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ИСХОДЫ БЕРЕМЕННОСТЕЙ У ЖЕНЩИН С ДОРСОПАТИЯМИ ПРИ ИСПОЛЬЗОВАНИИ МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ

© Янина Аудрюсовна Ваганова, Сергей Николаевич Гайдуков, Галина Анатольевна Суслова

Санкт-Петербургский государственный педиатрический медицинский университет. 194100, Санкт-Петербург, Литовская ул., 2

Контактная информация: Янина Андрусовна Ваганова — аспирант кафедры акушерства и гинекологии. E-mail: docgas@mail.ru

Аннотация: Проведено исследование, направленное на изучение влияния техник мануальной терапии у беременных женщин с дорсопатиями на исход беременностей и на внутриутробное состояние плода. За период с октября 2015 года по март 2018 года набрана исследуемая группа (в количестве 135 человек) и контрольная группа (n=135) беременных женщин с диагнозом «дорсопатии». Средний возраст обследуемых женщин составил: Me=31 (LQ=28; UQ=34) лет (p>0,05). Средний срок гестации составил Me=26 (LQ=21; UQ=31). Количество первобеременных женщин составило 117 пациенток (43,3%) (p>0,05), повторнобеременных — 153 (56,7%) (p=0,001); количество первородящих 152 (56,3%) (p>0,05) и повторнородящих — 118 (43,7%) (p>0,05). Большую часть беременных, состоящих на учете, составляют повторнобеременные, но первородящие женщины. Количество сеансов МТ, которое проходила каждая беременная женщина из первой группы исследования, составило от 1 до 4. Наибольшее число пациентов — 44% (n=60) соответствует прохождению двух сеансов МТ во время беременности. Во время исследования использовались такие методы как: кранио-сакральный метод, тракционный метод, миофасциальный релиз, постизометрическая релаксация, мягкотканые техники. Произведено сравнение влияния мануальных техник на внутриутробное состояние плода по группам методов родоразрешения. Использовались непараметрические статистические методы для обработки полученных данных, так как распределение не соответствует нормальному (гауссову). В ходе текущего исследования получены результаты, которые позволяют говорить об эффективности применения мануальной терапии у беременных женщин во втором и третьем триместрах с целью улучшения исходов беременностей и родов, а также влияние на внутриутробное состояние плода.

Ключевые слова: дорсопатии, беременность, боль в спине, исходы беременности, кесарево сечение.

ANALYSIS OF THE IMPACT OF MEDICAL REABILITATION ON PREGNANCY OUTCOMES IN WOMEN WITH DORSOPATHIES

© Yanina A. Vaganova, Sergey N. Gaidukov, Galina A. Suslova

Saint-Petersburg State Pediatric Medical University. 194100, Russia, Saint-Petersburg, Litovskaya str., 2

Contact Information: Yanina A. Vaganova — Postgraduate Student Department of Obstetrics & Gynecology. E-mail: docgas@mail.ru

Abstract: The present study the influence of manual therapy techniques in pregnant women with spinal diseases, also known as dorsopathy, on the outcome of the pregnancy and on the intrauterine state of the fetus. In the period from October 2015 to March 2018, an examination group (of 135 people) and a control group (n=135) of pregnant women diagnosed with «dorsopathy» were recruited. The average age of the examined women was Me=31 (LQ=28; UQ=34) years (p>0.05). The average gestation period was Me=26 (LQ=21; UQ=31). The number of first-pregnant women was 117 (43.3%) (p>0.05), 153 were re-pregnant(56.7%) (p=0.001); the number of primiparous women is 152 (56.3%) (p>0.05) and 118 were multiparous women (43.7%) (p>0.05). The majority of the surveyed pregnant women are re-pregnant, but primiparous women. The number of manual therapy (here in after MT) sessionsunderwent by each pregnant woman from

the first group of the study ranged from 1 to 4. A large percentage of patients (44%) (n=60) attended two sessions of MT during pregnancy. During the study, the following methods have been used: cranio sacral method, traction method, myofascial release, postisometric relaxation, soft tissue techniques. A comparison of groups of delivery methods and of the influence of manual techniques on the intrauterine state of the fetus. As the distribution does not comply with the normal (Gaussian) variant, nonparametric statistical methods have been used to process the data. The results obtained in the course of the current study allow to speak about an effective application of manual therapy in pregnant women in the second and third pregnancy trimesters in order to improve the outcomes of pregnancies and childbirth, as well as about a positive impact on the intrauterine state of the fetus.

