The relationship between weight gain during pregnancy and urinary tract infections in pregnant women of Shahrekord, by using the “Nested case-control study”, in 2013

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ABSTRACT

Background and Objectives: Pregnancy is one of the most important and risky periods in mothers and the fetus life, which plays a key role in health and social activity of the person, family and community. This study is trying to see if there is a relation between increasing weight and urinary tract infection (UTI) in pregnancy by using the open nested case-control study in the city of Shahrekord. Materials and Methods: In a nested case-control study, one cohort including 832 patients was examined until week 26 to 30 of pregnancy and their UTIs were studied. The required information was collected by examining the health records of pregnant women and completion of the data registration forms. Data collection was controlled by using SPSS and analyzed by using an independent t-test, Chi-square test, Pearson correlation and logistic regression. Results: According to the results of the cohort study with 832 individuals, average weight gain of the group with a UTI was 11.13 ± 3.9 kg and it was 10.63 ± 3.9 kg in the group without UTI, showing no statistically significant difference (P = 0.245). According to the results, genitourinary problems had the highest predictive value for UTIs and the numbers of infertility and the childbirth variables were in the second and third positions, respectively. Conclusion: According to the results study we can conclude that screening and treatment of UTIs have been on time and appropriate in health systems of the city of Shahrekord which have lead to the reduction of infant and maternal diseases even with the condition in having no UTI, and continuing this process for screening and treatment is recommended.

Key words: Obesity, pregnancy, urinary tract infection

INTRODUCTION

Pregnancy is one of the most important and risky periods in mothers and the fetus life, which plays a key role in health and social activity of the person, family and community. Health or disease in this age of mother will affect not only her life quality, but also the life and health of the fetus and the next generation.50 million women (40%) suffer annually from diseases related to pregnancy, 15% of which experience long-term effects problems. Thus, it seems that 300 million women suffer from pregnancy-related problems worldwide nowadays. This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms. For reprints contact: reprints@medknow.com

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One of the problems during pregnancy is urinary tract infections (UTIs). UTI is a microbial growth in the urinary tract that leads to urinary tract damages. UTI is the most common bacterial infection during pregnancy in 2 to 12% of pregnant women and if there are more than 100,000 organisms per milliliter of non-infected samples, the case will be considered as the UTI. Also, UTI is the second common disease after anemia in pregnancy, which if it is not handled correctly can have major impacts on the outcome of pregnancy. This condition is prevalent in women with weight gain in pregnancy.

In some studies, the relationship between UTI and preterm pregnancy, low birth weight, prenatal mortality, congenital malformations, mental retardation, delay in infants evolution, maternal hypertension, preeclampsia, maternal anemia and infection of the amniotic fluid have been reported.

Having proper weight before and during pregnancy helps the fetus growth during this period and is essential for continuation of mothers’ health. The relationship between pregnancy outcome and pre-pregnancy weight, weight gain during pregnancy and maternal height has also been shown by one study.

Although factors such as age, number of childbirths, socioeconomic status and personal health are the risk factors of UTI, but the predisposing factors have not been fully identified.

In a cross-sectional descriptive study, the pregnancy weight gain has been cited as a risk factor for UTI, and this has been confirmed.

Because the case-control study which confirms the relationship between the two variables is stronger than cross-sectional descriptive study and since few studies are done on the relationship between emergence of UTIs and the weight gain during pregnancy, both inside and outside the country, this study is trying to see if there is a relation between increasing weight and UTI in pregnancy by using the open nested case-control study in the city of Shahrekord.

