Croat Nurs J. 2022; 6(2): 111-119

Examination of Complications and Differentiating Factors (Method of Conception, Nutritional Status, Weight Gain) in Twin Pregnancies

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Article received: 06.04.2022

Article accepted: 06.07.2022.

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https://doi.org/10.24141/2/6/2/2

Keywords: twin pregnancies, nutritional status, complications

Abstract

Introduction. The aim of our study was to examine the complications and differentiating factors (method of conception, nutritional status, rate of weight gain) of twin pregnancies.

Methods. In our quantitative, cross-sectional, retrospective study we examined medical data sheets of women pregnant with twins (N=89) in the western regions of Transdanubia, Hungary.

Results. Conditions occurring during pregnancy affected almost half of the mothers. Hypertension and preeclampsia are increased risk factors among the complications of twin pregnancies, independently of the method of conception ($p>0.05$). Abnormal weight gain during pregnancy was observed in half of the mothers. Weight before pregnancy is a strong predictor of weight gain during pregnancy ($p<0.05$).

Conclusion. Our research showed that abnormal weight gain and obesity during twin pregnancy has a negative effect on maternal health, and correlates with maternal complications (hypertension/preeclampsia, gestational diabetes). Effective and preventative strategies are necessary, already during pregnancy planning, to prevent obesity before pregnancy.

Introduction

Nowadays, scientific advances have led to an increase in the use of ovulation inducement treatments to help infertile couples, as well as artificial reproductions like insemination and in vitro fertilization, which have led to a large increase in twin pregnancies, particularly dizygotic and polygynous pregnancies. The frequency of twin pregnancies worldwide is 1/85, while triplets and quadruplets are much rarer. Several studies show that the frequency of twin pregnancies changes yearly, changes according to geographical locations, and sometimes unknown or hidden factors influence the statistics (1). Considering the development and possible complications of twin pregnancies, it can be regarded as a special pregnancy-pathologic condition.

Obesity is becoming a worldwide issue with data from WHO 2013 showing that the rate of obesity doubled since 1980. Obesity is a global issue, and Hungary is affected, too; based on data from 2017, obesity in adults is among the highest in the EU. In 2017, one out of five adults were obese, and the rate has increased during the last decade (2). In addition, the number of overweight and obese women of reproductive age has increased in the last decade. In the US, approximately 60% of women of reproductive age are affected (3). This number corresponds to 18.5-38.3% of pregnant women in the US and is the most frequent cause of high-risk maternal complications (4). Prevalence of maternal obesity has risen from 11% to 21% in Canada, and is one of the most crucial challenges for the healthcare system, considering the cost implications of maternal and child morbidity (5). In a study by Lahti-Pulkkinen et al, the ratio of maternal obesity (n=118 021) increased from 3.1% (1950-1959) to 15.7% (2000-2011), and obese women were older, had higher parity, and higher socioeconomic status (6). In another study by Vernini et al, 22.7% of pregnant women were overweight and 27.6% were obese, which increased the risk of hypertension and gestational diabetes (7). Hypertension is a frequently occurring issue during pregnancy and may cause complications in 5-10% of pregnancies. In the study by Fitirani et al, 33% of obese, 50% of overweight, and 16.7% of pregnant women with normal BMI had hypertension (8). Both systolic and diastolic blood pressure values are elevated in overweight and obese women (9). Preeclampsia occurs in every second woman with maternal obesity (55.9%), while the number for women with normal nutritional status is 20.1%. Parantika and colleagues identified twin pregnancy and obesity as risk factors for preeclampsia. Certain maternal factors independently influence the outcome of twin pregnancies. Extra attention is necessary for women with twin pregnancy because the weight gain during pregnancy is more profound than in a singleton pregnancy. Obesity due to excessive weight gain is more likely in twin pregnancies and it may incur risk factors for both the mother and the fetus. These complications include gestational diabetes, hypertension, anemia, and preeclampsia (1,10,11). The incidence of preeclampsia is higher in twin pregnancies and the pathophysiological process differs from singleton pregnancies in atypical occurrence, faster progression, faster onset of symptoms, and exacerbations (12-14). The frequency of preeclampsia is 3.5 times higher in twin pregnancies than in singleton pregnancies. In addition, the chance to develop extreme hypertension is 3-4 times higher in twin pregnancies (15). The occurrence of gestational hypertension is proportional to the number of fetuses; 6.5% for singletons, 12.7% for twins, and 20% for triplets (14). Studies show that preeclampsia is more frequently occurring in twin pregnancies with assisted reproduction than in pregnancies with natural conception. Preeclampsia in twins conceived by assisted reproductive technology increases the risk of preterm birth, small for gestational age babies, and cesarean section (15). These findings might be explained by the higher rate and co-occurrence of risk factors (for example advanced maternal age) in women in need of in vitro fertilization (16). In twin pregnancies, the occurrence of preterm birth (31-36%), small for gestational age baby (mean=2300 g), and complications (6.8%) is higher than in singletons (17). Maternal complications of twin pregnancy include prolonged delivery due to weakness of childbirth pain, placental insufficiency, premature placental separation, and impaired contraction of the uterus after delivery. Fetal complications include polyhydramnios, and postural, lying, and implantation abnormalities.

