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The influence of physical activity on pregnancy evolution and the newborn's weight

Influența activității fizice asupra evoluției sarcinii și greutății nou-născutului

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Abstract

Backround. The indications regarding the level of physical activity during pregnancy comply with the recommendations for healthy individuals to complete a minimum of 30 minutes/day physical activity to ensure an optimal health condition.

Aims. The purpose of this paper is to demonstrate the benefits of physical activity sustained by pregnant women on the pregnancy evolution and anthropometric data of the mother and the newborn.

Methods. The research is based on an analytical observational study, conducted on a sample of 85 pregnant women from Mureș county, Romania. The study was performed between October 2015 - January 2016 and the data were collected based on an interview with 20 open questions.

Results. We identified a significant association between a sedentary lifestyle and weight gain outside the recommendations during pregnancy ($p<0.0001$). Sustained physical activity during pregnancy represented a protective factor against inadequate weight in newborns ($p=0.001$). Physical inactivity was not a risk factor for birth through cesarean section ($p=0.637$), gestational age classification outside the standards ($p=0.155$), or the occurrence of difficulties in breastfeeding ($p=0.296$).

Conclusions. Lack of physical activity during pregnancy is a risk factor resulting in inadequate anthropometric data in both the mother and newborn. Sustained physical activity among pregnant women is not a negative factor in the development of pregnancy.

Keywords: physical activity, pregnancy, weight gain, newborn, breastfeeding

Rezumat

Premize. Indicațiile privind nivelul de activitate fizică în timpul sarcinii respectă recomandările pentru indivizii sănătoși, și anume, de un minim de 30 de minute/zi pentru asigurarea stării optime de sănătate.

Obiective. Scopul lucrării este de a demonstra beneficiile activității fizice în cazul femeilor însărcinate asupra evoluției sarcinii, asupra datelor antropometrice ale mamei, respectiv ale nou-născutului.

Metode. Cercetarea se bazează pe un studiu de tip analitic observațional realizat pe un eșantion de 85 de femei însărcinate cu domiciliul în județul Mureș, România. Perioada de desfășurare a studiului a fost octombrie 2015-ianuarie 2016, iar datele au fost preluate pe baza unui interviu cu 20 de întrebări deschise.

Rezultate. S-au observat asocieri semnificative între sedentarism și greutatea crescută peste recomandări în timpul sarcinii ($p<0.0001$), activitatea fizică susținută în timpul sarcinii fiind un factor protector împotriva greutății nepotrivite la nou-născut ($p=0.001$). Sedentarismul nu a reprezentat un factor de risc pentru nașterea prin operație cezariană ($p=0.637$), încadrarea vârstei gestaționale în afara standardelor ($p=0.155$) sau apariția dificultăților la alăptare ($p=0.296$).

Concluzii. Lipsa activității fizice în timpul sarcinii reprezintă un factor de risc în apariția datelor antropometrice necorespunzătoare la mamă și la nou născut. Activitatea fizică susținută în rândul femeilor însărcinate nu este un factor negativ în evoluția sarcinii.

Cuvinte cheie: activitate fizică, sarcină, creștere în greutate, nou-născut, alăptare.

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Introduction

The benefits of physical activity to health are huge and are felt in the long and short term. In the case of pregnant women, recommendations are to perform 30 minutes/day physical activity (PA), which is applicable to all healthy individuals in order to ensure optimal health (Thompson et al., 2015).

Physical exercise during pregnancy has significant benefits for maternal health and the development of pregnancy. Thus, a moderate-intensity effort can lead to a decrease in the severity of postnatal depression symptoms (Robledo-Colonia et al., 2012), an improvement in mood (Poudevigne & O'Connor, 2006), prevention of abnormal weight gain during pregnancy, and the possibility to reduce postpartum weight retention (Weissgerber et al., 2006). The influence of PA on the health of newborns is assessed by correlating the weight gained during pregnancy (which is influenced by PA), with the child's weight and length, the correlation being significant: an appropriate weight gained by the mother during pregnancy is related to a proper weight of the child (Bodnar et al., 2011; Hadmaş et al., 2015; Oken et al., 2009; Sen et al., 2010).

Hypothesis

The objective of the study was to monitor the rate of PA among pregnant women and to assess its benefits for pregnancy and maternal health, as well as the impact on the newborn's anthropometric data.

Materials and methods

Research protocol

Data collection and analysis was initiated after obtaining the written consent of the subjects to participate in the study. The data obtained were used to perform an analytical observational study.

a) Period and place of the research

The study was conducted between October 2015 - January 2016, in Mureș county, Romania.

b) Subjects and groups

In order to conduct the study, we analyzed a sample of 85 female subjects. The inclusion criteria in the study were: mothers who gave birth between July-August 2015, without diagnosed chronic diseases, aged between 18-40 years, having residence in Mureş county.

c) Test applied

Data were collected based on an interview with 20 open questions concerning: demographic data, personal data, anthropometric data before conception, weight gained during pregnancy, sustained physical activity levels during pregnancy, the newborn's health, and anthropometric data at birth.

