition of 500 to 600 calories/day per child to ensure the production of the appropriate volume of milk to meet the necessary demand.

Discussion: Research demonstrates that this program increases the gestational period, and reduce the risks of prenatal and postpartum complications for mothers and children. The appropriate weight gain during pregnancy benefits the mother and their newborns, facilitating breast-feeding and milk volume production according to the demand. Comparing twin and single pregnant women there are differences related to weekly and total weight gain, recommendations for macro and micronutrients intake, number of portions, and nutritional status classification according to BMI.

Conclusions: Nutritional guidance, dietary adjustments, and gestational follow-up improve newborn’s weight gain, extend the gestational period, and reduce the risks of prenatal and postpartum complications for mothers and children, and favors breastfeeding.

Keywords: Pregnancy, multiple; Weight gain; Nutritional requirements

RESUMO
Objetivo: Atualizar e adequar os conhecimentos nutricionais sobre a gestante e puérpera gemelar para favorecer o cuidado prestado a esta clientela, a fim de melhorar sua sobrevida com qualidade, assim como, avaliar a conduta usada na Instituição e hospitais de referência, frente os conhecimentos adquiridos pela literatura específica.

Métodos: Esta revisão de literatura se deu por meio de pesquisa de documentos e publicações científicas em sites eletrônicos (SciELO, Pubmed, Sibi, Medline, Lilacs), datadas de 1964 a 2006, e contato direto via e-mail com alguns autores. Resultados: Em estudos selecionados, as gestantes gemelares apresentavam idade > 27 anos, sendo divididas em três períodos gestacionais (< 20°; 20 a 28° e > 28° semana). O programa nutricional recomenda: ingestão de 3.000 a 4.000 cals/dia de acordo com o índice de massa corpórea (IMC) da gestante, distribuídas em: proteínas (20%), carboidratos (40%) e gorduras (40%); além da suplementação de 3 g de cálcio, 1,2 g de magnésio e 45 mg de zinco, com a prescrição de dois comprimidos de multivitamínico/dia após a 20° semana. A alimentação deve ser composta de três refeições diárias e três lanches. Os poucos estudos encontrados sobre puérperas recomendam o acréscimo de 500 a 600 calories/dia por criança, para garantir produção de volume de leite adequado à demanda.

Discussão: Pesquisas demonstraram que o seguimento deste programa propicia maior tempo gestacional e peso dos recém-nascidos; redução dos riscos de complicações pré e pós-parto para mães e filhos. O adequado ganho de peso durante a gestação beneficia a mulher, os bebês e possibilita esta a amamentar e produzir leite de acordo com a demanda.

Existem diferenças

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INTRODUCTION

This literature review deals with the themes of nutritional assessment and special recommendations for women during and after twin pregnancy. It is an important issue, due to the high number of women with multiple pregnancies who are hospitalized and because there is no hospital protocol for nutritional assessment and specific nutritional recommendations appropriate for the care of these patients.

In the United States, there has been a 30% increase in twin pregnancies because of the growing practice of assisted reproduction\(^{(1)}\). In 2002, there were 132,535 births of twins. This number has been steadily increasing since 1980. Twin pregnancies represent 94% of multiple pregnancies every year\(^{(2)}\). In Mexico, the number of hospitalized women with twin pregnancies at Instituto Nacional de Perinatología increased from 140 in 1999 to 217 in 2003\(^{(3)}\). Data from the Perinatology Coordination of Hospital Israelita Albert Einstein (HIAE) revealed that, from January 1\(^{st}\) to June 30\(^{th}\), 2006, there were 1,510 deliveries, 5% (n = 76) were multiple pregnancies, of which, 69 twins (4.5%) and seven triplet.

Table 1 shows the distribution and the percentage of twin deliveries in Brazil, from 1996 to 2004, divided into Brazilian States and regions, according to the information from the Brazilian Ministério da Saúde.

According to the data showed in Table 1, the Southeastern region has the highest concentration of twin deliveries in Brazil (41.2%). Only in the State of São Paulo, there were 98,120 deliveries, which represent 21.1% of the total in the country. Within this context, the observed incidence of twin deliveries at HIAE during the first semester of 2006 is very significant, because it corresponds to 0.14% of total of deliveries in the State of São Paulo, if the same progression is to be kept for the second semester and also from 2004 to 2006. However, the trend is that it will increase in the two periods.

It is well known that nutrition has a relevant role for the individual's health, especially in life stages characterized by increased energy and nutrient demands, such as pregnancy and puerperium. During these periods, the following is observed: intense and peculiar process of tissue formation, as well as large organic transformations in a very short time period\(^{(4)}\). Pregnancy is a period of known biologic vulnerability. In the human life cycle, it represents, probably, the most crucial physiological process or moment, due to the demands and circumstances involving mother and fetus, because the gestational period is a phase in which nutritional needs are high, due to the physiological adjustments of the pregnant woman and nutrient demands for fetal growth\(^{(5)}\).

