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Research Article

Effect of Structured Bed Exercise on Uterine Contractions, Fetal Heart Rate Patterns, and Maternal Psychophysical Symptoms of Hospitalized High-Risk Pregnant Women: A Randomized Control Trial

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ABSTRACT

Purpose: This study examined the effect on uterine contraction frequency (UCF), blood pressure (BP), heart rate (HR), fetal heart rate (FHR) patterns and psychophysical symptoms (physical discomfort, anxiety, and depression) of structured bed exercise (SBE) in hospitalized high-risk pregnant women prescribed bed rest.

Methods: Forty-five hospitalized high risk pregnant women at >24 weeks of pregnancy prescribed bed rest were randomly assigned to the experimental or control group. From January to May 2014, data were collected using electronic fetal monitoring and patient monitoring of UCF, BP, HR and FHR patterns, and psychophysical symptoms were measured using the antenatal physical discomfort scale, state-trait anxiety scale, and Edinburgh postnatal depression scale.

Results: UCF, BP, HR, and FHR patterns (rate, variability, acceleration, and deceleration) did not differ significantly between the experimental and control groups. The experimental group showed a significant increase in baseline FHR after SBE within the normal range, and after SBE, it reduced to the FHR before SBE. The variability, acceleration and deceleration of FHR before and after SBE did not differ significantly between two groups. Moreover, there was no statistically significant difference before and after SBE in the experimental group. Also, the experimental group showed statistically significant decreases in physical discomfort score. However, there were no significant differences in depression and anxiety score between two groups.

Conclusions: SBE in hospitalized high-risk pregnant women under bed rest did not increase the risk to the fetus, and relieved physical discomfort and anxiety. Therefore, SBE should be considered as a nursing intervention in hospitalized high-risk pregnant women.

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Introduction

High-risk pregnancy is associated with various factors, such as socioeconomic and demographic parameters, a history of pregnancy, underlying diseases of the mother, current state of pregnancy, and life habits. In a narrow sense, the mother has various obstetric and medical disorders, including nutrient deficiency, diabetes, and cardiac disorders during pregnancy, aged pregnancy, pregnancy-induced hypertension, premature birth, and abortion [1].

Recently in Korea, because of the increasing age of pregnant women, the incidence of multiple pregnancy and multicultural families, risk factors for pregnancy, and obstetric complications are increasing. In 2011, the high-risk pregnancy rate reached 42.8% (196,740) of the total number of pregnant women (459,239) [2]. Accordingly, the number of high-risk pregnant women among women hospitalized in the hospital delivery room is increasing. Therefore, the clinical importance of therapeutic management and nursing for hospitalized high-risk pregnant women is increasing.

Bed rest is commonly prescribed during pregnancy for a variety of complications, from threatened abortion and multiple gestations to preeclampsia and preterm labor. Actually antepartum bed rest is a common obstetric management, with up to 95% of obstetricians utilizing maternal activity restriction in some way in their practice

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[3]. Bed rest is limiting the activity of the pregnant woman by making her stay in bed most of the time (>22 hour per day), except when using the bathroom [4]. Bed rest is used for preventive and therapeutic purposes in various high-risk pregnancy conditions, such as premature labor, premature rupture of membranes, multiple gestation, pregnancy-induced hypertension, or other complications of pregnancy [5].

However, although bed rest in hospital or at home is widely used as the first step of treatment, reviews have found no evidence to support or refute the efficacy of bed rest in preventing preterm birth in multiple pregnancies [6,7]. Some researchers suggest that bed rest and activity reduction do not significantly reduce the risk for preterm birth and may in fact increase the risk of complications including muscle atrophy, bone loss, weight loss, decreased infant birth weight in singleton gestations and gestational age at birth, and psychosocial problems such as depression and anxiety [8]. In high-risk pregnant women on bed rest, the reoxygenation time of the gastrocnemius muscle, which indicates the decline in muscular function, increased significantly during the antepartum period, suggesting the occurrence of muscle atrophy during antepartum bed rest [9]. Also, the risk of thromboembolism, bone loss, and demineralization increased significantly in high-risk pregnant women on bed rest [10]. Moreover, hospitalized high-risk pregnant women were reported to be higher in depression and anxiety and lower in spiritual well-being than non-pregnant or normal pregnant women [11].