Key words: dorsopathy, pregnancy; low back pain, outcomes of pregnancy, cesarean section.

INTRODUCTION

Pain in the lower back and pelvic pain in pregnant women caused by dorsopathies is the most common phenomenon and has recently been considered a normal part of pregnancy [12, 17]. Foreign (non-Russian) studies have shown about 50% of pregnant women to experience back pain at different stages of pregnancy [2, 15], preventing them from performing elementary actions, worsening of their emotional state (combined with increased irritability or depression), decreasing the sexual activity and causing sleep disorders [4, 7, 15]. At the same time, 25% of cases low-back pain in pregnant women leads to serious health problems, about half of the women even lose their ability to work already in the I–II trimesters and in 8% of the cases, it leads to invalidity of different severity [2, 17]. It is also reported that 94% of women who had low-back pain in previous pregnancies also recorded pain in subsequent pregnancies [18]. In the domestic (Russian) literature, there are clearly not enough studies on the course of this pathology in pregnant women and the possible methods of its treatment [3, 6, 8].

In 2016, a systematic review was conducted (HG Hall, L. Ward, H. Cramer, J. Adams et al.) including a meta-analysis (PRISMA) of the evaluation of effectiveness of treatment for pregnancy-related back and pelvic pain using additional impact methods (manual, “hand”) [14]. When comparing the effectiveness of MT techniques with the usual treatment/observation of patients during pregnancy (considering a high risk of systematic errors), the MT was found effective in reducing pain and in improving the quality of life of pregnant women. However, the study did indicate neither the results of pregnancy outcomes, nor a condition evaluation of children at birth. In an earlier study we could also confirm an improvement in the quality of life of pregnant women [1, 2].

The purpose of the present study is to assess the impact of the use of manual techniques in pregnant women with dorsopathies on pregnancy outcomes and the condition of the newborn.

MATERIALS AND METHODS

A total of 270 pregnant women with dorsopathies were subject of examination. 135 patients entered the first (examined) group being treated by a chiropractor. The second (control) group consisted of 135 pregnant women who did not receive treatment.

The average age of the examined women was Me=31 (LQ=28; UQ=34) years (p>0.05 between the groups). The average gestation period was Me=26 (LQ=21; UQ=31). 117 were first-pregnant women (43.3%) (p>0.05), 153 re-pregnant (56.7%) (p = 0.001); 152 primiparous (56.3%) (p>0.05) and 118 multiparous (43.7%) (p>0.05). Consequently, the majority of the surveyed pregnant women were re-pregnant, but primiparous women, due to the high percentage of burdened obstetric and gynecological anamnesis in patients nowadays. The number of MT sessions underwent by each pregnant woman from the first group of the study ranged from 1 to 4. A large percentage of patients (44%) (n=60) attended two sessions of MT during pregnancy, $\chi^2 = 1843.2$, p>0,05. The following manual techniques have been used: (1) diagnosis and correction of dysfunction of the thoraco-abdominal diaphragm; (2) decompression at the level of the lumbar spine, balancing the thoracolumbar fascia, lumbar and square muscles; (3) correction of the lumbosacral junction L5S; (4) correction of the sacroiliac joint; (5) diagnosis and correction of the dysfunction of the pubic symphysis; (6) diagnosis and correction of the coccyx dysfunction; (7) diagnosis and correction of pelvic muscle dysfunction: a) m. levatori ani; b) balancing the pelvic diaphragm (methods of raising the pelvic floor); c) method of balancing the perineum fibrous center; d) method of correction of the lumbar-iliac muscle; e) method of correction of the internal obturator muscle; f) method of correction of the piriformis muscle; (7) diagnosis and correction of uterine torsion; (8) techniques for balancing the muscle layers of the pregnant uterus; (9) methods for the correction of the sacro-uterine ligaments (per rectum); (10) correction of the nervous regulation of the uterus: a) methods for suppressing sympathetic ganglia; b) methods for stimulating sympathetic ganglia; c) methods of accelerating the parasympathetic system at the level of the sacral bone; d) methods of suppressing the parasympathetic system at the level of the sacral bone [4].