The nutritional status of pregnant women directly influences the adequate health, growth and development of fetuses, their birth weight, the chances of prematurity, neonatal mortality and morbidity\(^{(6)}\). Thus, the weight gain of pregnant woman, if appropriate to the pregestational weight and to the gestational week, has a positive influence on birth weight\(^{(7)}\). Inadequate nutrient stores and insufficient dietary intake may hinder fetal growth and consequently, birth weight. On the other hand, excessive gestational weight gain is not beneficial for the newborn, because sometimes this excess serves only to harm the maternal nutritional status and is not, necessarily, directed to the fetus.\(^{(6)}\). Therefore, nutritional assessment and weight gain monitoring of pregnant women are considered essential and the Brazilian Ministério da Saúde recommends to use anthropometric measures\(^{(7)}\).

Multiple pregnancy, often occurs in women older than 27 years, body mass index (BMI) > 30 kg/m\(^2\), black ethnicity, increased parity, family history (on the mother's side), higher frequency of sexual relations and, currently, with techniques of induced ovulation

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Table 1. Distribution and percentage of twin deliveries in Brazilian States and Regions from 1996 to 2004

<table>
<thead>
<tr>
<th>Brazilian states and regions</th>
<th>1996</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>38,465</td>
<td>51,248</td>
<td>52,714</td>
<td>55,537</td>
<td>54,883</td>
<td>53,178</td>
<td>53,360</td>
<td>52,596</td>
<td>52,625</td>
<td>465,241</td>
<td>100%</td>
</tr>
<tr>
<td>North</td>
<td>3,520</td>
<td>3,610</td>
<td>3,601</td>
<td>3,944</td>
<td>4,118</td>
<td>4,100</td>
<td>4,271</td>
<td>4,402</td>
<td>4,266</td>
<td>35,832</td>
<td>7.7%</td>
</tr>
<tr>
<td>Northeast</td>
<td>12,739</td>
<td>13,609</td>
<td>14,132</td>
<td>14,760</td>
<td>15,022</td>
<td>15,513</td>
<td>15,733</td>
<td>15,285</td>
<td>15,378</td>
<td>132,171</td>
<td>28.4%</td>
</tr>
<tr>
<td>Southeast</td>
<td>9,860</td>
<td>21,951</td>
<td>22,982</td>
<td>24,295</td>
<td>23,740</td>
<td>22,338</td>
<td>22,348</td>
<td>21,902</td>
<td>21,319</td>
<td>191,745</td>
<td>41.2%</td>
</tr>
<tr>
<td>São Paulo</td>
<td>1,087</td>
<td>12,441</td>
<td>12,173</td>
<td>12,676</td>
<td>12,470</td>
<td>11,860</td>
<td>12,157</td>
<td>11,579</td>
<td>11,877</td>
<td>98,120</td>
<td>21.1%</td>
</tr>
<tr>
<td>South</td>
<td>8,393</td>
<td>8,048</td>
<td>8,243</td>
<td>8,570</td>
<td>8,119</td>
<td>7,486</td>
<td>7,261</td>
<td>7,173</td>
<td>7,319</td>
<td>70,612</td>
<td>15.2%</td>
</tr>
<tr>
<td>Central-Western</td>
<td>3,953</td>
<td>4,030</td>
<td>3,746</td>
<td>3,968</td>
<td>3,884</td>
<td>3,741</td>
<td>3,747</td>
<td>3,834</td>
<td>3,978</td>
<td>34,881</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

or assisted fertilization\(^{(1,3,5,7)}\). Twin pregnancies are classified into three gestational periods (< 20 weeks, 20 to 28 weeks and > 28 weeks gestational age), and there are two types of twin pregnancies: monozygotic – resulting from a very early division of one egg after fertilization of the ovum; and dizygotic – in which there is fertilization of two ova by two spermatozoa\(^{(5,7)}\).

In twin pregnancy, blood volume increases about 50 to 60% opposed to 40 to 50%, in single pregnancies. This lowers the serum concentrations of hemoglobin, glucose, albumin, proteins and hydrosoluble vitamins. The concentration of progesterone and placental lactogen (HPL) increase, as their secretion is enhanced in this period, and this may affect glucose metabolism, increasing the risk of peripheral insulin resistance, gestational diabetes and high blood pressure\(^{(5)}\).