Aim

The aim of our study was to examine the complications and differentiating factors (method of conception, nutritional status, rate of weight gain) of twin

pregnancies. We wanted to see the types of diseases occurring before and during twin pregnancy, and we wanted to assess the body weight before and during pregnancy, weight change, and the possible complications of abnormal weight gain.

Methods

Our cross-sectional, retrospective study was carried out in the western regions of Transdanubia, Hungary. Permission for the study was provided by the directors of the healthcare institutes. Data acquisition and processing as conducted according to the Declaration of Helsinki (18). Between 1995 and 2018, medical data sheets of women pregnant with twins (N=89) and of their twin babies (N=183) were analyzed. Parameters collected from the data sheet included the mother's biographical data (age, marital status, highest education, location), previous pregnancies, diseases before and during pregnancy, weight gain during pregnancy, nutritional status, diseases in the family, possible medical treatments, drug sensitivity, method of conception and course of pregnancy, way of giving birth. Parameters collected from the data sheets of the infants included biographical data of the twins (gender, year and place of birth), somatometric information at birth (weight, length, head and chest circumference), possible abnormalities, Apgar 1-min and 5-min values, gestational age at birth. For sampling, a single expert sampling method was used within the target population. The study group consisted of women who gave birth to twins in hospitals and also received prenatal care.

Statistics

For the statistical analysis, we used SPSS 22.0 software package. Besides descriptive statistics, we used the Chi-square test, Student's t-test, and correlation analysis to analyze our data ($p<0.05$). Presentation of frequency values included confidence intervals (19,20).

Results

We collected and analyzed medical data sheets of women pregnant with twins and health data of their twins in nursing districts. We included medical data sheets of women pregnant with twins (n=89) and of their twin babies (n=183). Mothers to twins were most commonly married (76.4%), but some of them were single (5.62%), divorced (1.12%), or in a civil partnership (16.85%). Most mothers had university (41.57%), few had elementary school (4.49%), some had GCSE (31.46%), and vocational school (16.85%), while a few of them had more than secondary education but no degree (5.62%) as the highest level of education. Altogether, 83.15% of respondents were living in a city and 16.85% were living in a village. The mean age of pregnant mothers at childbirth was 30.8 years (SD=5.50). The youngest was 18 and the oldest was 42 years old. According to the literature, advanced maternal age starts at age 35 (21). One-fourth of our sample (26.97%) belonged to advanced maternal age. A total of 85.39% of pregnancies were planned and 14.61% were unplanned. In terms of conception, 56.18% were spontaneous and 43.82% were assisted reproduction (6.74% insemination, 37.08% in vitro fertilization). The use of assisted reproduction techniques was statistically more common in mothers over the age of 35 (62.5%) than in those under 35 (36.9%) (Chi-square=4.658; p=0.031). All pregnancies (N=89) lead to childbirth. A total of 56.18% of childbirth was preterm. Twin pregnancies ended in spontaneous delivery (13.48%), cesarean section (85.39%), and vacuum extraction (1.12%). The time of birth did not correlate with the method of conception (Chi-square=1.77; p=0.183), but the method of childbirth did (Chi-square=4.305; p=0.038). A total of 94.87% of pregnancies by assisted reproduction ended with cesarean section, most of which (62.5%) were in women over 35 years. Twins were born on average at 35.45th gestational week. Most of the twin pairs were born between gestational weeks 31 and 36 (49.44%) or 37 and 40 (43.82%). The fewest births happened between weeks 26 and 30 (6.74%). The earliest childbirth happened on the 26th week, the latest happened on the 40th week of gestation. Triplets occurred in 6 cases (7.86%). Most of the twins were dichorionic (69.66%), which occurred in 75.38% in the age group 20-35, and 68.42% in

