Comparison of Sleep Quality in Athlete and Non-Athlete Pregnant Women

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Received: 2 May 2016
Revised: 2 Aug 2016
Accepted: 24 Sep 2016

**Background:** Recent studies have shown that physical activity is an effective factor in improving sleep quality. Therefore, this study aimed to compare the sleep quality of athlete and non-athlete pregnant women.

**Methods:** This cross-sectional descriptive analytical study was performed on 300 pregnant women in the last trimester of pregnancy, referred to prenatal care unit of Amiralmomenin Hospital in city of Zabol. After selection via convenience sampling, participants were divided into two groups of athletes and non-athletes based on their level of physical activity. Data were collected via a demographic form and Pittsburgh sleep quality and Baek physical activity questionnaires. Data was analyzed using descriptive statistics and t-test.

**Results:** The mean score of sleep quality in pregnant women was 8.51 ± 2.09. Overall, 81.2% of the subjects had poor sleep quality. The sleep quality of athlete (7.19 ± 1.68) and that of non-athlete (10.18 ± 2.28) pregnant women were undesirable. However, athlete pregnant women had significantly better sleep quality compared to non-athletes (P=0.003).

**Conclusion:** Based on the results and the high prevalence of sleep disorders in pregnant women, as well as the positive impact of physical activity on sleep quality, daily physical activity seems essential for improvement of sleep quality in pregnant women.

**Keywords:** Quality of Sleep, Pregnant Women, Physical Activity

This paper should be cited as: Azarniveh MS, Tavakoli Khormizi SA. [Comparison of Sleep Quality in Athlete and Non-Athlete Pregnant Women]. J Res Dev Nurs Midwifery. 2017;14(1):1-7.
Introduction

Pregnancy is one of the most important and critical periods of a woman's life (1). Adequate rest and sleep lead to a mother’s calmness and psychological comfort, protecting the health of both the infant and mother. The important functions carried out during sleep include energy storage, division of skin and bone marrow cells, hormone regulation and secretion, immune system regulation and memory of mental performance (2). Inadequate sleep reduces concentration, judgment, ability to perform daily activities, and increases irritability (3). Sleep disorder is a common problem during pregnancy. Women complain of delayed sleep, frequent awakenings, insomnia and reduced sleep quality beginning from the start of the 12th week of pregnancy up to 2 months after delivery (4).

Sleep disorder is caused by a variety of factors including psychosocial problems, physiological and pathological changes in the body, certain diseases, drug use or discontinuation and hormonal changes during pregnancy (2, 5). The quality and amount of sleep is different in different stages of pregnancy (6, 7). Most sleep disorders occur during the third trimester of pregnancy (8). In one study, 97% of the women suffered from sleep disturbance in the third trimester of pregnancy (9). Another study showed that 61.15% of the pregnant women had sleep disorders (10). In general, changes in sleep patterns increase from 13-80% in the first trimester of pregnancy to 66-97% in the third trimester (1). Nowadays, many researchers are interested in non-pharmacological and applicable methods affecting physical and mental health of pregnant women (11). One of the most effective non-pharmacological methods is sport or physical activity. Pregnancy may put pregnant women at risk of reduced physical activity. Pregnant women are usually prohibited from exercise and physical activity (12). Meanwhile, studies on the body's physiological response to training show that healthy pregnant women can balance between exercise and their physiological needs (13, 14). The benefits of exercise for mothers include physical and psychological changes such as reduced fatigue and swelling of the lower limbs, reduced insomnia, stress and depression. In addition to exercise, regular physical activity can prevent some of the negative consequences of pregnancy such as gestational diabetes, preeclampsia and musculoskeletal problems; maintain a healthy weight; and improve mental health (12, 15, and 16). Some studies have shown that the women who exercise during pregnancy are more likely to continue the activities after delivery. Thus, the beneficial effects of exercise are most likely to continue until the postpartum period, which improves health of the mother and the baby (17). The beneficial effects in various aspects have been observed in pregnant women who perform regular aerobic exercise. Exercise leads to improved glucose metabolism and insulin sensitivity during pregnancy (15).

According to the American College of Obstetricians and Gynecologists, all pregnant women except those with complex conditions should exercise at a moderate level, equivalent to 60-90% of age-predicted maximum heart rate (18). Barbara Estranfeld (2000) demonstrated that women with less physical activity suffer from more severe sleep disorders (19).