Some risk factors or complications of pregnancy are more frequent in twin pregnancy, because of the older age of the mother; there is a higher incidence of pre-eclampsia and anemia; premature placental detachment; higher chance of intrauterine periventricular hemorrhage, rectal prolapse and chorioamnionitis, which is the most common infection of the placenta due to the early rupture of the water bag that contains the fetus. Such rupture causes the loss of amniotic fluid\(^{(8)}\). Therefore, twin pregnancies are considered of high maternal-fetal risk. For this reason, they require intensified guidance and multiprofessional follow-up\(^{(9)}\). Among the complications of twin pregnancy, the most frequent one is premature delivery, which may be fatal for the mother and the newborns\(^{(10)}\). Because of prematurity, they are more exposed to clinical complications and/or low birth weight. Some international studies demonstrated that twin pregnancy has a higher risk of pre-term delivery than single pregnancy (48% versus 11%, < 37 gestational weeks) and (11% versus 2%, < 32 gestational weeks). Twins have a higher chance of having low birth weight (50% versus 6% < 2,500 g; and 10% versus 1% < 1,500 g)\(^{(11)}\). In single pregnancies, the average birth weight is 3,332 g and the gestational age is 38.8 weeks, while in twin pregnancies, the average birth weight is 2,347 g and the gestational age is 35.3 weeks. In addition, women pregnant of twins have a six-fold greater chance of being hospitalized during pregnancy as compared to single pregnancies. Risk of death during the first year of life is seven-times higher in a twin, compared to a singlet\(^{(2)}\).

Although twins account for 3% of births, they represent 15% of preterm births (< 32 weeks) and 25% of very low birth weights (< 1,500 g). For this reason, they have a seven-fold greater risk of dying during the first year of life and the survivors continue having high risk of showing mental, learning and psychological problems\(^{(11)}\).

After delivery, it is the time for nursing the newborns and it is known that breastfeeding is an important component of child nutrition. It is able alone to fully nourish children in the first six months of life\(^{(12)}\). The World Health Organization (WHO) recommends that all children should receive mother’s milk, exclusively, up to six months of life and that breastfeeding should be maintained for at least two years\(^{(13)}\). It is scientifically acknowledged that infants fed exclusively with breast milk during that period, grow and develop appropriately. In addition, risk of gastrointestinal tract infections and allergies are reduced in these children\(^{(14)}\). However, a survey conducted in 1975 at the Southern California Mothers of Twins Clubs revealed that only 24% of women breastfed their children since birth. Of these, 37% stopped breastfeeding in the first month and 20% continued up to four or six months. Assessing the reasons for such high rate for quitting breastfeeding, 28% of women referred that their milk was inappropriate, insufficient; 15% mentioned sore nipple or other problems in the breast; 13% said the babies did not suck appropriately; 7% were ill or feeling weak and only 2% attributed it to fetus diseases. As to reasons for not starting breastfeeding, 36% of mothers said they were not interested; 8% became sick; 9% had physical limitations, 8% did not have enough milk and 11% did not have time for it\(^{(15)}\).

Preterm birth, cesarean section, neonatal complications, congenital anomalies, medications and anesthesia, the inexistence of rooming-in and newborns staying at Intensive Care Units (ICUs), among others, may impair the start of breastfeeding in twin pregnancies. For this reason, this group needs special attention and technical, psychological and nutritional support at the start of breastfeeding\(^{(16)}\). Some studies report that the reasons most often stated as stimulating for breastfeeding include: maternal satisfaction, proximity with the children, enhancing mother-child bond, and appropriate nutritional quality of maternal milk for children\(^{(17)}\).

The introduction of milk formulas in the first months of life is not recommended. The idea that maternal milk is insufficient for more than one newborn is denied by the fact that the milk volume produced is directly related to its demand. Therefore, the puerperal mother of twins produces twice the milk compared to that of a singlet. The mother of twins may produce more than 1.2 l per day in the first month and more than 2 l per day, starting in the second month. Each 100 ml contains, in average, 67 to 75 calories and production efficiency is approximately 80 to 90%\(^{(18)}\). Lactose, proteins, fat, vitamin and mineral concentrations are also higher\(^{(19)}\). Maternal milk, therefore, meets the fetus specific requirements. It provides the ideal amount of
nutrients, water and minerals for satisfactory growth and development of newborns\(^{(20)}\).

Infants who are breastfed have better cognitive and psychomotor development, and have a lower risk of infections, meningitis and pneumonia. This occurs for maternal milk is rich in antibodies, amino acids, fats, among other nutrients\(^{(21)}\).

During pregnancy, the female body gets prepared for lactation. The breasts increase, hormone production increases and there is fat accumulation (4 kg). During breastfeeding, the woman uses the fat stored during pregnancy and the calories from daily nutrition. Maternal nutritional status, therefore, directly influences breastfeeding. Breastfeeding requires an additional amount of calories from the mothers to warrant appropriate milk production. For this reason, it is necessary to adapt food intake, by increasing calories and proteins intake of the breastfeeding mother\(^{(22)}\).