Weight and length considered normal for the newborn were: 2500-4000 grams and 48-54 cm. Gestational age was considered appropriate in the range of 37-41 weeks (Stamatin & Păduraru, 2009; Aujard et al., 1997). To evaluate maternal body weight, calculation of BMI (body mass index) was used. The normal weight gained during pregnancy was established in relation to the BMI value. The weight gain considered adequate according to BMI value interpretation was: 13-18 kg for underweight, 11-16 kg for normal weight, 7-11 kg for overweight, and 5-9 kg for obese status (Hadmaş et al., 2015; Lammi Keefe et al., 2008; Whitney & Rolfes, 2009).

d) Statistical processing

Statistical tests were performed using GraphPad Prism 5.0. software. The evaluation tests used were: Fisher's exact test, Pearson correlation, standard deviation (SD), mean, minimum/maximum values.

Results

A percentage of 77.64% (n=66) of the subjects included in the study were from urban areas and 22.35% (n=19) were from rural areas. The mean age of the participants was 27.68 years, with a minimum of 18, and a maximum of 36 years. Classification by age was performed as follows: 3.52% (n=3) were aged under 20 years, 61.18% (n=52) were aged between 21-30 years, and 35.29% (n=30) were older than 30 years.

In order to characterize the education level of the mothers, four categories were considered: middle school, high school, university and post-university degrees. Thus, 14% of the subjects (n=12) had completed secondary school, 27.4% (n=21) had high school education, 49.4% (n=42) were college graduates, and 11.76% (n=10) had postgraduate studies. When analyzing the weight gained during pregnancy, we identified an average value of 16.45 kg, with a minimum of 7 kg, and a maximum of 30 kg. Depending on the gestational age of the subjects, these were classified as follows: 24.71% (n=21) had a premature birth, 74.11% (n=63) gave birth at term, and 1.17% (n=1) had a postmature birth. The mean gestational age was 37.87, with a minimum value of 27 and a maximum value of 43 weeks. From the point of view of the type of birth, 64.7% (n = 55) had a vaginal birth, and 35.29% (n = 30) had a cesarean section birth.

The level of physical activity was characterized as follows: 34.11% (n=29) completed a minimum of 30 minutes/day physical activity, while 66.88% (n=56) exercised less than 30 minutes/day, or not at all. Among the individuals who performed regular physical activity, the minimum value recorded was 30 minutes/day, and the maximum value was 120 minutes/day, with an average of 48.03 minutes/day, the activity being characterized as low/moderate intensity. Birth weight was normal in 71.76% of cases (n=61), low in 2.35% (n=2), and high in 25.88% of cases (n=22). The minimum weight recorded was 2450 grams, and maximum weight was 4600 grams, with an average value of 3520 grams.

In terms of breastfeeding, 80% (n=68) of the subjects did not encounter difficulties in feeding their newborn with breast milk, and 20% (n=17) had an insufficient amount of breast milk. A statistically significant correlation ($p=0.0002$) was established between PA and the weight gained during pregnancy. Sedentary pregnant women were predisposed to an abnormal increase in weight during pregnancy (OR = 6.50, 95% CI: 2.40-17.58); the risk of having a higher weight than recommended was significant ($p <0.0001$; OR = 29.290, 95% CI: 6.059 to 141.5).

In this group, no significant correlation between a sedentary lifestyle and gestational age outside the standards was obtained ($p = 0.296$; OR = 2.092, 95% CI: 0.683 to

Table I
The Fisher's exact test results in calculating sedentary lifestyle risk on certain factors.

Risk category	Sensitivity (95% CI)	Specificity (95% CI)	Predictive value	
			Positive (95% CI)	Negative (95% CI)
A	0.366 (0.199 to 0.561)	0.685 (0.544 to 0.804)	0.392 (0.215 to 0.594)	0.66 (0.521 to 0.781)
B	0.82 (0.685 to 0.914)	0.588 (0.407 to 0.753)	0.745 (0.61 to 0.853)	0.689 (0.491 to 0.847)
C	0.772 (0.546 to 0.912)	0.381 (0.261 to 0.512)	0.303 (0.187 to 0.441)	0.827 (0.642 to 0.941)
D	0.916 (0.730 to 0.989)	0.433 (0.305 to 0.567)	0.392 (0.265 to 0.532)	0.928 (0.765 to 0.991)
E	0.812 (0.543 to 0.959)	0.388 (0.271 to 0.515)	0.24 (0.134 to 0.376)	0.896 (0.726 to 0.978)

6.410). Insignificant data were also obtained in the case of reported sedentary lifestyle and breastfeeding difficulties (p=0.155; OR=2.748, 95% CI: 0.713 to 10.58).

No statistically significant risk was observed between physical inactivity and the risk of birth through cesarean section, OR = 1.26 (CI 95%: 0.492 to 3.222; p=0.637). Therefore, physical activity was not a protective factor against cesarean section in this group.