the age group 36-45; no statistically significant difference was present (Chi-square=0.36; p=0.54). Almost all (90.91%) of the monochorionic twins were naturally conceived (Chi-square=15.665; p<0.001). In terms of gender, 51.37% were boys and 48.63% were girls. Based on birth weight (mean=2314 g), the twins had small (<2500 g; 59.56%) and average (2500-4000 g; 40.44%) weight.

A key pillar of our research was to map out maternal risk factors. We were able to identify 17 familially occurring diseases in the medical data, and we categorized them into 8 groups. The medical history contained no familially occurring disease in 32 cases (36.36%). The most commonly occurring diseases in the families of pregnant women were hypertension (14.77%) and cancer (18.18%). Besides those, other diseases occurring in the families were diabetes (4.55%), obesity (6.82%), allergy/asthma (5.68%), thrombosis (3.41%), cardiovascular diseases, infarction, and stroke (10.23%). Other categories had single occurrences of GI disorder, renal and urinary disease, behavioral disorder, hearing disorder, schizophrenia, dislocated hip, hematologic disorder, autism, mental retardation, and developmental abnormality.

We also examined whether the mothers had any underlying diseases or surgical procedures before pregnancy. Possibly occurring underlying diseases included obesity, hypertension, diabetes mellitus, endometriosis, polycystic ovarian syndrome, hypothyroidism, antiphospholipid syndrome, ectopic pregnancy, previous miscarriage, chickenpox, scarlet fever, asthma, allergy, depression, hernias (spinal, inguinal), scoliosis, kidney stone. Sorting these problems occurring before pregnancy, we can conclude that 21.35% of participants had gynaecological, 19.1% had other, and 59.55% had no diseases affecting their condition. Issues occurring before pregnancy showed no correlation to the method of conception (Chi-square=0.28; p=0.59). Assessing the conditions that were also present during twin pregnancies was crucial for us. Our results showed no disease during pregnancy in 44 cases (49.44%). A total of 15 twin pregnant mothers had diabetes (16.85%), 8 had hypertension (8.99%), 4 had preeclampsia (4.49%), and 3 had hypertension, preeclampsia, and diabetes co-occurring (3.37%). The remaining 15 mothers (16.85%) had other diseases, for example, obesity, hyperemesis gravidarum, risk of miscarriage/preterm birth, dyspnea, premature placental separation, and varicosity in veins. Figure 1 shows that the method of conception for twin pregnancy wasn't associated with the occurrence of diseases during pregnancy (Chi-square=0.54; p=0.46); changes were comparable, with almost similar frequency, in spontaneous conception and conception using assisted reproduction techniques.

