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The Association between Pregnancy-Related Discomforts and Pre-Pregnancy Body Mass Index in Japanese Women

Saori Morino[1*], Mika Ishihara[2], Shu Nishiguchi[1,3], Naoto Fukutani[1], Daiki Adachi[1], Yuto Tashiro[1], Takayuki Hotta[1], Minoru Yamada[4], Mamoru Yamashita[2] and Tomoki Aoyama[1]

[1]Department of Physical Therapy, Human Health Sciences, Kyoto University Graduate School of Medicine Kawahara-cho 53, Shogoin, Sakyo-ku, Kyoto 606-8507, Japan

[2]Kishokai Medical Corporation Koike 4-122, Inazawa, Aichi 492-8144, Japan

[3]Japan Society for the Promotion of Science Kojimachi 5-3-1, Chiyoda-ku, Tokyo 102-0083, Japan

[4]Graduate School of Comprehensive Human Sciences, University of Tsukuba Tennodai 1-1-1, Tsukuba, Ibaraki 305-0006, Japan

[*]Corresponding author: Saori Morino Department of Physical Therapy, Human Health Sciences, Kyoto University Graduate School of Medicine Kawahara-cho 53, Shogoin, Sakyo-ku, Kyoto 606-8507, Japan Tel: +81-75-751-3935 Fax: +81-75-751-3909 E-mail: morino.saori.48r@st.kyoto-u.ac.jp

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Abstract

Objective: To determine the association between pregnancy-related discomforts and pre-pregnancy body mass index in a longitudinal study.

Methods: The study included 355 pregnant women (age, 31.1 ± 4.1 years). Participants were divided into three groups according to their pre-pregnancy body mass index: the low body mass index group, normal body mass index group, and high body mass index group. The occurrence of pregnancy-related discomforts during the second and third trimesters was investigated. Binomial logistic regression analysis was used to examine the association between pre-pregnancy body mass index and pregnancy-related discomforts experienced during the last two trimesters.

Results: The occurrence of most pregnancy-related discomforts increased in the third trimester, while that of constipation and shoulder stiffness or headache decreased. Based on logistic regression analysis, pre-pregnancy body mass index was significantly associated with various discomforts. The occurrence of hip joint or pubis pain (odds ratio/95% confidence interval = 2.38/1.14–4.95) during the second trimester, and sleeping difficulty (2.00/1.09–3.67), hand or finger stiffness (3.00/1.36–6.45), leg cramps (2.29/1.32–3.98), low back pain (2.20/1.29–3.75), hip joint or pubis pain (2.14/1.23–3.73), and shoulder stiffness or headache (2.01/1.06–3.82) during the third trimester was significantly higher in the high body mass index group than in the normal body mass index group. The low body mass index group exhibited a significantly a higher occurrence of shoulder stiffness or headache (2.84/1.35–5.96) during the second trimester and constipation (2.28/1.08–4.82) during the third trimester than the normal body mass index group.

Conclusion: The occurrence of discomforts decreased or increased during pregnancy. Furthermore, both pre-pregnancy high and low body mass index represent important risk factors for many pregnancy-related discomforts, compared with a pre-pregnancy normal body mass index.

Keywords: Health promotion; Pregnancy; Pregnancy-related discomforts; Pre-Pregnancy BMI; Prevention

Introduction

Methods

Anatomical, physiological, hormonal, and psychological changes occur in woman during pregnancy [1,2], causing a variety of discomforts such as low back pain, ligament pain, fatigue, and headache [3]. These pregnancy-related discomforts negatively impact mother and child health and affect the quality of life and limit the daily activities of mothers [4,5]. Despite a number of researchers investigating the management of pregnancy-related discomforts [6,7], there are several limitations to the treatments available during pregnancy. For example, non-prescribed medicines are usually unsuitable because of their adverse effects on pregnant women themselves and on the developing fetus [8,9]. Therefore, a longitudinal study is necessary to collect information on the prevalence of discomforts through the stages of pregnancy. Such information will increase the knowledge of the measures that can be taken to protect women from pregnancy-related discomfort and will be essential to prevent their onset.

