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## Original Article

# Relationship between Delivery Type and Menstrual Disorders: A Case-Control Study

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### ABSTRACT

**Background:** High incidence of menstrual disorders at late ages of fertility accounts for 20% of clinical visits and 25% of gynecological surgeries. This study was conducted to identify the relationship between delivery type and menstrual disorders in women referring to hospitals affiliated to Medical Universities in Tehran in 2008.

**Methods:** In this case-control study, which was conducted from April to August, 2008 in Tehran, 160 women aged 36 to 44 years, 80 women with and 80 without menstrual disorder as case and control groups were enrolled respectively. Data collection tool was a questionnaire (included questions regarding demographic and obstetrical characteristics). Higham pictorial chart (scores more than 80 denoted menorrhagia), a verbal multidimensional scoring scale (from 0 for painless to 3 for severe pain), and Holmes-Rahe scale for assessing stress were used.

**Results:** About 93.1% of the cases and 65% of the controls had experienced dysmenorrhea at the beginning of the study ( $P=0.009$ ). In other words, 65% of women with dysmenorrhea had a history of C-section. Women with menstrual disorders had more caesarian sections (53.7%) than those without the disorders (27.5%) ( $P<0.001$ ) with an odds ratio estimate of 3.06 [95% CI: 1.58, 5.91]. There were significant differences in the number of pads/tampons used ( $P=0.009$ ) and amount of uterine bleeding based on Higham chart ( $P=0.009$ ) among case and control group.

**Conclusion:** Caesarian may be considered as a risk factor for menstrual disorders particularly at late ages of fertility. Therefore, pregnant women should be consulted by health providers regarding advantages versus disadvantages of caesarian before selective C-section.

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## Introduction

Menstrual disorders are common problems of women at late ages of fertility. Menstruation is a periodic bleeding of uterus which most women experience at child-bearing age<sup>1</sup>. Any change in menstruation patterns is considered as a disorder (spotting, metrorrhagia, menorrhagia, menometrorrhagia,

and hyper-menorrhagia). Menstrual disorders account for about 20% of clinical visits and 25% of all gynecological operations<sup>1-5</sup>. In the USA, about 10 million women suffer from abnormal uterine bleeding each year and 50% of 0.5 million hysterectomies are performed due to these disorders<sup>3,6</sup>. Although rarely life-threatening,

menstrual disorders adversely affect on personal, familial and social aspects of women's lives.

Decreased serum iron following menorrhagia leads to iron deficiency anemia<sup>1,7</sup>. Different studies revealed that this condition can cause physical and emotional problems such as physical pain, hypotension, fatigue, anxiety, emotional distress, negative self-image, inadaptability, reduced self-confidence<sup>1,8-9</sup>, sensory overload, stress, and decreased social as well as occupational efficiency<sup>10</sup>. The women experience dysmenorrheal account for 50%, another common disorder, at childbearing ages<sup>11,12</sup>. Menstrual disorders interfere with religious rituals and sexual activities as well as conception, which are upsetting<sup>10</sup>.

Although recent diagnostic and therapeutic methods to manage abnormal uterine bleeding have been somewhat successful, its etiologies, risk factors and, particularly, its nature remain unknown and most cases are symptomatically treated<sup>3</sup>. Anatomical, endocrine, infectious, hematologic as well as neoplastic disorders and even pregnancy are related to abnormal bleeding of uterus<sup>1,8</sup>. The effects of some iatrogenic procedures such as tubal ligation and exogenous hormones on menstrual disorders have been investigated; however, the effects of delivery type remain unknown<sup>3,13-14</sup>. It seems, therefore, that identifying predisposing factors of menstrual disorders is of critical importance and can play an important role in the prevention of this disorder and promotion of women's health.

Delivery occurs through labor process in two forms, namely, normal vaginal delivery (NVD) and caesarian section (C-section). If NVD would not be safe for mother, C-section becomes necessary with a significant role in the reduction of maternal morbidity and mortality<sup>15</sup>. However, with respect to complications of caesarian such as maternal mortality and physical as well as psychological problems like infection, postpartum depression, and lactation disturbances, menstrual disorders may prevail in some women especially at late ages of fertility<sup>3, 14, 16</sup>. There is a positive correlation between caesarian frequency and prevalence of menstrual complications at late ages of fertility<sup>3, 6, 13, 18</sup>. In addition, primary dysmenorrhea and