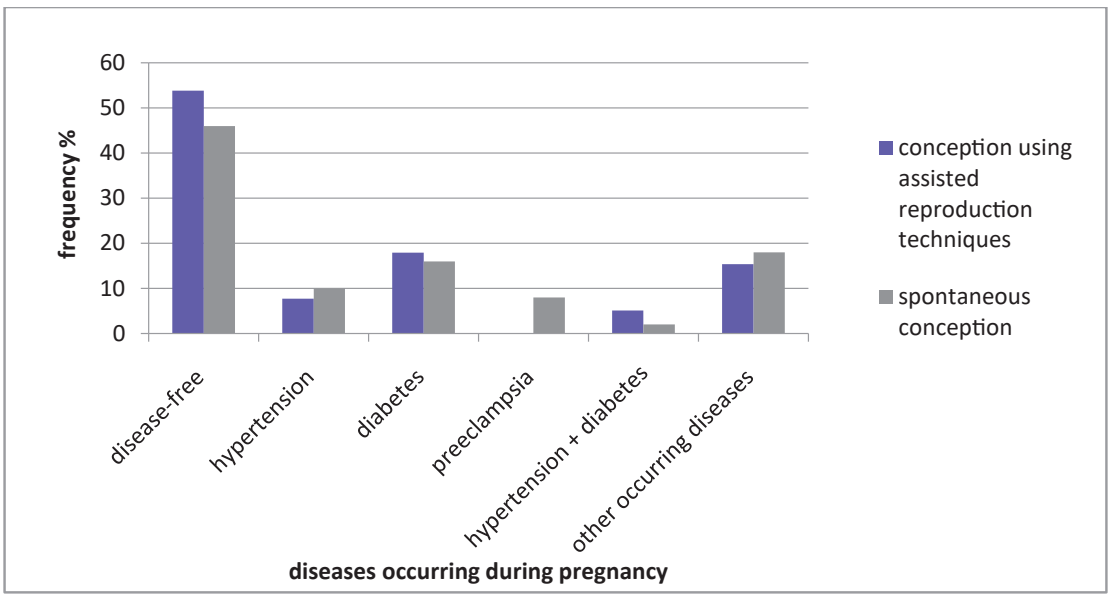

Figure 1. **Incidence of diseases occurring during pregnancy depending on the method of conception in our sample (N=89)**

Among the participants, the body weight measured at first admission was 68.84 kg (SD=17.17 kg; min=46 kg, max=130 kg). Based on their nutritional status (BMI), 8.99% of pregnant women belonged to underweight (<16-18.49 kg/m^2), 53.93% belong to healthy (18.5-24.99 kg/m^2), 21.35% belonged to overweight (25-29.99 kg/m^2), and 15.73% belonged to obese (>30 kg/m^2) category. We summarized the weight gain during pregnancy - the smallest gain was 5 kg, and the biggest gain was 37 kg (mean=15.08 kg, SD=7.87 kg). The age of mothers showed no association with either the baseline BMI at the beginning of pregnancy (r=0.051; *p*=0.159), or the rate of weight gain (r=0.102; *p*=0.342), but a higher baseline BMI correlated with greater weight gain. We further analyzed our data and grouped our subjects into 2 groups based on their weight gain; altogether, 51.69% showed normal and 48.31% showed abnormal weight gain. The rate of weight gain during pregnancy was determined relative to baseline BMI. For a baseline BMI of 19.8 or below, the recommended weight gain is 12-18 kg throughout pregnancy, for 19.9-25.9 BMI the recommendation is about 11.5-16 kg, for pre-pregnancy overweight women the recommended weight gain is 7-11.5 kg throughout pregnancy, and in case of obesity the maximum weight gain is 6 kg (22). The biggest weight gain was observed in those mothers who were overweight or obese before their twin pregnancy and belonged to the abnormal weight gain group (66.67%). In the normal weight gain group, a greater change was observed in pregnant women with normal BMI (66.67%). Weight gain during pregnancy showed a significant difference with baseline BMI at the beginning of pregnancy (Chi-square=10.97; *p*=0.0041). More extensive, abnormal weight gain was more common in women who had a BMI over normal at the beginning of pregnancy (Figure 2).