Before pregnancy, it is important for women to maintain an appropriate body mass index (BMI) to avoid hormone imbalance and its negative impact on fertility [10]. Furthermore, some research indicates that the pre-pregnancy BMI is a predicting factor for conditions such as gestational diabetes, and thus for adverse pregnancy outcomes [11,12]. Pre-pregnancy obesity may also be a modifiable risk factor for intellectual disability in children [13]. On the other hand, women with pre-pregnancy low weight are at an increased risk of intrauterine growth restriction, perineal tears, preterm birth (spontaneous and induced), and low birth weight [14,15]. These results suggest that both pre-pregnancy high and low BMI negatively

affect the progress of the pregnancy. Information about the occurrence of discomforts at each gestational period is necessary for their prevention. Moreover, a normal BMI before pregnancy promotes an uneventful progress through pregnancy. However, to date, very few studies have been conducted on the association between pre-pregnancy BMI and pregnancy-related discomforts. Accordingly, we conducted a longitudinal study aimed to identify pregnancy-related discomforts throughout pregnancy and to identify possible associations between these discomforts and the pre-pregnancy BMI.

Settings

We collected information from 355 women (age, 31.1 ± 4.1 years) at the obstetrics and gynecology clinics in the Aichi Prefecture, Japan, between 2009 and 2013. When the pregnant women visited the clinic for their periodic health examination, the information was collected by the hospital staff such as nurses. The inclusion criteria for the survey were the lack of serious orthopedic disorders, neurological diseases, and high-risk pregnancy. At the first medical examination, we recorded the personal information (age and BMI before pregnancy) of each participant by using a questionnaire.

Questionnaire about Pregnancy-Related Discomforts

The subjects of this study were asked to complete a questionnaire during the second trimester (22.4 ± 2.1 weeks of gestation) and third trimester (33.7 ± 2.1 weeks of gestation). We used the Medical Check Sheet to track pregnancy-related discomforts during gestation. The sheet, developed by the Japan Maternity Fitness Association, is a self-entry questionnaire for the management of physical conditions, to be completed before exercise. Questions were related to the expected date of birth, weeks of gestation, blood pressure, and 10 different pregnancy-related discomforts (i.e., sleeping difficulty, constipation, hand or finger stiffness, swelling, leg cramps, low back pain, hip joint or pubis pain, shoulder stiffness or headache, rib pain, and anorexia or heartburn), reported to commonly occur and to have an adverse effect on pregnancy. If the participants had felt discomfort due to any of the items on the list, those items were checked.

Ethical Considerations

After the purpose of the study had been explained, written informed consent was obtained from each participant in accordance with the guidelines approved by the Kyoto University Graduate School of Medicine and the Declaration of Human Rights, Helsinki, 1975. The protocol was approved by the Ethics Committee of Kyoto University Graduate School of Medicine (protocol approval E-2110).

Statistical Analyses

Participants were divided into three groups (low BMI group, normal BMI group, and high BMI group) according to their pre-pregnancy BMI (<18 kg/m^2, ≥18 kg/m^2, and <22 kg/m^2 or ≥22 kg/m^2, respectively). We statistically calculated the differences in age between these three groups using analysis of variance. Based on the Medical Check Sheet completed during the second and third trimester, we determined the occurrence of each symptom during the second and third trimesters and analyzed this using descriptive statistics. Binomial logistic regression analysis was used to examine the association between each discomfort and the pre-pregnancy BMI for each trimester. We referred to discomforts as the dependent variables, to low and high BMI groups as the independent variables (with the normal BMI group as reference), and to age as the adjustment variable. Data were entered and analyzed using the Statistical Package for the Social Sciences (Windows version 20.0; SPSS Inc., Chicago, IL, USA). For all analyses, $p<0.05$ was considered statistically significant.

Result

Information on 355 women (pre-pregnancy BMI= 20.3±2.1 kg/m^2) who met the inclusion criteria was collected. We assigned 37 women to the low BMI group (BMI= 17.4±0.6 kg/m2), 246 women to the normal BMI group (BMI= 19.8 ± 1.0 kg/m2), and 72 women to the high BMI group (BMI= 23.5±1.8 kg/m^2). There were no significant differences between the three groups (low, normal, and high BMI groups) in age (30.4 ± 4.2 years, 31.2 ± 4.0 years, and 31.2 ± 4.2 years, respectively).