Calculations of the descriptive statistics of the obtained data were processed using the software package STATISTICA for Windows (10.0 (StatSoft inc.) and Microsoft Excel 2010 for Windows XP. The statistical significance (p-value) for this study was set at 0.05. A distribution different from the normal was determined: the number of research objects (n), median (Me), upper and lower quartiles (LQ/Q and UQ/Q). Non-parametric methods were used for the comparison of the three independent (unrelated) groups: χ^2 (for n> 30). For cases in which n<30 Fisher’s exact test (φ) was used. Pairwise comparison of independent groups was carried out using the non-parametric Mann-Whitney test. For the median test, contingency tables were created using the χ^2 criterion. To determine whether the two characteristics are correlating by groups,

Spearman's correlation analysis or Pearson contingency coefficient were used (C).

RESULTS

During the analysis of delivery methods, statistically significant differences between the examined groups were found. Thus, in the first group vaginal births occurred in 80.7% of cases, whereas in the second group the percentage of normal deliveries was with 62.9% significantly lower. Accordingly, the level of abdominal delivery was higher in the second group (table 1).

Table 1

Characteristics of delivery methods by groups

Delivery	Total (n=270)	Group 1 (n=135)	Group 2 (n=135)	Statistical Values
Delivery through the birth canal	194 (71.8%)	109 (80.7%)	85 (62.9%)	χ^2=9198.4 p<0.001
Abdominal delivery	76 (28.2%)	26 (19.3%)	50 (37.1%)	χ^2=9198.4 p<0.001

Thus, the birth per vias naturalis was in 71.4% (n=218) of the cases and the abdominal delivery was in 28.6% (n=87) of the cases (with p<0.01) among all examined pregnant women suffering from dorsopathies.

In the course of determining the Pearson contingency coefficient (C) between the research groups and the methods of delivery per vias naturalis and by abdominal delivery, strong connections were found (C=0.985 in both cases, according to a 2x2 contingency table).

Indications for abdominal delivery were compared and are shown in table 2. In all groups, the largest percentage of cesarean section (CS) operations occurred in labor anomalies (includes a pathological preliminary period, labor weakness, discoordinated labor). Thus, anomalies of labor as indications for cesarean section in the first group amounted to 10.37% (group), against 14.8% in the second group, where manual therapy was not applied on. However, no statistically significant differences were obtained. It should be noted that the pelvic structure in the MT group was close to cross-contracted sizes (p<0.001), however, the percentage of labor abnormalities in this group was lower than in the control group, which also allows to speak about the effectiveness of MT techniques use in pregnant women. Comparison of indicators between the groups was performed using Fisher's exact test, and only when comparing the "pre-eclampsia" item statistically significant differences were revealed (p<0.05) allowing the conclusion that the MT methods affect the reduction of this pathology compared to the control group) (table 2).

During the MT, attention was drawn to the fact that in 10 out of 12 patients with breech/pelvic presentation an independent turnover/rotation of the fetus after the MT sessions occurred (p> 0.05). The median of the gestation period was calculated, at which an independent fetal turnover/rotation took place (Me)=37 weeks was carried out (LQ=36; UQ=39 weeks). It should be noted that an independent turnover/rotation of a full-term does practically not happen. The average number of sessions after which the fetus turnover/rotation occurred was (Me)=2 (sessions) (for n=7 after 2 sessions, for n=3 after 1 session). In the control group, 1 out of 9 patients had an independent fetus turnover/rotation in the 35th week of pregnancy.

The structure of operations and benefits during childbirth in the examined women (table 3). It turned out that in the first group there was a significantly lower level of perineotomy, induced labor and abdominal delivery compared with the second group, with the following statistical significance p=0.029, p<0.001, p=0.001, respectively. However, applying the Pearson contingency coefficient resulted in the identification of weak links in all three cases.