menorrhagia are more common in women with the history of caesarian compared to those who had NVD<sup>12,14</sup>. However, in some studies, no relationship was found between caesarian scar and menstrual disorders<sup>19</sup>. Many researchers confirmed that further studies are still needed to find any relationship between delivery type with its surgical scars and disorder in menstrual cycles or patterns<sup>3,5,10</sup>. Since menstruation occurs because of regular hormonal and structural changes<sup>1</sup>, caesarian may result in endometrial dysfunction by leaving scar in uterus wall. Additionally, most studies have focused on organic, hormonal and hematologic disorders of the uterus for diagnostic and therapeutic purposes rather than risk factors particularly delivery type, which is a contradictory issue. More research, therefore, is warranted for identifying the risk factors in this regard.

This case-control study was conducted to assess the relationship between delivery type and menstrual disorders in women referring to selected hospitals affiliated to Medical Universities (Shaheed Beheshti, Iran, and Tehran) in Tehran, Iran in 2008.

## Methods

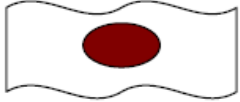
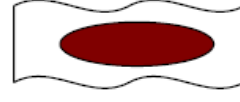
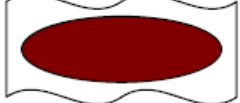
In this case-control study, 160 women, 80 women with and 80 without menstrual disorder as case and control groups were enrolled in the study respectively. Any change in menstrual period in women of childbearing age, such as abnormal uterine bleeding (AUB) and painful menstruation (dysmenorrhea) are considered as menstrual disorders<sup>20</sup>. AUB may involve any disturbance of regularity, frequency, duration or amount of menstrual flow, as well as bleeding between cycles. In the present study, we evaluated menorrhagia, menometrorrhagia, metrorrhagia, hypermenorrhea and spotting as patterns of AUB<sup>1,2,4,7-10,21,24</sup>. Sampling was performed at Imam Khomeini, Mirza Kouchak Khan, Baharlu, Mahdiye, Taleghani and Shaheed Akbar Abadi hospitals in Tehran, Iran from April to August, 2008. The case group was selected from 520 women whose chief complaint was menstrual disorders. The control group was selected from women without menstrual disorder who referred to aforementioned hospitals in order to receive health services. All women were Iranian aged 36 to 44 years. The

women were excluded from the study those who had a history of uterus surgery other than caesarian, used hormonal or intrauterine contraceptive devices, received drugs affecting on menstrual cycle, had a history of both NVD and caesarian as well as abnormal bleeding of uterus, and experienced dysmenorrhea prior to the first labor and severe stress (scores more than 200 according to Holmes-Rahe stress scale)<sup>22</sup>.

After obtaining written informed consent from the subjects, they were trained how to fill out Higham chart and verbal multidimensional scoring scale (VMSS)<sup>10,11</sup>. Data collection tools included a checklist of medical records of the subjects and a two-part validated questionnaire included 11 questions regarding demographics as well as confounding variables and 38 ques-

tions regarding obstetrical characteristics completed via face-to-face interview.

The amount of menstrual bleeding was measured in cubic centimeter (cc) using Higham pictorial chart in which the number of pads or tampons was checked by corresponding pictures of the chart<sup>10,11,14</sup>. Wetting of the pads was categories into three groups as follows: score 1: mild (1 cc), score 5: moderate (5 cc), and score 20: sever (20 cc) (Figure 1). Accordingly, the amount of bleeding was calculated for the first and the second month of the study. The amounts of bleeding more than 80 cc were considered as menorrhagia. The number of pads was also considered (less than 10 as mild, 10 to 19 as moderate, 20 to 30 as relatively severe, and more than 30 as severe bleeding)<sup>4,10,11</sup>.

Score	Number of pads per day	Number of days							
		1	2	3	4	5	6	7	8
1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	Small blood clots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Big Blood Clots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Figure 1:** Higham Pictorial Blood Lose Assessment Chart (PBLAC) for measuring amount of menstrual bleeding (cc)

Pain severity during menstruation was measured by a verbal multidimensional scoring scale (VMSS) with scores 0, 1, 2, and 3 denoting painless, mild, moderate and severe respectively<sup>12,23</sup>. Stress of the subjects was estimated by Holmes-Rahe scale investigating 43 stressful events during past 12 months. Stress scores more than 300 were considered as severe stress<sup>22</sup>. The validation of the above three tools were established in previous studies<sup>4,23</sup>.