**MATERIALS AND METHODS**

This study is of analytical type, with nested case-control method that is based on a cohort. In this research the confronting data was collected and recorded by the beginning of the study and was available for the researchers. The controls of the disease were selected from the population under study lacking the disease. Specifically, the risk of bias in this study is much less common compared to the case-control study. This method provides faster and more reliable findings than a cohort study. A nested case-control study is an important type of case-control study which chooses samples and controls from a well-defined cohort. In these circumstances, some information about some of the variables under study is available for both of the groups. Therefore, concerns about bias or misconduct in their classification are largely decreased. One of the major advantages of this type of study is its significant recall bias reduction. The studying population included all pregnant women who have been referred to Shahrekord health centers in the first 6 months of 2011 and their records were completed (total female = 1027). Entry criteria for this study included: No history of gestational diabetes and chronic diseases like asthma and thyroid, no drug consumptions, being under the supervision of physicians, being aware of recorded pre-pregnancy BMI, visiting the pregnant woman at 6-10 weeks of gestation, regular BMI measurement and doing their routine urine test at the first visit. The exclusion criteria included incomplete information about weight gain and those with morbid obesity (35 < BMI). This cohort including 832 patients was examined until week 26 to 30 of pregnancy and their UTIs were studied.

According to ministerial instruction integrated care program, all the pregnant women who go to health centers are routinely sent to the laboratories for urinalysis at 26 to 30 weeks of pregnancy.

The required information was collected by examining the health records of pregnant women and completion of the data registration forms. The data included demographic variables (age, education, women career, blood group and RH), current pregnancy status (multi-fetal condition, unwanted pregnancy, an interval of less than 3 years between two pregnancies, spotting problems, genitourinary, hyperemesis, preeclampsia, gestational diabetes, pre-pregnancy care), history or current risk of illnesses (renal, diabetes, hypertension), and history of previous pregnancies (stillbirths, miscarriages, premature births, number of pregnancies, number of childbirths).

In this method of case-control study, cases were considered for the individuals with UTIs (urinary tract infection was diagnosed by growth of at least 100,000 colony-forming units of a urinary tract pathogen per milliliter in a culture of a midstream urine sample). Controls were considered as the cases without UTIs. This 6 months’ cohort was divided into 12 parts containing 15 days (1 or to 15 April, 16 to 31 April, 1 May 15, 16 to 31 and 16 to September 31). Pregnant women with UTIs belonging to each of the 12 segments (depending on the pregnancy beginning) were considered as the case study (n = 109) and three controls were selected from the rest of pregnant women without UTI belonging to the related part (327 control), and finally the weight gain in pregnancy was examined.

The overweight status data was obtained by comparing the case study group with the control group. In the present study, pregnancy BMI was classified according to IOM that women with BMI <19.8 considered thin, 26 >BMI >8.19: Normal, 29 >BMI >26: Overweight and BMI >29 were defined as obese.

By considering the ethical issues in this study, necessary permits were obtained from the Research Council of the
University, Health Center of the city and the province and other health centers. The personal information remained confidential and the data were analyzed as a whole.

Data collection was controlled by using SPSS and analyzed by using an independent t-test, Chi-square test, Pearson correlation and logistic regression.

According to the results of the cohort study with 832 individuals, 109 of whom were diagnosed with UTI, and emergence of UTI was recorded to be 13.1% in this study.

RESULTS

Average weight gain of the group with a UTI was $11.13 \pm 3.9$ kg and it was $10.63 \pm 3.9$ kg in the group without UTI, showing no statistically significant differences [Table 1].

The average age of patients with UTI was $28.37 \pm 4.8$ and $28.11 \pm 5.1$ for the group with no UTI, and the age difference was not statistically significant ($P = 0.637$).

The mean BMI in the beginning of pregnancy for women with infection was $24.63 \pm 3.8$ and in women without urinary infection was $25.55 \pm 3.9$. This difference was statistically significant ($P = 0.031$).

There was no significant relationships between UTIs and the variables of blood group, RH, maternal educational level and job, husband’s educational level and job, the year interval of less than 3 years between two pregnancies, multi-fetal, hard childbirth, premature birth, spotting, unwanted pregnancy, abortions, stillbirths, pre-pregnancy care, renal disease, preeclampsia, gestational diabetes and high blood pressure.

There was a significant relationship between urinary infection and variables of parity, number of pregnancies, pregnancy interval for; preconception care, renal disease, preeclampsia, gestational diabetes and high blood pressure.