The analysis of the course of the postpartum period suggests that methods of manual therapy also have a positive effect. Subinvolution of the uterus with statistical significance p=0.024 is less common than in the control group (C=0.13).

The evaluation of the analysis of the influence of manual techniques on the fetal intrauterine state was carried out by comparing the results of groups with each other using the Mann-Whitney test. The MT methods turned out to be statistically significantly more effective than the results of the analysis of the control group, where these methods were not applied on (with p<0.001 both at the 1st and at the 5th minute) (figure 1). Comparison of the two groups was carried out using the **χ^2 criterion: at the** 1st minute = 10098.0, at the 5th minute = 11323.81, with p<0.001 in both cases. The analysis of Pearson contingency coefficient (C): at the 1st minute C=0.986 and at the 5th minute C=0.988, these data

Table 2

Indications for CS operations in all examined groups

Indications for CS operations	Cesarian Section		Statistical values	
	Group 1 (n=26),%	Group 2 (n=50),%	Fisher's exact test (φ)	Value p
Labor anomalies	14 (10.37%)	20 (14.8%)	φ=0.182	p>0.05
Breech/pelvic presentation	1 (0.7%)	8 (5.92%)	φ=1.74	p>0.05
Big fetus	4 (3%)	2 (1.5%)	φ=0.175	p>0.05
Preeclampsia	1 (0.7%)	17 (12.6%)	φ=5.19	p<0.05
Uterine scar	3 (2.2%)	3 (2.2%)	φ=0	p>0.05
In vitro (extracorporal) fertilization	2 (1.5%)	0 (0%)	φ=1	p>0.05
Placental insufficiency	2 (1.5%)	0 (0%)	φ=1	p>0.05

Table 3

Benefits and surgeries during labor in the examined groups

Benefits and surgeries during labor	Total (n=270)	Group 1 (n=135)	Group 2 (n=135)	Statistical values (χ^2, p, C)
Labor stimulation	25 (9.25%)	10 (7.4%)	25 (18.5%)	χ^2=7386, при p<0.001, C=0.16
Amniotomy	74 (27.4%)	29 (21.5%)	45 (33.3%)	χ^2=2596, при p=0.03, C=0.13
Vacuum extraction	2 (0.74%)	1 (0.74%)	1 (0.74%)	χ^2=337, при p=0.56, C=0.03
Perineotomy	61 (22.59%)	23 (17%)	38 (28.14%)	χ^2=4768, при p=0.029, C=0.13
Manual examination of the uterine cavity	2 (0.74%)	0 (0%)	2 (1.48%)	χ^2=2014.9, при p=0.15, C=0.08
Caesarean section	76 (28.14%)	26 (19.25%)	50 (37.1%)	χ^2=10548 при p=0.001, C=0.19

Table 4

Peculiarities of the postpartum period

Complications	Total (n=270)	Group 1 (n=135)	Group 2 (n=135)	Statistical values
Subinvolution of uterus	5 (1.8%)	0 (0%)	5 (3.7%)	χ^2=5094, при p=0.024, C= 0.13
Anaemia	13 (4.8%)	5 (3.7%)	8 (5.9%)	χ^2=0.727 при p=0.39, C= 0.05
Bleedings in the post-natal period	4 (1.48%)	1 (0.074%)	3 (2.22%)	χ^2=1015, при p=0.3, C= 0.06