The previous studies on physical activity in pregnant women indicated a reduction of leisure, occupational and heavy physical activities. Most of these changes in the intensity and duration of physical activities occur during the third trimester of pregnancy. It seems that pregnant women replace heavy physical activity with a lighter and longer activity (16). Many studies showed the beneficial effects of physical activity on mother and fetus, providing a problem-free pregnancy. (20) Having a great deal of information about the physiological manifestations of exercise during pregnancy (21), there is no comprehensive and accurate understanding of the effects of exercise with different intensity and duration on the mother and fetus during pregnancy. As shown by study of Tiffany et al. (2012), aquatic exercise with moderate-intensity reduces back pain in pregnant women and determines the time of birth (22).

However, studies have reported some adverse effects for exercise during pregnancy that include fetal endangerment due to temperature rise in mother, reduced fetal growth due to declined blood supply to placenta, and reduced fetal access to glucose in response to the mother's lowered blood sugar (20).
Considering the limited number of studies on the effects of exercise on pregnancy and quality of sleep of mothers, as well as lack of attention to sleep disturbance in the third trimester of pregnancy, this study was conducted to compare sleep quality of athlete and non-athlete pregnant women.

**Methods**

This cross-sectional study was conducted on pregnant women admitted to prenatal care unit of Amiralmomenin Hospital in Zabol, from September to December 2014. Overall, 300 pregnant women in the last trimester (at least 28 weeks) of pregnancy were selected via convenience sampling and Morgan-Krejcie table. The participants were then divided into two groups of athletes and non-athletes based on their level of physical activity. The inclusion criteria were willingness to participate in the study, gestational age of 28 weeks, primiparous, singleton pregnancy, lack of physical and psychological disorders, and lack of use of drugs, tobacco, sleeping pills and hormones. The participants were assured of the confidentiality of the data and informed consent was obtained from all of them. Pittsburg Sleep Quality Index (PSQI) questionnaire and Baek habitual physical activity questionnaire were used to assess sleep quality and level of physical activity, respectively. All data were collected via daily interviews and completion of the questionnaires by the researcher and the research assistants at the hospital from 8 to 12 A.M.

The PSQI questionnaire was used to assess sleep quality of sleep problems during the past four weeks. The questionnaire has 19 questions and seven subscales: 1) general self-description of sleep, 2) delayed sleep, 3) length of efficient sleep, 4) sleep sufficiency (ratio of total time sleeping by the total duration of time in the bed), 5) sleep disorder (middle of the night insomnia), 6) amount of sleeping pills used, and 7) morning performance (problems experienced by an individual resulting from poor sleep during the day). Each scale of the questionnaire was scored based on a 4-point Likert scale (from 0 to 3). Reverse scoring method was used in some instances such as questions related to subscale 6. Total score, between 0 and 21 was obtained from the sum of each score. Overall score of > 5 indicated poor sleep quality (23). Sensitivity and specificity of the PSQI are 89.6 and 86.5%, respectively. In addition, the reliability of the questionnaire was validated in Iran (3). In the present study, Cronbach’s alpha was used to determine the internal reliability of the questionnaire (r=0.82). Baek’s physical activity questionnaire is an international standard questionnaire for assessment of physical activity level that was translated by scientific centers including the University of Tehran and Iran University of Medical Sciences. The questionnaire has been used in a number of studies in Iran and evaluates physical activity level via 16 questions that are scored based on Likert scale (24).

The participants with physical activity score of ≤ 2.40 were considered as non-athlete and the participants with score of ≥ 2.40 were considered as athlete (25). Based on the result of Cronbach’s alpha, reliability of the questionnaire was determined as r=0.78. Normal distribution of the data was assessed by Shapiro-Wilk test; The data were analyzed using SPSS-19, descriptive statistics and t-test; and P-value ≤ 0.05 was considered as statistical significance level.