There was a significant relationship between urinary infection and variables of parity, number of pregnancies, pregnancy interval for; preconception care, renal disease, preeclampsia, gestational diabetes and high blood pressure.

There was no significant relationship between weight gain during pregnancy and variables of blood group and RH, maternal educational level and job, husband’s educational level and job, the year interval of less than 3 years between two pregnancies, multi-fetal, hard childbirth, premature birth, spotting, unwanted pregnancy, abortions, stillbirths, pre-pregnancy care, renal disease, preeclampsia, gestational diabetes and high blood pressure.

There was a significant correlation between weight gain during pregnancy and age, number of childbirth, severe vomiting, abortion, infertility, the number of pregnancies, preterm birth, preconception care, husband’s occupation and BMI at the beginning of pregnancy.

The rates of UTIs predictive variables by using logistic regression are shown in Table 2. Since the correlation between variables, number of pregnancies, number of childbirths, BMI and severe vomiting in pregnancy are related to both weight gain and UTI; they can play a confounding role in this study. Thus, the relationship between weight gain and the incidence of UTI and logistic regression analysis was used to control the effects of these variables.

The results of logistic regression analysis showed no correlations between the incidence of UTI and overweight with controlling effects of these variables. According to the results, genitourinary problems had the highest predictive for UTIs and the numbers of infertility and the childbirth variables were in the second and third positions, respectively. The variables of the interval of less than 3 years between two pregnancies ($P = 0.801$) and pre-pregnancy care ($P = 0.439$) had no predictive values for the UTI.

### Table 1: Average weight gain in the two control and case groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>UTI (percentage)</th>
<th>No UTI (percentage)</th>
<th>P value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery</td>
<td>28.87</td>
<td>71.13</td>
<td>0.012</td>
<td>1.6</td>
</tr>
<tr>
<td>Previous pregnancy interval of less than 3 years</td>
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<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>27.3</td>
<td>72.7</td>
<td>0.801</td>
<td>1.469</td>
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<td>No</td>
<td>24.9</td>
<td>75.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genitourinary problems (burning, itching and discharge pus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>52.6</td>
<td>47.4</td>
<td>0.011</td>
<td>3.222</td>
</tr>
<tr>
<td>No</td>
<td>23.7</td>
<td>76.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preconception care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>55.6</td>
<td>78.3</td>
<td>0.005</td>
<td>3.093</td>
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<tr>
<td>No</td>
<td>23.7</td>
<td>74.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infertility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>55.6</td>
<td>44.4</td>
<td>0.026</td>
<td>3.874</td>
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<tr>
<td>No</td>
<td>24.4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin</td>
<td>53.3</td>
<td>46.7</td>
<td>0.031</td>
<td>0.953</td>
</tr>
<tr>
<td>Normal</td>
<td>25.4</td>
<td>74.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over weight</td>
<td>25.2</td>
<td>74.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>16.9</td>
<td>81.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UTI = Urinary tract infection, BMI = Body mass index

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<th>No UTI (percentage)</th>
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</tr>
</thead>
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UTI = Urinary tract infection, BMI = Body mass index

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Rejali, et al.: Weight gain and urinary tract infections in pregnant women
DISCUSSION

This study aimed to determine the correlation between weight gain during pregnancy and UTI of pregnant women in the city of Shahrekord and the results showed that despite significant weight gain during pregnancy, the difference of the average weight gains of the groups with and without UTI was not statistically significant (P = 0.245).

The average weight gain during pregnancy in this study was 10.755. The average weight gain during pregnancy in China was about 11.5 kg and the international standards indicates about 12.5 kg. One study has examined the correlation between weight gain during pregnancy and UTI beginning; however, the results of this study were not in conformity with the study done by Ebadi, who examined the relationship between weight gain and UTI in pregnant women in the city of Larestan. The notable factor in this study was that obese women get trauma and less damage of genitalia during sexual relations than in non-obese ones, because of more fat tissues that they have. Also, regarding the average age of women in this study (28.37 ± 4.8), more estrogen preserves genital tissues against damage and infection, but Vessay et al. recorded an increasing prevalence of UTI in obese women for two and three times.