For these reasons, this study is important and justifiable because of the low number of publications and studies on the theme, and because of increase in twin pregnancies. Brazil lacks criteria and studies on assessment of weight gain of women pregnant of twins. This was observed based on literature search and epidemiological data obtained at the HIAE. Therefore, this study may contribute to nutrition teams and scientific community, since it aims at technical and scientific improvement for the better quality of hospital care, delivered to women during and after twin pregnancy.

**OBJECTIVE**

To assess, update and adjust nutritional information about women during and after twin pregnancy, in order to improve care delivered to them, regarding assessment of nutritional status and specific recommendations and improving their quality of life.

**METHODS**

This is a literature review, conducted through publication and scientific articles search in databases (SciELO, Pubmed, Sibi, Medline, Lilacs) with no language restriction and made available from 1964 through 2006; also, through direct contact (by e-mail) with authors of studies which are primary sources for the present study. The keywords utilized were: twin pregnancies, puerperal women, twins, nutritional recommendations and nutritional assessment.

The number of scientific material screened was 82, of which only nine studies were selected for final elaboration, because they had similar objectives to those of the present study. The studies quoted in the selected articles were excluded. The studies or articles assessed were classified as literature review, cohort, prospective and case control, with significant samples.

Two spreadsheets for recording and organizing data obtained from the summaries of each selected study were prepared including the variables: title, country of origin, author, journal and year, objectives, materials and methods, results, discussion and conclusion.

**RESULTS**

Over 85% of studies searched were carried out in the United States, demonstrating that this is the country that has the greatest number of publications on the themes assessment of and specific nutritional recommendations for women during and after twin pregnancy, followed by Mexico with one study selected.

All studies here assessed had the main goal of establishing the appropriate rates of weight gain for twin pregnancies, in order to attain the best outcomes in birth weight \((> 2,500\) g) and longer gestational time \((> 36\) weeks), aiming to reduce pre and post-gestational complications in women and fetuses.

The nutritional program most indicated and used by the authors corresponded to a 3,000-4,000 cals/day diet, according to the woman BMI, distributed as 20% proteins, 40% carbohydrates and 40% fat. Supplementation with 3 g of calcium, 1.2 g of magnesium and 45 mg of zinc, is recommended, with the prescription of two multivitamin tablets per day after the 20th week, therefore meeting 100% of the recommended daily allowances (RDA) of non-pregnant women. In addition, their food intake must be divided into three daily meals and three snacks, always emphasizing the nutritional quality of foods. These recommendations are based in the fact that pregnant women who followed such nutritional program had better outcomes regarding gestational duration, birth weight and reduced risk for pre-and post-pregnancy complications for them and their fetuses (Chart 1).

In the studies analyzed, single pregnancy was divided into three exact trimesters (in average, 13.3 weeks) periods each. For twin pregnancies, in 100% of studies, the periods were divided as: up to 20 weeks, from 20 to 28 weeks and > 28 weeks gestational age.

According to a prospective, interventional study, the BMI of the women pregnant of twins is classified differently from that of women pregnant of singlet, taking into account the pre-gestational nutritional status and the weight at the beginning of pregnancy. Research showed that the woman pregnant with twins is considered as having low weight, when her BMI \(< 19.8\) kg/m\(^2\), while the woman pregnant with a singlet is said to have low weight when her BMI \(< 18.5\) kg/m\(^2\). In twin
pregnancies, the range of BMI for euthrophism is wider (19.8 < 26.0 versus 18.5 < 24.9 kg/m²); for overweight, the range is narrower (26.1 < 29.0 versus 25.0 < 29.99 kg/m²). Pregnant women with BMI > 29.0 kg/m² are considered obese when pregnant with twins and > 29.99 kg/m², when pregnant with singlet (Charts 2, 3, 4).

Chart 2. Recommendation for weight gain per twin pregnancy period, according to assessment of the nutritional status of women, based on the body mass index

<table>
<thead>
<tr>
<th>Weekly weight gain (g)</th>
<th>Underweight (BMI &lt; 19.8 kg/m²)</th>
<th>Normal weight (BMI 19.8-26.0 kg/m²)</th>
<th>Overweight (BMI 26.1-29.0 kg/m²)</th>
<th>Obesity (BMI &gt; 29.0 kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20 weeks</td>
<td>0.56-0.78</td>
<td>0.45-0.67</td>
<td>0.45-0.56</td>
<td>0.56-0.78</td>
</tr>
<tr>
<td>20-28 weeks</td>
<td>0.67-0.78</td>
<td>0.56-0.78</td>
<td>0.45-0.67</td>
<td>0.56-0.78</td>
</tr>
<tr>
<td>&gt; 28 weeks</td>
<td>0.56</td>
<td>0.45</td>
<td>0.45</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Source: Luke et al., 2003