Data were collected on standardized forms and were encoded for computerized analysis using of SPSS 10 for windows. Various statistical measurements were used for data analysis including t-test, chi-squared test, Mann-Whitney U test at 95% significant levels.

### Results

There were no statistically differences between cases (with menstrual disorder) and con-

trols (without menstrual disorder) in terms of age, body mass index (BMI), parity, age of menarche, duration of using oral contraceptive, intervals between menstrual cycles and duration of menstruation (Table 1).

In addition, there were not significant differences between demographic and obstetrical

characteristics of the subjects in the two groups in terms of education level, marital status, occupation, contraceptive methods, history of abortion, history of tubectomy, history of oral contraceptives and primary dysmenorrheal (Table 2).

**Table1:** Comparison of some characteristics of cases (with menstrual disorder) and controls (without menstrual disorder) using *t*-test

Variable	Mean (95% CI)			P value
	Cases	Controls	Difference	
Age (year)	39.4 39.0, 39.9	40.1 39.6, 40.7	0.725 -0.006, 1.450	0.052
Body mass index (kg/m <sup>2</sup> )	25.7 25.3, 26.2	26.4 25.9, 26.9	0.615 -0.959, 1.326	0.089
Parity	2.4 2.24, 2.65	2.6 2.44, 2.88	0.225 -0.069, 0.519	0.790
Age of menarche (years)	13.1 12.8, 13.4	12.9 12.6, 13.2	-0.150 -0.585, 0.285	0.490
Duration use oral contraceptive (years)	19.1 15.4, 22.6	20.3 16.4, 24.2	1.325 -3.943, 6.593	0.620
Intervals of menstrual cycles (days)	29.2 29.0, 29.5	29.1 28.8, 29.4	-0.125 -0.520, 0.270	0.530
Duration of menstruation (days)	5.7 5.43, 5.94	5.9 5.65, 6.10	0.188 -0.151, 0.526	0.270

Thirty five percent of the cases and 32.5% of the controls had delivery 1 to 5 years ago ( $P=0.430$ ).

About 93.1% of the cases and 65% of the controls had experienced dysmenorrhea at the begging of the study ( $P=0.009$ ). In other words, 65% of women with dysmenorrhea had a history of C-section.

There were significant differences between the number of pads/tampons used ( $P=0.009$ ) and amount of uterine bleeding based on Higham chart ( $P=0.009$ ) among case and control groups (Table 3).

The effect type of delivery on menstrual disorders was evaluated (Table 4). Women with menstrual disorders had history of C-sections more than those without the disorders (53.7%

versus 27.5% respectively). Odds ratio (OR) estimate of C-sections among cases was 3.06 [95% CI: 1.58, 5.91] against controls. In other words, women with C-section had 3.06 times more chance to have menstrual disorders in their medical history. Moreover, odd ratio estimate adjusted for body mass index (BMI) lead to relatively similar or even slightly stronger results, 3.32 [95% CI: 1.69, 6.53].

Various reasons were mentioned for C-section among cases and controls included dystocia (44.2% versus 40.9%), selective section (23.3% versus 22.7%), abnormal presentation (14% versus 4.5%), respiratory distress (11.6% versus 18.2%) and other causes (7% versus 13.6%).

## Discussion

The present study assessed the relationship between delivery type and menstrual disorders. The results provided objective evidence to validate that delivery type affects on the menstrual disorders. Abenhaim et al<sup>3</sup> and Harlow et al<sup>14</sup> found similar findings as OR=2.2 and OR=3.3 respectively. Uppal et al and Menada et al found that caesarian was performed more in those with menstrual disorders<sup>13,5</sup>. In addition, menorrhagia was more common in women with positive history for C-section. Abenhaim et al also found similar findings in this regard<sup>3</sup>.

This relationship has also been reported in other studies<sup>14,25-27</sup>. In addition, in the present study we found that hypermenorrhea was more common in women who had C-section. Abenhaim et al<sup>3</sup>, Uppal et al<sup>13</sup>, and Harlow et al<sup>14</sup>, reported similar findings. Furthermore, spotting and metrorrhagia were among disorders observed more significantly in women with C-section. Uppal et al<sup>13</sup> and Fabre's et al<sup>25</sup> reported similar findings in their studies. In this study, menometrorrhagia was more common in NVD group. However, the author did not find similar evidence in the literature.