**Results**

In this study, 300 primiparous women in the last trimester of pregnancy (28 weeks) with mean [standard deviation(SD)] age of 21.78±3.89 were studied. The education level of most mothers was below high school diploma (73%). In addition, 71% of the participants were homemakers and 66 were athletes. Characteristics of the participants are shown in Table 1.
Comparison of Sleep Quality in Athlete and … /4
J Res Dev Nurs Midwifery. -2017. Vol 14: No 1

Table 1: Characteristics of Subjects Studied

| Variable                          | Number (%) |
|----------------------------------|------------|
| Education Level                  |            |
| Below high school diploma        | 219 (73)   |
| High School Diploma              | 43 (14)    |
| Bachelor degree                  | 27 (9)     |
| Master’s degree or higher        | 11 (4)     |
| Occupation                       |            |
| Homemaker                        | 213 (71)   |
| Employed                         | 87 (29)    |
| Economic Status                  |            |
| Good                             | 39 (13)    |
| Moderate                         | 189 (63)   |
| Poor                             | 72 (24)    |
| Physical Activity                |            |
| Athlete                          | 66 (22)    |
| Non-athlete                      | 234 (78)   |

In this study, 59 of the participants (19.8%) had good sleep quality and 243 (81.2%) had poor sleep quality. Sleep quality of pregnant women in the third trimester are shown in Table 2.

The mean score of sleep quality in women was 8.51 ± 2.09. A significant difference was observed between the two groups in the scales of delayed sleep (P=0.041), length of efficient sleep (P=0.002), sleep sufficiency (P=0.005) and sleep disorders (P=0.001), but that is not the case for other three scales. The mean overall score in the athlete and non-athlete participants was 7.19 ± 1.68 and 10.18 ± 2.28, respectively. Given that the score of higher than five indicated a poor sleep quality, both groups in the present study had poor sleep quality. The mean overall score of sleep quality in non-athletes was significantly higher than in athletes, indicating a poorer sleep quality in non-athlete subjects (Table 2).

Table 2: Mean total scores of sleep quality in the two groups

| Group                     | Athlete Mean ±SD | Non-athlete Mean ±SD | Total Mean ±SD | P-value |
|---------------------------|------------------|----------------------|----------------|---------|
| General self-description of sleep | 1.24±0.61        | 1.92±1.39            | 1.57±0.98      | 0.375   |
| Delayed sleep             | 1.82±1.86        | 2.27±2.01            | 2.55±1.93      | 0.041*  |
| Length of efficient sleep | 2.03±0.65        | 2.71±0.98            | 2.39±0.80      | 0.002*  |
| Sleep sufficiency         | 1.14±1.55        | 1.61±1.40            | 1.39±1.46      | 0.005*  |
| Sleep disorder            | 0.97±0.72        | 1.79±0.26            | 1.37±0.45      | 0.001*  |
| Amount of sleeping pills used | 0.11±0.09        | 0.13±0.58            | 0.12±0.22      | 0.081   |
| Morning performance       | 0.79±0.98        | 0.97±1.12            | 0.88±1.02      | 0.314   |
| Total Score               | 7.19±1.68        | 10.18±2.28           | 8.51±2.09      | 0.003   |

Discussion
The results showed that only 19% of the women studied had good sleep quality and the rest had poor sleep quality. The mean score of sleep quality was 8.51 ± 2.09. In a similar study by Ahmadinejad et al. (2014), the average quality of sleep in the third trimester was 8.27 ± 2.91, and 89.88% of pregnant women had poor sleep quality. They believed that the increased age of mothers and decreased physical activity were associated with poor sleep quality (26). In the study of Taskran et al. (2011), average sleep quality during maternity was 8.22 ± 3.02, and 89% of
pregnant women suffered from sleep disorders. It is noteworthy to mention that pregnant women with any gestational age were enrolled in their study (27). Moreover, Jahdi et al. (2013) reported the average sleep quality in the second trimester of pregnancy to be 7.78 ± 3.14, and poor sleep quality was observed in 87.2% of the participants (1). On the other hand, Alipour et al. (2012) evaluated the sleep quality of 156 pregnant women in their late pregnancy. They found that at the end of 28th week and 38th week of pregnancy, 56.3% and 65.7% of the women had poor sleep quality, respectively. This indicates deterioration in sleep quality as the pregnancy advances (6). Mindel et al. (2010), also reported that pregnant women suffered from more severe sleep problems near the end of their pregnancy (4), which not only affected their mental and psychological health, but also increased their anxiety, fear of taking care of the baby and accepting the role of a mother in the family. In some cases, it causes grief and negative effects on the family after delivery, and indirectly imposes an economic burden on society (26). The results of the present study and other studies have some inconsistencies, which may be partly justified by differences in the exercise level, age and cultural and individuals characteristics of subjects studied. The present study evaluated the quality of sleep in athlete and non-athlete pregnant women and showed that athletes experienced a better sleep quality compared to non-athletes. Similarly, study of Ahmadianejad et al. (2014) reported that increased physical activity was associated with more desirable sleep quality patterns in pregnant women in their last trimester of pregnancy. Nevertheless, physical activity was defined as amount of daily exercise in form of slow walking, which may have had calming effects on the subjects of the mentioned study (26). While study of Rajabi (2014) found an association between intense physical activity and poor sleep quality in pregnant women in the third trimester, no association was found between sleep quality and daily physical activity at home or work and leisure activities (28). The inconsistency between the results of this study and the present study could be related to different research methods and number of participants. Nowadays, sport trainings are considered as non-therapeutic procedures with positive effects that have been used in several studies in various forms. However, the biological mechanism of these positive effects on sleep quality and patterns remains unknown. Enhanced physical fitness following exercise is accompanied by an increase in electroencephalographic delta waves during the third and fourth stages of sleep. In addition, influence on the neuroendocrine system, particularly metabolic changes in the brain, may be associated with improved sleep quality (17). The present study also investigated the education level, employment status and economic status and found no significant association between these variables and quality of sleep in the two groups. However, study of Dabiran et al. (2009) showed that women with higher education level experienced better sleep quality because they were more physically active. The women with bachelor's or higher degree had better sleep patterns compared to women with less than high school diploma who had worse sleep quality (18). Most of the participants examined in the present study had less than a high school diploma that could justify their poor sleep quality to some extent. Most pregnant women in this study were homemakers with poor or moderate economic status (87%), which could be attributed for the poor quality of sleep and mental state of the participants.