Chart 3. Recommendation for total weight gain per twin pregnancy period, according to assessment of the nutritional status of women based on the body mass index

<table>
<thead>
<tr>
<th>Weight gain goal (kg)</th>
<th>Underweight (BMI &lt; 19.8 kg/m²)</th>
<th>Normal weight (BMI 19.8-26.0 kg/m²)</th>
<th>Overweight (BMI 26.1-29.0 kg/m²)</th>
<th>Obesity (BMI &gt; 29.0 kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20 weeks</td>
<td>11.3-15.8</td>
<td>9.0-13.5</td>
<td>9.0-11.3</td>
<td>6.75-9.0</td>
</tr>
<tr>
<td>Up to 28 weeks</td>
<td>16.7-22.0</td>
<td>13.5-19.8</td>
<td>12.6-16.7</td>
<td>9.5-13.5</td>
</tr>
<tr>
<td>28 to 38 weeks</td>
<td>22.5-27.9</td>
<td>18.0-24.3</td>
<td>17.1-21.2</td>
<td>13.0-17.1</td>
</tr>
</tbody>
</table>

Source: Luke et al., 2003

Chart 4. Recommended weekly weight gain in (kg) in single pregnancy, according to initial nutritional status

<table>
<thead>
<tr>
<th>Periods</th>
<th>Underweight</th>
<th>Normal weight</th>
<th>Overweight</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st trimester</td>
<td>2.3</td>
<td>1.8</td>
<td>0.9</td>
<td>-</td>
</tr>
<tr>
<td>2nd and 3rd trimesters</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Total weight gain</td>
<td>12.5-18.0</td>
<td>11.5-16.0</td>
<td>7.0-11.5</td>
<td>7.0</td>
</tr>
</tbody>
</table>


Of the searched studies, only two dealt with nutritional care of puerperial women, both carried out in the United States and giving similar recommendations, being one of these studies based on questionnaires (Chart 5).

In none of the studies on puerperial women there were recommendations of portions’ size, weight gain or loss, nutritional status classification according to the BMI, nor supplementation with micronutrients, minerals and vitamins.

Chart 5. Program of daily nutritional recommendations for macronutrients and total calories for twin pregnancy

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy increase</td>
<td>36 cals/kg + 500-600 cals per baby</td>
</tr>
<tr>
<td>Proteins (%)</td>
<td>20% or 1 g/kg + 16 g/day (1st trimester)</td>
</tr>
<tr>
<td>Carbohydrates (%)</td>
<td>40% or 1 g/kg + 12 g/day (as from the 2nd trimester)</td>
</tr>
<tr>
<td>Fats (%)</td>
<td>40%</td>
</tr>
</tbody>
</table>

Source: Rimon, 2002

DISCUSSION

The studies reviewed indicate that there has been an increase in twin births since 2001. This coincides with the significant growth of in vitro fertilization, which may have led to greater interest in research in this area. In a study conducted by Mares, in 2001, it is stated that there was a 30% increase in twin pregnancies, due to the practice of assisted reproduction. According to Luke et al., in 2002, there were 132,535 births of twins in the USA, which corresponded to 94% of multiple gestations in the country.

Chart 1 shows the recommendations for distribution of macronutrients used in the nutritional program of the study by Luke et al., for women pregnant of twins. Comparing to the nutritional recommendations for singlet pregnancy, we observe an increase in the percent distribution of the recommendations of fat (40 versus 25 to 30%) and proteins (20 versus 10 to 15%); besides the reduction in the proportion of carbohydrates (40 versus 50 to 60%) in twin pregnancy. This shows the importance of proteins and lipid energy in the diet of these pregnant women, because this physiological condition involves intense tissue proliferation, fat accumulation to be used as energy stores during lactation and energy expenditure with the fetuses.

According to Hytten, twin pregnancy needs the addition of 20 g of protein per day, while in singlet pregnancy; the woman needs extra 10 g.

Roselló-Soberón recommends an increase of 150 cals/day in addition to the 300 cals/day recommended for single pregnancy, adding up to 450 cals/day accrual (Chart 6).

Analyzing the chart above, we observe that recommendations for twin pregnancies and single
pregnancies are different. The number of portions, of almost all food groups, is greater for twin pregnancy. The most significant increases are found in the recommendations for meat and its byproducts, with a five-fold increase in portions; oils and fats, three-fold; and dairy products, with a 2.5-fold increase. Portions were the same for vegetables and very similar in the groups of cereals and fruits. Recommendations for twin pregnancy do not indicate portions for sweets. Perhaps, this may be encompassed in the recommendations of fats and oils, but it is not clear in the study.