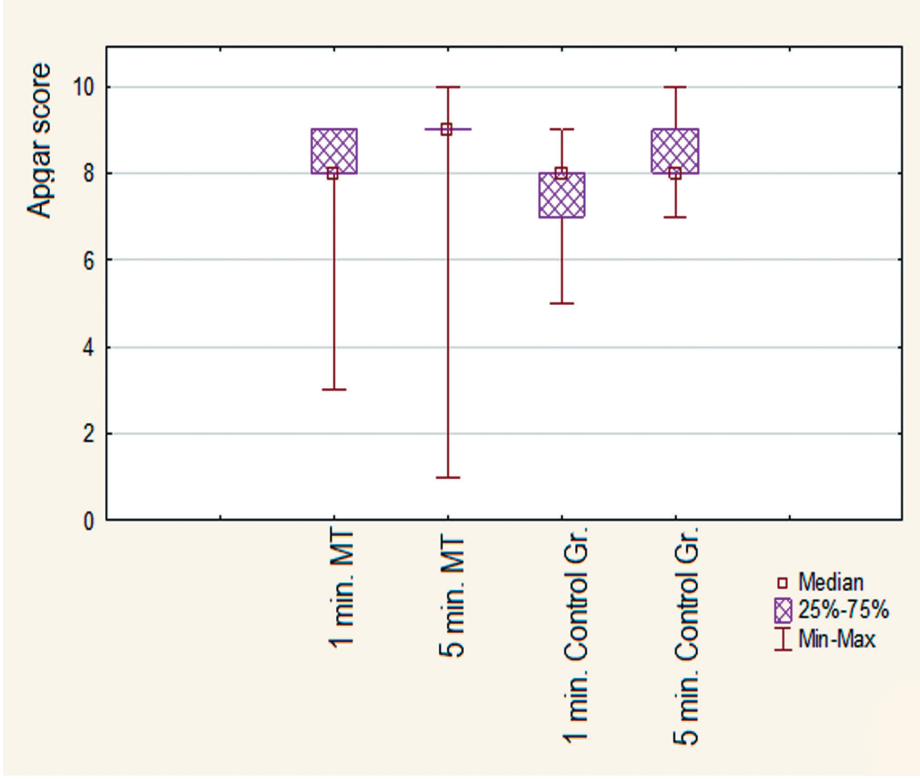

Fig. 1. Intergroup comparison of data according to the criterion for assessing a newborn on the 1st and 5th minute on the Apgar scale (Apgar Score)

allow to conclude that the MT methods affect the higher Apgar score of the newborn compared to numbers obtained in the control group.

CONCLUSION

Earlier, foreign (non-Russian) studies on the effectiveness of manual techniques in pregnant women [9,10,11,12,16,18] addressed the problems of reducing the quality of life of pregnant women with dorsopathies, a marked pain syndrome in the back. At the same time, the assessment of the course of labor, the use of benefits and surgical interventions and the assessment of the newborn condition were not carried out. Our research produced statistically significant results indicating the effectiveness of the influence of manual therapy techniques on birth outcomes, methods of delivery, as well as on the intrauterine state of the fetus and newborn. Attention should be paid to the fact that in some cases pain in a pregnant woman is regarded as a manifestation not of a neurological but obstetric pathology. Primarily it refers to the localization of pain. In these cases, unreasonable stationary hospitalization is often the consequence. In the present case, in patients with dorsopathies, it seems reasonable to use the possibilities of stationary-replacement technologies [5] for differential diagnosis and appropriate treatment. The use of such approaches will help reduce the employment of obstetric beds and reduce expenses.