UTI in pregnant women was evaluated in the present study to be 13.1%. Incidence of UTIs during pregnancy has been evaluated to be 28.5% in Pakistan, 48.5% in Nigeria, and 2.5-8.7% in the west population, respectively.

Dysuria, urinary frequency and pain under the belly are the clinical signs of UTI. As in this study, 52.6% of women in the group with UTI and 47.4% of women in the group without UTI showed these symptoms and the differences were statistically significant (P = 0.011). AaliJahan et al. reported a difference in these symptoms between two groups with and without the infections, which was not statistically significant. A number of studies have reported the correlation between UTIs and preeclampsia. The mechanism of catching preeclampsia in women suffering UTI is the direct impact of microorganisms on the walls of blood vessels and the destruction of vascular endothelial which leads to the dysfunction and hardness of blood vessels. However, there was no statistically significant difference between infected and not infected cohorts with the presence of preeclampsia (P = 1), which is consistent and in conformity with the study of Raheleh AaliJahan and Gilstrap.

In this study, severe vomiting of pregnancy showed a statistically significant relationship with urine infection (P = 0.005). However, this factor was not significant in AaliJahan’s study. Severe vomiting can lead to decreasing fluid intake by the mother, during pregnancy and hence the urinary tract function would be affected. Thus, the decrease in urinary output, leading to long-term accumulation of urine in the urinary tract and the ground for bacteria and infection will be provided. Pregnancy number factor is significantly associated with UTI in pregnancy, as it has been frequently an agent for increasing and in fact doubling a marked UTI. The relationship between UTI and pregnancy numbers is due to the physiological changes that occur in the urinary tract during pregnancy period. In this study, the number of pregnancies had a significant relationship with UTI. Therefore, the results of this study agrees with the results of other studies as of Hamdan’s study on UTI in Sudan, or Masinde study in Tanzania, Turpin’s study in Ghana, and Hazhir’s investigations on asymptomatic UTIs of pregnant women in Iran. However, it agreed with UTI studies of Okonko in from Nigeria, Enayat’s study on asymptomatic UTI in pregnant women, and Haider’s study in Pakistan.

In this study, the interval of less than 3 years had no significant correlation with UTI (P = 0.801). Undermining food supplies of pregnant women due to pregnancies and having not enough time for reconstructing body supplies lead to lack of essential nutrition and as a result, lack of resistance of mothers’ bodies toward infections. In many cases with interval of less than three years between pregnancies, pregnancy care begins with delays, due to the unwanted pregnancy, high maternal engagement in taking care of previous children and lack of awareness to menstrual arrears due to amenorrhea or irregularities in the first few months after childbirth. In AaliJahan et al., study, a relationship between UTI and 3 years interval between pregnancies was reported.

Because of women screening for in 6-10 weeks before pregnancy UTI, they do not receive any proper care or receive very early care before pregnancy which may increase the risk of UTI in these women. However, we did not find a significant relationship between pre-pregnancy care and catching UTI in this study (P = 0.439).

Also, no significant correlation was seen between the age of pregnant women and affecting UTI. Similar findings to Haider, Okonko, Vszkan, and AaliJahan reports are obtained. However, there was a significant correlation between the age factor and UTI in Vessey investigation.

The different results about the presence or absence of a correlation between risk factors of UTI among pregnant women in different studies may be due to the differences in methodologies, the study population and the study sample volume.

Most notably, maternal factors especially weight gain during pregnancy did not have statistically significant association with UTI. Therefore, we can conclude that screening and treatment of UTIs have been on time and appropriate in health systems of the city of Shahrekord which have lead to the reduction of infant and maternal diseases even with the condition in having no UTI, and continuing this process for screening and treatment is recommended. The results of this
项目可用于健康中心的治疗方面，对成年女性应进行尿路感染筛查。

它被推荐进行进一步的研究，对体重和尿路感染在怀孕期间的持续3个月的体重变化，以及与尿路感染的相关性进行测量。

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没有冲突利益。

**REFERENCES**