According to the assessed studies, there was a significant improvement in the outcomes fetal weight gain, gestational duration and reduction in risk of fetal and maternal complications, when they received supplementation composed by daily multivitamins with 100% non-pregnant women RDA in the first trimester, including 400 µg of folic acid and double doses of multivitamins starting in the second trimester. In addition, daily ingestion of 3 g calcium, 1.2 g magnesium, 45 mg zinc, 400 IU vitamin D and 1 g vitamin C is indicated. Newman et al. (24), on the other hand, indicated 150 mg/day vitamin C for the pregnant woman with twins, while the need of woman pregnant with singlet is 70 mg/day; and the Institute of Medicine of the United States (IOM) (25) recommends only 50 mg/day vitamin C.

The recommendations of the IOM (25) for women pregnant with more than one fetus for other micronutrients are: 15 mg zinc, 2 mg copper, 250 mg calcium, 2 mg vitamin B6, 300 µg folic acid, , 5 µg vitamin D and 30 mg iron after the 12th week, that is, lower than the other studies recommend. Calcium supplementation, for instance, is 75% higher in the other studies.

Only the study by Roselló-Soberón (20), discussed the need of iron supplementation. According to the author, the pregnant woman of twins has higher risk of developing anemia, recommending a 1.8-fold increase in iron allowance, compared to that of women pregnant of singlet. Iron deficiency (in the second and third periods of pregnancy) may be associated to preterm delivery. A four-fold higher risk for gestational anemia in the pregnant woman with twins exists when compared to the pregnant woman with singlet.

The Luke et al.’s study in 2005 (26) showed the association between zinc deficiency and iron-deficiency anemia in pregnant women, which could cause more complications before and after delivery.

Another study performed by Luke et al., in 2003 (11), with 529 pregnant women, of which 190 were enrolled in the nutritional program, demonstrated that the participating women were less prone to pre- and post-partum complications, and had appropriate and easier weight gain for their pregestational BMI, especially between the 20th and 28th weeks of gestation. The non-participating women had more than twice the chance of developing pre-eclampsia and premature rupture of membranes, besides having a three-fold greater risk for developing anemia. Gestational diabetes was not assessed in this study; however, high blood glucose levels may predispose the pregnant woman with twins to have placental infections and inflammation, which are associated to newborn weight and fetal development (26). Therefore, it is a significant variable in the incidence of complications in pregnancy, such as pre-eclampsia.

It was also observed that fetuses of mothers who participated in the program, had a significant decrease in the incidence of all aspects assessed, especially in the use of phototherapy (16% versus 37%), in neonatal ICU admissions (43% versus 62%) and in morbidity (17% versus 32%). Moreover, fetuses of women participating in the program had higher weight gain and longer gestations, as well as improved rates of all gestational intercurrences. In addition, the risk of re-hospitalization during the first three years of life of the child was lower in children of the participating mothers, and they had more weight, length and head circumference at birth and during early infancy. Regarding the nutritional status, there was no significant difference in the proportion of

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**Chart 6. Program of daily nutritional recommendations for food groups in portions, in different groups, per nutritional status of twin pregnancy and single pregnancy**

<table>
<thead>
<tr>
<th>Food groups</th>
<th>Underweight (BMI &lt; 19.8 kg/m²)</th>
<th>Normal weight (BMI 19.8-26.0 kg/m²)</th>
<th>Overweight (BMI 26.1-29.0 kg/m²)</th>
<th>Obesity (BMI &gt; 29.0 kg/m²)</th>
<th>Recommendations for single pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy products</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Cereals</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>5-9</td>
</tr>
<tr>
<td>Meats and meat by-products</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>1-2</td>
</tr>
<tr>
<td>Eggs</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Beans</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Vegetables</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4-5</td>
</tr>
<tr>
<td>Fruits</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>3-5</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>1-2</td>
</tr>
<tr>
<td>Sweets</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1-2</td>
</tr>
</tbody>
</table>

Source: Luke et. al., 2003 (11)
Pregnant women classified as eutrophic, overweight and obese. The major difference occurred in the low-weight group: 17% in those participating and 13% in those not participating. Despite this fact, all outcomes were better in the first group.

In single pregnancies, the woman’s weight, when she gets pregnant, is used to calculate pre-gestational BMI, not taking the gestational week into account. The calculation is done using the initial weight at that pregnancy, classifying the woman according to the WHO recommendations. The gestational week is taken into account when the nutritional status of the pregnant woman is established from the SISVAN/MS (2005), in which the classification considers the current weight and the gestational week as the woman. In twin pregnancy, the nutritional status classification and the gestational week are important to establish the ideal range of weight gain, as depicted in Charts 2 and 3. The classification of the nutritional status of pregnant women based on the pre-gestational BMI and their current BMI, according to the gestational week, is important because it gives consistent information for establishing recommendations of appropriate weekly and total weight gain according to the woman needs.