The occurrence of most of the pregnancy-related discomforts analyzed increased from the second to third trimester, in contrast to that of constipation and shoulder stiffness or headache that showed a decrease (Figure 1).

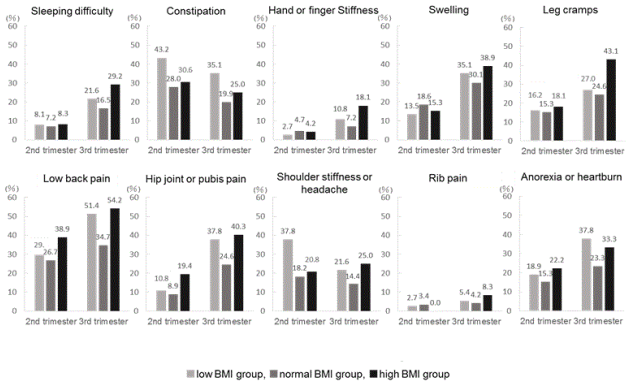

Figure 1: The prevalence of pregnancy-related discomforts during second and third trimester.

Multivariate analysis revealed that pre-pregnancy BMI was significantly associated with some of the discomforts during pregnancy (Table 1). The occurrence of hip joint or pubis pain (odds ratio/95% confidence interval=2.38/1.14–4.95) during the second trimester, and sleeping difficulty (2.00/1.09–3.67), hand or finger stiffness (3.00/1.36–6.45), leg cramps (2.29/1.32–3.98), low back pain (2.20/1.29–3.75), hip joint or pubis pain (2.14/1.23–3.73), and shoulder stiffness or headache (2.01/1.06–3.82) during the third trimester was significantly higher in the high BMI group than in the normal BMI group ($p<0.05$). The occurrence of shoulder stiffness or headache (2.84/1.35–5.96) during the second trimester, and constipation (2.28/1.08–4.82) during the third trimester was significantly higher in the low BMI group than in the normal BMI group ($p < 0.05$). No significant differences were observed in swelling, rib pain, and anorexia or heartburn.

Discussion

We analyzed the changes in the occurrence of pregnancy-related discomforts throughout pregnancy and whether their occurrence was significantly associated with pre-pregnancy BMI. We observed a different trend in the occurrence of the pregnancy-related discomforts

analyzed; in fact, while some of them tended to decrease, others appeared to increase during pregnancy progression. Furthermore, we found that both low and high BMI before pregnancy represent important risk factors for many pregnancy-related discomforts, compared with normal BMI.

		second trimester		second trimester	
Discomforts	**BMI group**	**Odds ratio**	**95%CI**	**Odds ratio**	**95% CI**
sleeping difficulty	**low BMI** **normal BMI** **high BMI**	1.13 1[reference] 1.15	0.32-4.01 0.44-3.02	1.32 1[reference] 2.00*	0.57-3.11 1.09-3.67
constipation	**low BMI** **normal BMI** **high BMI**	1.92 1[reference] 1.13	0.95-3.91 0.64-2.00	2.28* 1[reference] 1.38	1.80-4.82 0.74-2.56
hand or finger stiffness	**low BMI** **normal BMI** **high BMI**	0.6 1[reference] 0.93	0.08-4.81 0.25-3.43	1.61 1[reference] 2.97*	0.74-2.09 1.36-6.45
swelling	**low BMI** **normal BMI** **high BMI**	0.68 1[reference] 0.51	0.25-1084 0.38-1061	1.25 1[reference] 1.45	0.60-2.58 0.84-2.51
leg cramps	**low BMI** **normal BMI** **high BMI**	1 1[reference] 1.14	0..39-2.55 0.57-2.26	1.1 1[reference] 2.29*	0.50-2.40 1.32-3.98
low back pain	**low BMI** **normal BMI** **high BMI**	1.15 1[reference] 1.74	0.54-2.45 1.00-3.01	1.98 1[reference] 2.20*	0.99-3.98 1.29-3.75
hip joint or pubis pain	**low BMI** **normal BMI** **high BMI**	1.27 1[reference] 2.38*	0.41-3.94 1.14-4.95	1.95 1[reference] 2.14	0.94-4.03 1.23-3.73
shoulder stiffness or headache	**low BMI** **normal BMI** **high BMI**	2.84* 1[reference] 1.21	1.35-5.96 0.63-2.33	1.63 1[reference] 2.14	0.69-3.86 1.06-3.82
rib pain	**low BMI** **normal BMI** **high BMI**	0.83 1[reference] 0	0.10-6.86 0	1.32 1[reference] 2.14	0.28-6.31 1.06-3.82 0.75-6.11
anorexia or heartburn	**low BMI** **normal BMI** **high BMI**	1.24 1[reference] 1.56	0.51-3.03 0.81-3.01	1.97 1[reference] 1.62	0.95-4.08 1.06-3.82 0.92-2.87