A limitation of the study was the possible impact of unknown individual factors and other psychological and mental factors on mothers that could not be controlled by the researchers. This limitation was intended to be solved by increasing the number of participants.

**Conclusion**

The results of this study show that 81.2% of the pregnant women in their last trimester of pregnancy suffer from sleep disorders, indicating a high percentage of poor sleep quality during this period. However, athlete pregnant women have better sleep quality compared to non-athletes. Given the significant increase in severity of sleep disorders in the
last trimester of pregnancy that could cause serious problems for both mother and fetus, it is recommended to perform daily physical activities during this period to improve the sleep quality of mothers.

References
1. Jahdi F, Moghadam Z, hagani H. Prevalence of sleep disorders in the pregnant women. Journal of the Iranian Institute for Health Sciences Research. 2013;12(6):629-35. [In Persian]
2. Bondad R, Abedian Z, Hassanabady H, Esmaili H. The Relationship between Sleep Pattern and Depression in Pregnant Women in the Third Trimester. 2005 .9 (2):07-03.
3. Reza H, Kian N, Pouremsmail Z, Masood K, Bagher MSS, Cheraghi MA. The effect of acupressure on quality of sleep in Iranian elderly nursing home residents. Complementary Therapies in Clinical Practice. 2010;16(2):81-5. [In Persian]
4. Malekzadegan A, Moradkhani M, Ashayeri H, Haghani H .Effect of Relaxation on Insomnia during Third Trimester among Pregnant Women. Iran Journal of Nursing. [Research]. 2010;23(64):52-8. [In Persian]
5. Lopes EA, Carvalho LBCd, Seguro PBdC, Mattar R, Silva AB, Prado LB ,et al. Sleep disorders in pregnancy. Arquivos de neuro-psiquiatria. 2004;62(2A):217-21.
6. Alipour Z, Lamyian M, Hajizadeh E. Sleep Quality in Late Pregnancy and Postpartum Depression. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2012;14(8):39-47. [In Persian]
7. Neau J-P, Texier B, Ingrand P. Sleep and vigilance disorders in pregnancy. European neurology. 2009;62(1):23-9.
8. Beebe KR, Lee KA. Sleep disturbance in late pregnancy and early labor. The Journal of perinatal & neonatal nursing. 2007;21(2):103-8.
9. Sunil Sharma M, Rose Franco M. Sleep and its disorders in pregnancy. Wisconsin Medical Journal. 2004;103(5):48.
10. Hung H-M, Tsay P-S, Ko S-H, Chen C-H. Patterns and predictors of sleep quality in Taiwanese pregnant women. MCN: The American Journal of Maternal/Child Nursing. 2013;38(2):95-101.
11. Sadeghi A, Sirati N, Hajiamini Z, Ebadi A, Naderi Z, Medhizadeh S. The Effect Of Exercise On Level Of General Health Of Pregnant Women Referred To A Prenatal-Care-Clinic Of Baghiatallah Hospital. journal of shahid beheshti school of nursing & midwifery. 2012.;22(77).6-10. [In Persian]
12. Loprinzi PD, Loprinzi KL, Cardinal BJ. The relationship between physical activity and sleep among pregnant women. Mental Health and Physical Activity. 2012;5(1):227.
13. Zand S, Zamani A. The effect of simple exercise maneuvers and proper performance of daily activity on outcome of pregnancy. Iranian Journal of Obstetrics, Gynecology and Infertility. 2009;12(3):51-7. [In Persian]