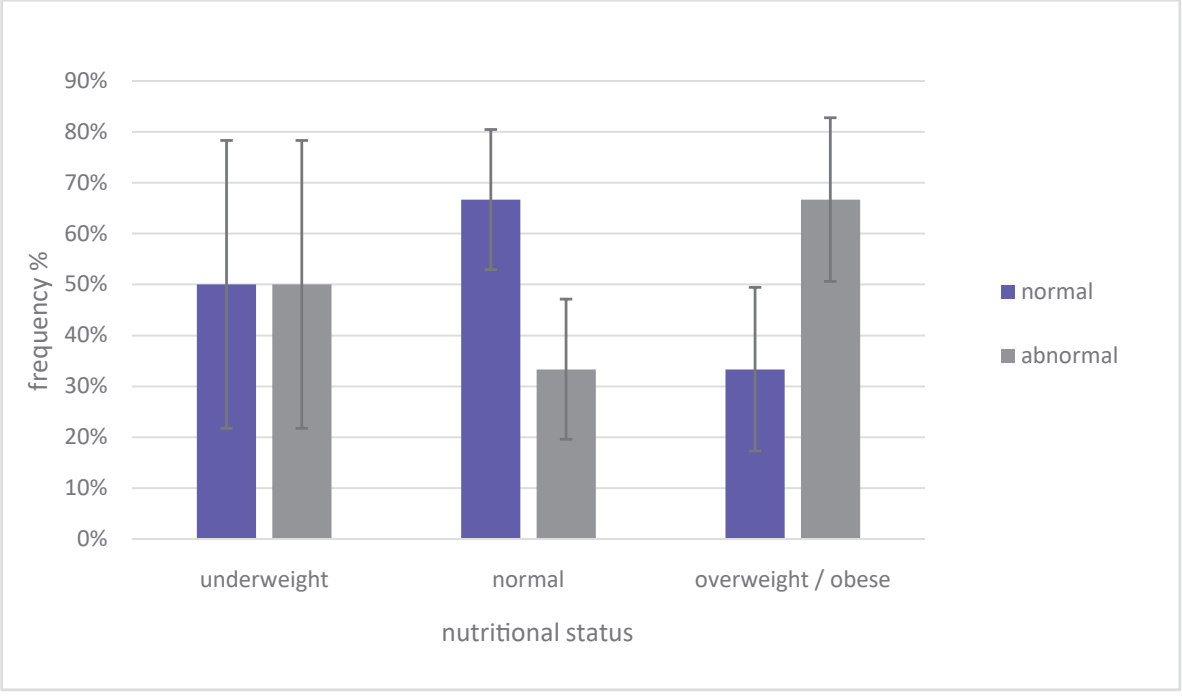

Figure 2. **Weight gain during pregnancy depending on nutritional status in our sample (N=89)**

We created 2 groups, one experienced complications during pregnancy, the other did not, and we analyzed these 2 groups in terms of nutritional status. Using a one-tail t-test we found a higher baseline BMI in the group that had complications (t(87)1.693; p=0.05) (BMI with complications: 25.75 kg/m^2; BMI without complications: 22.51 kg/m^2), but there was no significant difference in the mean weight gain (t(87)0.659; p=0.512) (mean BMI 16.36 kg/15.25 kg). Mean BMI was comparable according to the method of conception (t(87)0.868; p=0.388) (natural: 25.1 kg/m^2; assisted reproduction: 24.05 kg/m^2) but this difference is not significant.

We found evidence that health issues are more common during pregnancy in overweight/obese mothers. Figure 3 shows that the most common issues in twin pregnancy were hypertension, preeclampsia, and diabetes. Pregnant women in the underweight/healthy BMI categories were more frequently disease-free (37.21%) than overweight/obese pregnant women (13.95%). Hypertension/preeclampsia was more common in overweight/obese (13.95%) than in underweight/healthy women (6.98%). In terms of diabetes and its occurrence, it was slightly more common among overweight/obese (9.3%) than in underweight/healthy pregnant women (8.14%). Additionally, we examined other occurring diseases that were more common in underweight/healthy (11.63%) than in overweight/obese pregnant women (5.81%). It is clear in Figure 3 how frequently health issues occurred regarding nutritional status in women with twin pregnancies.