ЛИТЕРАТУРА

1. Ваганова Я. А., Суслова Г.А., Гайдуков С.Н. Качество жизни и исходы беременности у женщин с дорсопатиями при использовании методов мануальной терапии. Журнал Врач-Аспирант. Научная книга. 2017; Т. № 6(2): 85.
2. Ваганова Я. А., Гайдуков С.Н., Суслова Г.А., Заузолкова Е.К. Эффективность применения методов медицинской реабилитации во время беременности, с целью купирования болевого синдрома в спине, вызванного дорсопатиями. Журнал Современные проблемы науки и образования. 2016; № 6.
3. Вахромеев А. П., Сарыева О.П., Парейшвили В.В., Перетятко Л.П. XV Всероссийский научный форум мать и дитя. Сочи. Конференция. Особенности течения беременности, родов и морфология последа у женщин с недифференцированной дисплазией соединительной ткани. 2014.
4. Егорова И. А., Кузнецова Е.Л. Остеопатия в акушерстве и педиатрии. СПб.: Изд. дом СПбМАПО; 2008.
5. Орел В. И., Гайдуков С.Н., Резник В.А. Стационарзамещающие технологии в акушерстве. СПб.; 2002.
6. Парейшвили В. В., Вахромеев А.П. XV Всероссийский научный форум мать и дитя. Сочи. Конференция. Течение беременности у женщин с вертебральной патологией. 2014.
7. Савченко В. А., Бирюков А.А. Мануальная коррекции синдромов вертоброгенного остеохондроза. М.: Физич. культура; 2011.
8. Суслова Г. А., Стебунов Б.А. Система медико-социальной реабилитации больных с остеохондрозом позвоночника в условиях медицинского реабилитационного центра. Журнал Врач-Аспирант. Научная книга. Выпуск 3.1(40); 2010: 172–180.
9. Boguszewski D., Sałata D., Adamczyk J.G. et al. Evaluation of the effectiveness of massage performed by a partner in reducing low back pain in pregnant women. Journal Fizjoterapia Polska. 2012; 12: 379–87.
10. Elden H., Ostgaard H.C., Glantz A., et al. Effects of craniosacral therapy as adjunct to standard treatment for pelvic girdle pain in pregnantwomen: a multicenter, single blind, randomized controlled trial. Journal Acta Obstetricia Gynecologica Scandinavica. 2013: 9.
11. Field T., Diego M., Hernandez-Reif M. et al. Pregnancy massage reduces prematurity, low birthweight and postpartum depression. Journal. Infant Behav Dev. 2009; 32: 454–60.
12. Field T., Diego M.A., Hernandez-Reif M., et al. Massage therapy effects on depressed pregnant women. Journal. J Psychosom Obstet Gynaecol. 2004; 25: 115–22.
13. Gross G., George J.W., Thompson P.A. et al. A randomized controlled trial comparing a multi-modal intervention and standard obstetrical care for low back and pelvic pain in pregnancy. Journal. Am J Obstet Gynecol. 2012; 208: 1–7.
14. https://www.researchgate.net/publication/308484207. Систематический обзор и мета-анализ болевого синдрома в спине у беременных женщин. (Дата обращения 02.07.2018).
15. Kalus S.M. Kornman L.H., Quinlivan J.A. Managing back pain in pregnancy using a support garment: a randomised trial. Journal. BJOG: An International Journal of Obstetrics & Gynaecology. 2007; 115: 68–75.
16. Licciardone J. C., Aryal S. Manual therapy, exercise, and education for low back pain and pelvic pain during pregnancy. Journal. Am J Obstet Gynecol. 2014; 210: 592–3.
17. Peters R., Linde M. Osteopathic treatment of women with back pain during pregnancy. A randomised controlled study. Journal. Osteopathische Medizin. 2007; 8: 26.
18. Peterson C. D., Haas M., Gregory W.T. A pilot randomized controlled trial comparing the efficacy of exercise, spinal manipulation, and neuro emotional technique for the treatment of pregnancy-related low back pain. Journal. Chiropractic Manual Ther. 2012; 20: 18.

REFERENCES

1. Vaganova YA. A., Suslova G.A., Gajdukov S.N. Kachestvo zhizni i iskhody beremennosti u zhenshchin s dorsopatiyami pri ispol'zovanii metodov manual'noj terapii. [Quality of life and pregnancy outcomes in women with dorsopathies using manual therapy methods]. ZHurnal Vrach-Aspirant. Nauchnaya kniga. 2017; T. № 6(2): 85. (in Russian).
2. Vaganova YA. A., Gajdukov S.N., Suslova G.A., Zauzolkova E.K. EHffektivnost' primeneniya metodov medicisnkoj reabilitacii vo vremya beremennosti, s cel'yu kupirvoaniya bolevogo sindroma v spine, vyzvannogo dorospatiyami. [The effectiveness of the use of methods of medical rehabilitation during pregnancy, with the aim of kupirvoaniya pain in the back, caused by dorospathia]. ZHurnal Soveremennye problemy nauki i obrazovaniya. 2016; № 6. (in Russian).
3. Vahromeev A. P., Saryeva O.P., Parejshvili V.V., Peretyatko L.P. XV Vserossijskij nauchnyj forum mat' i ditya. Sochi. Konferenciya. Osobennosti techeniya beremennosti, rodov i morfologiya posleda u zhenshchin s nedifferencirovannoj displphiej soedinitel'noj tkani. [Features of the course of pregnancy, childbirth and the morphology of the afterbirth in women with undifferentiated connective tissue dysplphia]. 2014. (in Russian).