14. Borodulin K, Evenson KR, Wen F, Herring AH, Benson A. Physical activity patterns during pregnancy. Medicine and Science in Sports and Exercise. 2008;40(11):1-19.
15. Oken E, Ning Y, Rifas-Shiman SL, Radesky JS, Rich-Edwards JW, Gillman MW. Associations of physical activity and inactivity before and during pregnancy with glucose tolerance. Obstetrics and gynecology. 2006;108(5).1-12. [In Persian]
16. Borodulin K, Evenson KR, Monda K, Wen F, Herring AH, Dole N. Physical activity and sleep among pregnant women. Paediatric and perinatal epidemiology. 2010;24(1):45-52.
17. Mirmohammadali M, Ashrafinia F, Rajabi H, Amelvalizadeh M, Sadeghniai Haghighi K, Kazemnejad A. Effect of Exercise on Quality of Sleep in Post-Partum Women. Hayat. [Research]. 2012;18(1):20-9. [In Persian]
18. Dabiran S, Daneshvar Fard M, Hatmi Z. To Assess the Performance of Exercise during Pregnancy. Iranian Journal of Epidemiology. [Research]. 2009;5(3):22-6. [In Persian]
19. Azhari S, Ghorbani M, Esmaeili H. Evaluation of the relationship between lifestyle and quality of sleep in postmenopausal women. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2014;17(112):7-14. [In Persian]
20. Abasi S, Moazami M, Bijeh N, Mirmajidi SR. Investigation of the Relationship between Physical Activity Levels, Maternal Weight (before delivery) and Serum Cortisol Level (during labor) in Nulliparous Women. The Iranian Journal of Obstetrics, Gynecology and Infertility .2015;18(151):12-19. [In Persian]
21. Polley BA, Wing RR, Sims CJ. Randomized control trial to prevent excessive weight gain in pregnant women. Int J Obes Relat Metab Disord 2002; 26(11): 1494-502.
22. Tiffany F. Prenatal exercise research .Infant Behav Dev 2012; 35(3): 397-407.
23. Ardani A, Moghani M, Nejati R, Sabouri S, Hoseini S. Assessment the rules of demographic variables and body mass index in sleep quality among medical students. Journal of Fundamentals of Mental Health. 2012;14(54):132-9. [In Persian]
24. Mocini B, Jalilian F, Jalilian M, Barati M. Predicting factors associated with regular physical activity among college students applying basnec model. Sci J Hamadan Univ Med Sci. 2011;18(3):70-6. [In Persian]

Acknowledgements
The study was derived from a research project with contract number P8/15830 (2013), approved by Zabol University. The author would like to express their appreciation to Vice Chancellor for Research, Zabol University, staff of maternity unit at Amiralmomenin Hospital and all the participants in this study.
25. Hesarkoshki M, Molanovrozi A, Hamedinia MR. Prevalence of obesity and its associated factors among 50 to 30 year old city of Nishapur, with emphasis on physical activity. Iranian Journal of Endocrinology. 2012; 14(5): 472-78. [In Persian]

26. F. S. Seyed Ahmadi Nejad NG, N. Asghari Pour, M.T. Shakeri. Investigation of Sleep quality during the third trimester of pregnancy and some related factors in primigravida women referred to health care centers in Mashhad- 2014. 2. [Research]. 2015; 22(4):53-60. [In Persian]

27. Askiran N. Pregnancy and sleep quality. Journal of Turkish Society of Obstetrics and Gynecology. 2011; 8(3):181-7. [In Persian]

28. Rajabi M. The Relationship between the Level of Physical Activity and the Quality of Sleep in Women in the Last Three Month of Pregnancy. Int J of Basic Sci & Applied Res 2014; 3(2): 90-3.