Total weight gain in single pregnancies varies from 7 to 18.0 kg, depending on the woman nutritional status. In twin pregnancy, this variation is greater, with the recommendation of at least 13 kg and at the most 27.9 kg, if the pregnant woman is classified as low weight. Such data express that the total weight gain for twin pregnancy is much higher, regardless of nutritional status category, and this may justify the caloric recommendation and supplementation proposed in the studies assessed.

For the woman pregnant with twins classified as eutrophic and having low weight, the recommendation of total weight gain may be 1.5 times the recommended for the single pregnant woman; for those with overweight, it is almost twice as much and for the obese ones, the recommendation is to increase up to 2.5 times as much. According to the study by Roselló-Soberón, gestational weight gain may begin before the eighth week, reaching a total gain of 16 to 20.5 kg at the end of the gestation. Weight gain lower than 385 g per week before the 24th week is associated with intra-uterine growth retardation and higher morbidity for the child, even if there is an appropriate weight gain after that period, until the end of pregnancy.

According to Luke et al., Brown and Carlson (28), the pre-gestational BMI and the classification of nutritional status are not the only indicators for warranting longer gestations, and appropriate fetal growth. In a study carried out by the author, between 1999 and 2002, comparing Hispanic Americans, non-Hispanic white and non-Hispanic black women, it was observed that despite the fact that the Hispanics had higher proportion of overweight women (26.5%) and lower proportion of eutrophic ones (56.1%) than non-Hispanic whites, they had the lowest rates of preterm deliveries (34.1% < 36 weeks and 11.3% < 32 weeks), lowest rates of low birth weight babies (48.8% < 2,500 g and 8.2% < 1,500 g), and of premature rupture of membranes (15.8%). Their mean age was lower than that of non-Hispanic whites (27.5 years versus 29.8 years), they had the highest proportion of women with medical insurance (22%) and they were the ones who smoked less (5.7% versus 13%). This may suggest that other variables should be considered during the assessment of pregnancy risk. Other indicators are, therefore, important for aiming at better outcomes concerning adequate fetal weight gain, longer gestational length and lower risk for clinical complications in the pregnant woman and the newborn. According to Roselló-Soberón, the factors influencing most in the prognosis of pregnancy are the pre-gestational weight, the weight gain during pregnancy, fetal growth, gestational time and smoking. This corroborates the results found by Luke et al., which demonstrated that cigarette smoking is an important factor when assessing gestational prognosis in twin pregnancy.

Concerning the rate of weekly weight gain, it can be noted that the recommendation for single pregnancies is higher than for twin pregnancies in almost all categories of nutritional status, in the first trimester. However, it is important to mention that in single pregnancy this first period is in average 13.3 weeks and in twin pregnancy, it corresponds to 20 weeks. The exception to this recommendation is for obese women since, in those cases, in singlet pregnancy, weight gain is not recommended in the first trimester, while in twin pregnancy, a weekly weight gain between 0.34 g and 0.45 g is recommended. In the other periods, the ranges of recommendations for women pregnant of twins, increase and are significantly higher than those of single pregnancy. For eutrophic women pregnant with twins it is recommended a weekly weight gain of 0.56 g to 0.78 g from the 20th to the 28th gestational week, while for single pregnancies, the average weight gain should be of 0.4 g starting from the second period. In the third period, these recommendations are alike for both groups. Even so, recommendations for singlet pregnancies are lower (0.4 g versus 0.45 g for eutrophic women). Hence, because of these differences in weekly recommendations, total weight gain for twin pregnancy is much higher in all nutritional status categories.

Physical activity during pregnancy is very important. It helps preventing hypertension, helps blood circulation and improves the pregnant woman’s disposition. The Centers for Disease Control and Prevention and the
American Association of Sports Medicine recommend 30 minutes or more of physical activity. However, the Guidelines for Physical Activity during pregnancy and after delivery (2002), of the American College of Obstetricians and Gynecologists, contraindicate aerobic activity for women pregnant of twins, because of the higher risk for premature rupture of the membranes.