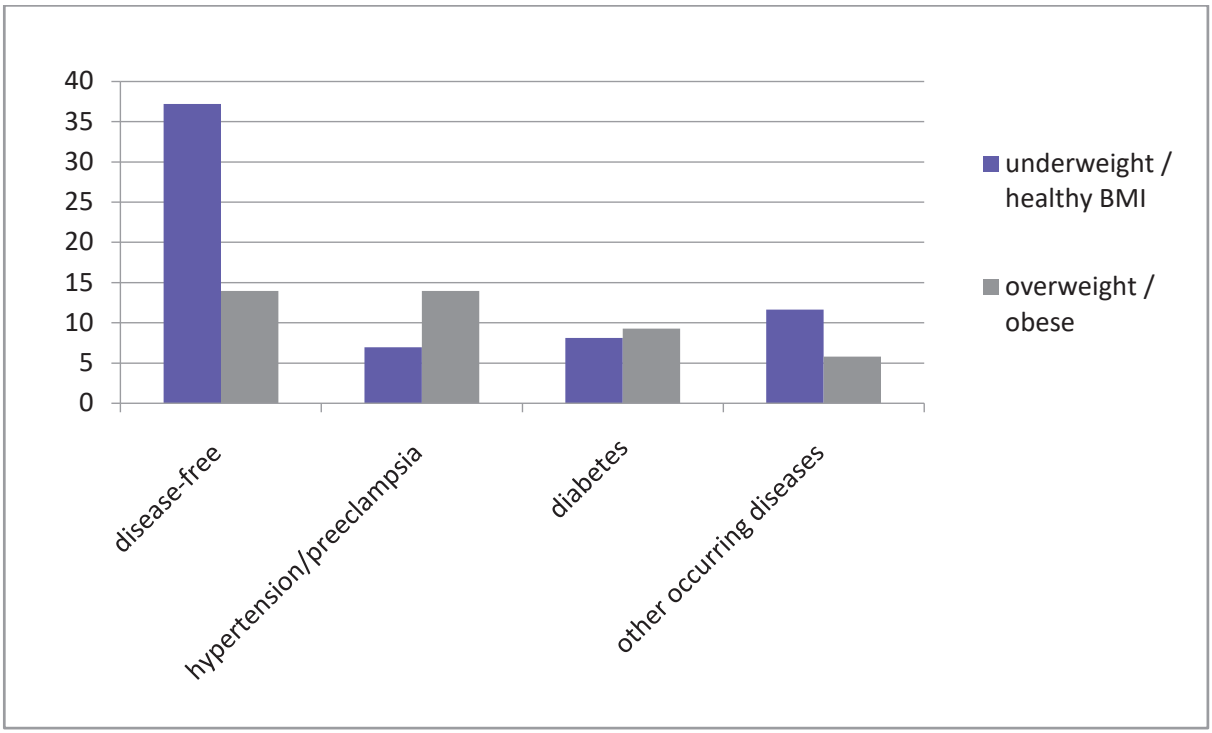

Figure 3. **Incidence of diseases occurring during pregnancy depending on nutritional status in our sample (N=89)**