We determined a significant influence of low level physical activity on the child's weight status at birth (p=0.001), the newborn beeing predisposed to an inappropriate birth weight in relation to gestational age and length (OR = 8.412, CI95%: 1.812 to 39.05).

In Table I, we presented additional statistical data obtained after performing the Fisher's exact test, in order to associate the sedentary lifestyle with the risk of birth through cesarean section (A), the risk of abnormal weight gain during pregnancy (B), the risk of birth at a gestational age beyond normal limits (C), the risk of having a child with an inappropriate birth weight (D) and the risk of difficulties during the lactation period (E).

Table II presents the correlations between PA during pregnancy and the mother's education level, age, and environment of origin.

Table II
PA correlation with maternal data.

Indicator	r	95% CI	p value
Level of education	0.245	0.034 to 0.436	0.02
Maternal age	0.078	-0.137 to 0.286	0.477
Environment of origin	-0.186	-0.382 to 0.030	0.092

Discussions

The most statistically significant association in the studied group was the correlation between a sedentary lifestyle and abnormal weight gain during pregnancy. Physical inactivity is a major risk factor (OR=29.290) for weight gain over the ideal range, during pregnancy. Similar data to those obtained by us were highlighted by Haakstad et al. in 2007, which were relevant for pregnant women in the third trimester (Haakstad et al., 2007). A meta-analysis conducted in 2013, which included the analysis of 11 studies, concluded that aerobic exercise plays a role in weight gain control during pregnancy (Lamina & Aqbanusi, 2013). Activities such as swimming, aerobic exercise or walking cannot pose risks to maternal or fetal health (Korsten-Reak, 2010). Like us, Ghodsi et al. demonstrated in their research that there is a positive significant correlation between a sedentary lifestyle and weight gain during pregnancy. In their opinion, the effort performed (aerobic or anaerobic) influences the importance of the results obtained; however, this study did not establish differences between the types of activities (Ghodsi & Asltoghiri, 2012a).

Regarding birth weight, our results were statistically significant. Some literature data support our results, and some do not (Ghodsi & Asltoghiri, 2012b). One of the studies that established a connection between physical activity and birth weight was that of Marquez-Sterling et al.; however, their data were not statistically significant (Marquez-Sterling et al., 2000). Contrary to the data obtained in this research, Clapp et al. showed in a paper published in 2000 that the initiation of a physical activity program among pregnant women did not affect weight gain during pregnancy, birth weight, or head circumference, but significantly influenced placental growth (Clapp et al., 2000). Neither the analysis performed in this sample nor those performed in other samples demonstrated a significant influence of a sedentary lifestyle on gestational age. Many results such as those mentioned were published between 2006-2010 (Mothari et al., 2010; Dun Comb et al., 2006; Orr et al., 2006; Barakat et al., 2008).

In this research, no significant correlations were found between physical activity and a reduced risk of birth through cesarean section. However, there are literature studies that show a positive correlation between physical activity and a decrease in the rate of cesarean births. The data found were representative especially for regular moderate or high-intensity exercise performed in the third trimester of pregnancy. An important factor in this area of physical activity is education among pregnant women regarding the benefits of exercise (Barakat et al., 2012; Wu et al., 2013).

In our sample, we observed significant positive correlations between the level of education of pregnant women and the level of physical activity. A greater proportion of women with a higher level of education practiced physical activity. It seems that the most important reason for reducing the level of physical activity during pregnancy is the lack of education in this area. The most important concern discovered in this sense is fetal harm (Weir et al., 2010).

Following an analysis of our data compared to the literature data (Table III), we consider it important to continue research in order to determine the precise benefits of PA on the health of pregnant women, fetuses, infants,

or pregnancy outcomes. Also, imposing a level of physical activity associated with the effort zone (aerobic, anaerobic - lactacid, alactacid) is of particular importance, to establish a physical activity program in pregnant women.

Table III

Comparative results of the correlations between PA and certain parameters analyzed.

Indicator	Our research	Literature
Weight gain during pregnancy	Positive correlation	Positive correlation or no correlation
Newborn weight	Positive correlation	Positive correlation or no correlation
Gestational age	No correlation	No correlation
Cesarean birth	No correlation	Positive correlation
Level of education	Positive correlation	Positive correlation

Conclusions

1. Physical inactivity is a major risk factor for abnormal weight gain during pregnancy.

2. The lack of PA represents a risk factor for having a newborn with a weight that may not fit in the current recommendations.

3. Increasing the level of education is positively correlated with an increase of PA during pregnancy.

4. Physical inactivity in this group was not correlated with a higher rate of birth through cesarean section, compared to active subjects.

5. Premature/postmature birth was not influenced by the mother's physical activity level in this sample.

6. Initiation of physical activity among pregnant women is not a negative factor in pregnancy evolution.

Conflicts of interest

There are no conflicts of interest concerning the results or methodology of the study.

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