Regarding women after delivering twins, as seen in Chart 5, the recommendation of macronutrients distribution is the same as during pregnancy (20% protein, 40% carbohydrates and 40% lipids). A daily increase of 500 to 600 calories per breastfed child is recommended for the puerperal woman of twins. The recommendation for women after singlet pregnancy is the addition of 500 cals/day. According to Rimon and Shinwell it is observed that for those women who had twin pregnancy, this is twice as much, because the milk production demand is doubled, requiring a greater calorie addition (29). Puerperal women have higher energy needs in order to warrant the appropriate production of milk and maintenance of breastfeeding. According to these author, the caloric addition may surpass 1,200 calories and attain up to 1,500 calories per day, because milk production after the second month is much higher than two liters per day. The study revealed that the puerperal woman needs a diet with higher total energy value (TEV) compared to the pregnant woman of twins, in order to maintain the necessary nutritional conditions to support breastfeeding. In single pregnancies, the recommendation is 2,700 cals/day and in twin pregnancy, of 3,000 to 4,000 cals/day. If we calculate the TEV for an eutrophic puerperal woman after having twins, weighing 70 kg, the caloric recommendation will be 3,520 cals/day (36 x 70 + 1,000) to 3,720 cals/day (36 x 70 + 1,200), which is very close to what is recommended during twin pregnancy. The greatest difference occurs between the puerperal woman of singlet pregnancy and twin pregnancy, since, in this case, the recommendation would be of 3,020 cals/day (36 x 70 + 500).

The nutritional care for puerperal women according to one study performed in 1975 with the women of the Southern California Mothers of Twins Clubs, observed that poor nutrition, vegetarianism and insufficient hydration interfere in milk production, reducing its quantity but not its quality (15). This study also verified that only 24% of the mothers started breastfeeding immediately after labor, of which 37% stopped it in the first month and only 20% were able to maintain it for four to six months. Among the several reasons for interrupting or not starting breastfeeding, the following were mentioned: rejection to the idea of breastfeeding (36%), feeling that the milk was insufficient (28%), weakness or illnesses of the mother (7%) or babies (2%), sore nipple (15%), among others.

Another study by Damato et al. (30), involving 123 women pregnant of twins of the group of mothers of twins of the United States, in Columbia, showed higher rates of breastfeeding. According to the authors, 89.4% (110) of women started nursing right after the birth of the children (around the third to fourth day postpartum). Of these women who began breastfeeding, 72.7% (n = 80) continued after the first month and 39.1% (n = 41) were able to breastfeed for at least six months. The average was of 4.5 months or 17.9 weeks. In this study, depression was the only factor identified as having significant influence in the duration of lactation. The mothers who knew more facts about the benefits of breastfeeding were able to breastfeed for longer periods. The reason most often mentioned to justify the interruption of breastfeeding, was the false idea of inadequate and insufficient milk and problems with the frequency of feeds; leaking breasts and inflamed and painful nipple. Women who breastfed for more than six weeks were able to maintain breastfeeding for longer time.

According to the above mentioned studies on puerperal women, those who had twins need nutritional follow up and support, especially to initiate and maintain breastfeeding according to the existing recommendations. In this context, nutritional guidelines are mandatory for providing energy for the mother, and should be adjusted to the energy needs which are specific for this period.

CONCLUSIONS

The studies reviewed demonstrated that the recommendations on nutrition and total weight gain are quite high for women during and after twin pregnancy. The results found, showed that nutritional guidance, adequacy of the diet and gestational follow-up share a close relation with the increase in the birth weight, longer gestational period, lower risk of pre and post-partum complications for mother and fetus. It is suggested that pregnant woman of twins must eat from 3,000 to 4,000 cals/day, as well as supplement some micronutrients, according to IOM (15 mg zinc; 2 mg copper; 250 mg calcium; 2 mg vitamin B6; 300 µg folic acid; 50 mg vitamin C; 5 µg vitamin D and 30 mg iron as from the 12th week). Macronutrients distribution should be 20% protein (50% of high biologic value), 40% carbohydrates and 40% lipids. The number of portions of dairy products, meats and equivalent, cereals, fruits, vegetables, and fats and oils, should also be increased in order to meet the total energy value of the diet. Besides this, these women should eat three meals a day and three snacks. The aim is to ensure weight gain appropriate to the nutritional status of the woman, never forgetting the quality of the nutrition.
Regarding puerperal women of twins, there are very few studies about nutritional assessment and specific recommendations. What could be seen is that these women have problems in starting breastfeeding and, especially, in maintaining it for at least six months. They need a great deal of emotional, psychological and nutritional support, because there are many difficulties for starting and maintaining breastfeeding. Regarding the recommendations found, it can be seen that the indication for the daily addition of 500 to 600 cals/day per child, with no mention to the amount of portions for the different food groups or supplementation with micronutrients. The distribution of macronutrients is the same as during twin pregnancy (20% of protein, 40% of carbohydrates and 40% of lipids).

Therefore, it is necessary to develop a program of nutritional guidance and specific recommendations of weight gain, macronutrient distribution and total calories in the diet for women during and after twin pregnancy. Therefore, there will be an improvement in the quality of care delivered to this population, to attain the highest levels in satisfaction and improve the outcomes for the pregnant woman, fetuses and the nutrition team.

REFERENCES