Discussion

In our document analysis, the participants (N=89) had an even distribution in terms of natural conception versus assisted reproduction techniques, and the latter had a higher frequency of cesarean section (85.39%; $p<0.05$) that correlated with the advanced age of the mothers. Preterm birth was more common (56.18%) in our sample and the newborns (n=183) had a smaller birth weight (mean=2314 g) than observed in singleton pregnancies, but our results matched those of Santana et al (17). One-third of pregnancies were monochorionic, which was more likely in natural conceptions ($p<0.05$). A total of 40% of pregnant women had some kind of underlying condition before pregnancy, half of which were gynaecological. Conditions occurring during pregnancy affected almost half of the mothers, and the most common were gestational diabetes, hypertension, and preeclampsia. These last 2 diseases had a 13.48% occurrence rate, which is similar to the research of Narang et al (12.7%) (14). In agreement with international research data (12-14), we also found that hypertension and preeclampsia are increased risk factors among the complications of twin pregnancies. Health conditions occurring during twin pregnancy were independent of the method of conception ($p>0.05$) which contradicts the results of Want et al (15). Independently of the maternal age ($p>0.05$), more than one-third of our participants were over the normal nutritional status, which corresponds to international research (5-7). Abnormal weight gain during pregnancy was observed in half of the participants, which was not influenced by maternal age ($p>0.05$). A higher baseline BMI corresponded to a greater weight gain ($p<0.05$) and abnormal weight gain ($p<0.05$). In our study, matching the international research data, the abnormal maternal BMI, being overweight or obese increased the risk of hypertension/preeclampsia (7-11) and gestational diabetes (7,10,11). Our research showed that abnormal weight gain during twin pregnancy has a negative effect on maternal health, and obesity correlates with an increased risk of maternal complications. Our results point out that obese women with twin pregnancy have an extremely high risk in terms of gestational diabetes, gestational hypertension, and preeclampsia. Effective and preventative strategies are necessary, already during pregnancy planning. The effort to prevent obesity before pregnancy should focus on children, adolescents, and young women; besides education, acquiring practical knowledge in identifying and maintaining the optimal weight, and, in case of weight gain, assessing the nutritional and lifestyle factors are essential. The aim of preconception care is to provide the best possible health conditions for the mother and the unborn baby and to prevent maternal and fetal complications of pregnancy and developmental abnormalities. Twin pregnancy should be treated as high-risk pregnancy to mitigate the risks. Treatment with a supporting multidisciplinary approach can optimize and improve the health of the mother and the offspring. As part of the team besides doctors, nurses, midwives, and advanced practice nurses can identify risk factors, make health plans, recognize acute conditions, coordinate future care for patients, and monitor the condition of pregnant women (23,24). In the process of care, from preconception to the postnatal period, it is important for the pregnancy care team to be continuously present, pay attention, provide professional support, educate people in care, and to support risk groups. Further observational research is necessary for this topic to map out background factors because many areas are assessed only from the standpoint of a singleton pregnancy.

The research was financed and supported by the Human Resource Development Operational Programme of the Ministry for Human Capacities within the HRDOP-3.6.1-16-2016-00004 Comprehensive Development for Implementing Smart Specialization Strategies at the University of Pécs. The project has been supported by the European Union and co-financed by the European Social Fund.

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ISPITIVANJE KOMPLIKACIJA I DIFERENCIJACIJSKIH ČIMBENIKA (NAČIN ZAČEĆA, STANJE UHRANJENOSTI, POVEĆANJE TJELESNE TEŽINE) U BLIZANAČKIM TRUDNOĆAMA

SAŽETAK

Uvod. U današnje vrijeme, zbog visoke razine znanstvenog napretka, tretmani indukcije ovulacije za pomoć neplodnim parovima postali su sve rašireniji, što je rezultiralo velikim porastom broja blizanačkih trudnoća. Cilj našeg istraživanja bio je procijeniti komplikacije blizanačke trudnoće i njezine diferencirajuće čimbenike (način začeća, nutritivni status, stupanj debljanja).

Metode. Naše kvantitativno, presječno, retrospektivno istraživanje provedeno je u Mađarskoj, Zapadnom Podunavlju, analizom sadržaja zdravstvene dokumentacije trudnica (N=89).

Rezultati. Gotovo polovica majki razvila je određene komplikacije tijekom trudnoće. Komplikacijama u blizanačkoj trudnoći mogu se smatrati povećani čimbenici rizika za hipertenziju/preeklampsiju, na koje nije utjecao način začeća (p>0,05). Na temelju naših rezultata, abnormalno povećanje tjelesne težine bilo je mjerljivo kod svake druge trudnice. Tjelesna težina prije začeća značajno je odredila stopu debljanja tijekom trudnoće (p<0,05). Naša studija potvrđuje da abnormalno povećanje tjelesne težine i pretilost tijekom blizanačkih trudnoća negativno utječu na zdravlje majki te su povezani s rizikom od komplikacija (hipertenzija/preeklampsija, gestacijski *diabetes melitus*).

Zaključak. Kako bi se spriječila pretilost prije trudnoće, već su tijekom planiranja trudnoće potrebne učinkovite i preventivne strategije.

Ključne riječi: blizanačke trudnoće, nutricijski status, komplikacije