4. Egorova I. A., Kuznecova E.L. Osteopatiya v akusherstve i pediatrii. [Osteopathy in obstetrics and pediatrics]. SPb.: Izd. dom SPbMAPO; 2008.
5. Orel V. I., Gajdukov S.N., Reznik V.A. Stacionarzameshchayushchie tekhnologii v akusherstve. [Inpatient obstetrics technology]. SPb.; 2002. (in Russian).
6. Parejshvili V. V., Vahromeev A.P. XV Vserossijskij nauchnyj forum mat' i ditya. Sochi. Konferenciya. Techenie beremennosti u zhenshchin s vertebral'noj patologiej. [Pregnancy in women with vertebral pathology]. 2014. (in Russian).
7. Savchenko V. A., Biryukov A.A. Manual'naya korrekcii sindromov vertobragennogo osteohondroza. [Manual correction of syndromes of vertebral osteochondrosis]. M.: Fizich. kul'tura; 2011. (in Russian).
8. Suslova G. A., Stebunov B.A. Sistema mediko-social'noj reabilitacii bol'nyh s osteohondrozom pozvonochnika v usloviyah medicinskogo reabilitacionnogo centra. [The system of medical and social rehabilitation of patients with osteochondrosis of the spine in a medical rehabilitation center]. ZHurnal Vrach-Aspirant. Nauchnaya kniga. Vypusk 3.1(40); 2010: 172–180. (in Russian).
9. Boguszewski D., Sałata D., Adamczyk J.G. et al. Evaluation of the effectiveness of massage performed by a partner in reducing low back pain in pregnant women. Journal Fizjoterapia Polska. 2012; 12: 379–87.
10. Elden H., Ostgaard H.C., Glantz A., et al. Effects of craniosacral therapy as adjunct to standard treatment for pelvic girdle pain in pregnantwomen: a multicenter, single blind, randomized controlled trial. Journal Acta Obstetricia Gynecologica Scandinavica. 2013: 9.
11. Field T., Diego M., Hernandez-Reif M. et al. Pregnancy massage reduces prematurity, low birthweight and postpartum depression. Journal. Infant Behav Dev. 2009; 32: 454–60.
12. Field T., Diego M.A., Hernandez-Reif M., et al. Massage therapy effects on depressed pregnant women. Journal. J Psychosom Obstet Gynaecol. 2004; 25: 115–22.
13. Gross G., George J.W., Thompson P.A. et al. A randomized controlled trial comparing a multi-modal intervention and standard obstetrical care for low back and pelvic pain in pregnancy. Journal. Am J Obstet Gynecol. 2012; 208: 1–7.
14. https://www.researchgate.net/publication/308484207. Систематический обзор и мета-анализ болевого синдрома в спине у беременных женщин. (Дата обращения 02.07.2018).
15. Kalus S.M. Kornman L.H., Quinlivan J.A. Managing back pain in pregnancy using a support garment: a randomised trial. Journal. BJOG: An International Journal of Obstetrics & Gynaecology. 2007; 115: 68–75.
16. Licciardone J. C., Aryal S. Manual therapy, exercise, and education for low back pain and pelvic pain during pregnancy. Journal. Am J Obstet Gynecol. 2014; 210: 592–3.
17. Peters R., Linde M. Osteopathic treatment of women with back pain during pregnancy. A randomised controlled study. Journal. Osteopathische Medizin. 2007; 8: 26.
18. Peterson C. D., Haas M., Gregory W.T. A pilot randomized controlled trial comparing the efficacy of exercise, spinal manipulation, and neuro emotional technique for the treatment of pregnancy-related low back pain. Journal. Chiropractic Manual Ther. 2012; 20: 18.