Table1: The influence of pre-pregnancy BMI on pregnancy related discomforts (logistic regression analysis). **Note:** The analysis for discomforts was adjusted for age. *: $p < 0.05$

The occurrence of most pregnancy-related discomforts increased from the second to third trimester, while the occurrence of constipation and shoulder stiffness or headache decreased. The tendency for the occurrence of the two discomforts of current study was almost equivalent to previous reports. A previous study in the United States showed that the occurrence of constipation decreased (26.3% to 15.7%) from the second to the third trimester [16], and in another cross-sectional study, the occurrence of headache decreased (44.9% to 37.6%) and that of constipation increased (38.6 to 45.2%) from the second to the third trimester [3]. Here, we observed a difference when compared with the previous study of Nazik and Eryilmaz, where the prevalence of constipation decreased in our study but increased in that study. However, it is worth noting that ours is a longitudinal study, and thus, we collected information during each trimester from the same participants, and that found that some discomforts might improve during the course of pregnancy. Therefore, pregnant women should pay attention to constipation and shoulder stiffness or headache during the early stages of pregnancy, especially during the second trimester, and of other discomforts thereafter.

We found significant differences in the occurrence of analyzed discomforts according to pre-pregnancy BMI. The occurrence of hip joint or pubis pain was higher during the second trimester, and the occurrence of sleeping difficulty, hand or finger stiffness, leg cramps, low back pain, hip joint or pubis pain, and shoulder stiffness or headache during the third trimester was higher in the high BMI group than in the normal BMI group. These discomforts are related to changes in the musculoskeletal and cardiovascular systems, common during pregnancy [17-21]. Overweight exposes the musculoskeletal system to excessive loads, resulting in conditions such as low back pain and hand pain (22,23). Overweight might also affect the cardiovascular system [24,25], leading to leg cramps and hand or finger stiffness.

Accordingly, discomforts, especially those related to the musculoskeletal and cardiovascular systems, might occur in the high BMI group. The occurrence of shoulder stiffness or headache during the second trimester, and constipation during the third trimester, was higher in the low BMI group than in the normal BMI group. These discomforts are related to fluctuations in hormones such as estrogen, occurring during pregnancy [26,27], and low weight might determine hormone imbalance, in particular by decreasing the effects of female hormones [28]. Therefore, pre-pregnancy low BMI might hamper the hormonal balance and lead to the observed pregnancy-related discomforts.

In recent years, the occurrence of obesity has increased worldwide [29],while women, especially young adults, attempt to lose weight despite being of normal weight or underweight [30,31]. In this respect, our study showed that both women with high or low pre-pregnancy BMI have a high risk of pregnancy-related discomforts that not only affect their quality of life and limit their daily activities, but might also have a negative impact on their children's health [4,5]. Hence, our findings suggest that young women should maintain an appropriate BMI before getting pregnant, in order to have a good pregnancy progression.

This study has several limitations. First, we could not obtain information on some factors that could affect pregnancy-related discomforts (e.g. living environment, parity, and hormonal fluctuations during pregnancy). These factors may have affected our results. Second, we could not investigate the occurrence of additional discomforts that occur during pregnancy: it is known that more than 30 discomforts might be experienced by pregnant women [3]. In the future, a similar study investigating various pregnancy-related discomforts should be conducted, taking into account the different factors related to the discomforts.

Conclusion

The current study showed that pregnancy-related discomforts have different trends in occurrence from the second to the third trimester. Therefore, pregnant women should pay attention to different discomforts depending on the pregnancy period. Moreover, pre-pregnancy low or high BMI might be a risk factor for pregnancy-related discomforts, regardless of age. These findings indicate that women should maintain an appropriate BMI before pregnancy to prevent potential discomforts during pregnancy.

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