However, bed rest is used as the primary therapeutic management for hospitalized high-risk pregnant women in the clinic. According to a mail-based survey of all Society for Maternal-Fetal Medicine members in the USA asking whether they would recommend bed rest in the hypothetical setting of arrested preterm labor or premature rupture of membrane at 26 weeks of pregnancy, 71% responded that they would recommend bed rest for premature labor and 87% for premature rupture of membrane even though they were not confident of its safety and effectiveness [4]. Although there is a lack of scientific evidence on the efficacy of therapeutic bed rest for hospitalized high-risk pregnant women, it is prescribed for hospitalized high-risk pregnant women in Korea. Therefore, preventing side-effects that may arise when therapeutic bed rest is prolonged in hospitalized high-risk pregnant women is of clinical importance.

Most previous studies on exercise during pregnancy involved normal pregnant women or high-risk pregnant women without activity limitations. Studies on the effect of exercise in normal pregnant women have reported that it relieves the symptoms of depression [12] and anxiety [13], suppresses excessive weight gain during pregnancy [14], and contributes to relieving backache and pelvic pain [15]. Also, studies involving high-risk pregnant women without activity limitations reported that resistance exercise reduces the insulin demand and has a positive effect on hyperglycemic control in gestational diabetic pregnant women. Also, in pregnant women with a history of chronic hypertension or pregnancy-induced hypertension in a previous pregnancy, resistance exercise does not increase the risk of hypertensive complications, premature labor, and a low birth-weight infant [16].

However, few studies have evaluated the effect of bed exercise on hospitalized high-risk pregnant women on bed rest [17], and no domestic study is extant. Therefore, the purpose of this study was to assess the effects of structured bed exercise (SBE) on hospitalized high-risk pregnant women on bed rest. In this study, the SBE was expected to reduce the psychophysical symptoms such as side effects which could arise when the prescribed bed rest is prolonged. In addition, it was expected that SBE would not result in negative changes such as abnormal variability or deceleration of baseline fetal heart rate and the increase in uterine contraction frequency (UCF), blood pressure (BP), or pulse rate (PR).

The hypotheses are as follows; hypothesis 1: There will be no difference in UCF and change in BP and PR between high-risk pregnant women who did and did not undertake SBE; hypothesis 2: There will be no difference in fetal heart rate patterns (FHR patterns: rate, variability, acceleration, and deceleration) between high-risk pregnant women who did and did not undertake SBE; hypothesis 3: The high-risk pregnant women who undertook SBE will have lower scores for psychophysical symptoms (physical discomfort, anxiety, and depression) than high-risk pregnant women who did not undertake SBE.

Methods

Study design

A randomized control group pretest–posttest design with repeated measures was used to examine the effects of SBE on the UCF, BP, PR, FHR patterns, and psychophysical symptoms in hospitalized high-risk pregnant women on bed rest.

Setting and sample

The participants were 45 high-risk pregnant women hospitalized from January 2014 to May 2014 in the delivery room of a University Hospital in Seoul. The inclusion criteria were pregnant women at >24 weeks of pregnancy and hospitalized for more than 2 days, prescribed bed rest, and who understood the purpose of the study and agreed to participate. The exclusion criteria were pregnant women with continuous vaginal bleeding, uncontrolled pregnancy-induced hypertension, premature membrane rupture, cervical dilatation of >3 cm, or joint disorder.

To calculate the number of participants, the effect size of an intervention applied to reduce stress in hospitalized high-risk pregnant women in a previous study [18] was used. In this study, the effect size of the experimental group was .87. In applying $\alpha = .05$, power = .80 on the G*power 3.1 software, the experimental group comprised 18 women and the control group 18 women, for a total of 36. A total of 46 were set with 23 in each group to account for participant drop out.

For group allocation, the permuted block randomization method was used. Six possible combinations (AABB, ABAB, BAAB, BABA, BBAA, and ABBA) were assigned using four block sizes by researcher. At the admission, one of the above six blocks was randomly selected, and four subjects were assigned to one block, and A was assigned to the experimental group and B to the control group. In order to maintain the assignment concealment, the experimental group (A) and the control group (B) were placed separately in the other rooms of the delivery room and separated by curtains between the beds. One woman in the control group was excluded due to voluntary discharge on the third day of admission. Therefore, there were 23 pregnant women in the experimental group and 22 pregnant women in the control group (Figure 1).

In addition, we could not get the baseline data in case of difficult reading the FHR patterns in three women with twin pregnancy (one in the experimental group and two in the control group) and in one woman within 30 weeks of pregnancy in the control group. In this case, we excluded in statistical analysis.

Ethical considerations

This study was performed after receiving approval from the institutional ethics review committee of Korea University Hospital (Approval no. ED13125). The researcher explained the purpose and procedures of the study to potential participants and that they

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