**Table 2:** Comparison of demographic and obstetrical characteristics among cases (with menstrual disorder) and controls (without menstrual disorder) using chi-squared test

Variable	Cases N=80 (%)	Controls N=80 (%)	P value
Education level			
Illiterate	4 (5.0)	8 (10.0)	0.494
Primary school	26 (32.5)	24 (30.0)	
Secondary & High school	45 (56.3)	40 (50.0)	
Academic	5 (6.2)	8 (10.0)	
Marital status			
Married	76 (95.0)	72 (90.0)	0.230
Widow & divorced	4 (5.0)	8 (10.0)	
Occupation			
House maker	68 (85.0)	70 (87.5)	0.646
Working	12 (15.0)	10 (12.5)	
Contraceptives methods			
Tubal ligation	17 (21.3)	21 (26.2)	0.260
Condom	21 (26.2)	27 (33.8)	
Vasectomy	10 (12.5)	4 (5.0)	
Withdrawal	32 (40.0)	28 (35.0)	
History of abortion			
Yes	14 (17.5)	19 (23.8)	0.329
No	66 (82.5)	61 (76.2)	
History of tubectomy			
Yes	17 (21.2)	21 (26.2)	0.457
No	63 (78.8)	59 (73.8)	
History of oral contraceptive			
Yes	64 (80.0)	62 (77.5)	0.699
No	16 (20.0)	18 (22.5)	
Primary dysmenorrhea			
Yes	73 (91.3)	76 (95.0)	0.349
No	7 (8.7)	4 (5.0)	

In general, abnormal uterine bleeding was more severe in the caesarian group than the NVD group 5 to 10 years after last delivery.

Manado et al found the same results regarding abnormal bleeding after 5 to 10 years from last delivery<sup>5</sup>. Fabre's et al also reported an in-

creased abnormal bleedings 5 to 10 years following caesarian<sup>25</sup>. Regnard et al, however, found no relationship between the type of delivery and abnormal uterine bleeding<sup>19</sup>. This may be due to the limited number of subjects and passage of only 3 months after the last delivery

in their study. However, different studies showed that passage of time increases menstrual disorders in women with the history of caesarian; thus, it seems that menstrual patterns cannot be evaluated during short intervals form c-section.

**Table 3:** Comparison of number of pads and amount of bleeding based on Higham chart among cases (with menstrual disorder) and controls (without menstrual disorder) using Mann-Whitney U test

Variable	Cases		Controls		P value
	N=80	%	N=80	%	
Number of pads/tampons used					
<10	0	00.0	41	51.2	0.009
10-19	15	18.8	39	48.8	
20-30	65	81.2	0	00.0	
>30	0	00.0	0	00.0	
Amount of bleeding/(cc)					
Mild	0	00.0	23	28.8	0.009
Moderate	12	15.0	57	71.2	
Sever	68	85.0	0	00.0	

**Table 4:** Odds ratio (OR) estimates of effect of delivery type on late reproductive menstrual disorder using logistic regression analysis, OR adjusted for body mass index.

Type of delivery	Cases N=80	Controls N=80	Unadjusted OR 95% CI	P value	Adjusted OR 95% CI	P value
Normal vaginal delivery	37	58	1	<0.001	1	<0.001
Caesarian section	43	22	3.06 1.58, 5.91		3.32 1.69, 6.53	

Dysmenorrhea was significantly more common in women with the history of caesarian than those of NVD. While this disorder was somehow more common at early ages of childbearing in the group with menstrual disorders than the other group, it was much more common at late ages of fertility in caesarian group than NVD group. Our findings indicated that caesarian had no effect on dysmenorrhea while NVD had decreasing effect on it. Abenhaim et al<sup>3</sup> and Juang et al<sup>12</sup> found that caesarian had less decreasing effect on dysmenorrhea than NVD. It seems that severe uterine contractions particularly at late stages of labor leads to decreased sensitivity of uterine nerves to pain at inferior segment and cervix. These areas, therefore, become less sensitive to nerve impulses during normal menstruation and this may decrease dysmenorrhea. In caesarian espe-

cially selective types, women do not experience such contractions and decreased nerves sensitivity will not occur. The results of some literatures were shown that severity of dysmenorrhea could be relieved by childbirth. The results of this study confirmed the old hypothesis of the effects of childbirth on dysmenorrhea. Caesarian was the most common reason for Caesarian after dystocia. Manado et al also reported similar result<sup>5</sup>.

Uppal et al<sup>13</sup>, Fabres et al<sup>25</sup>, and Ceci et al<sup>26</sup> found that caesarian scar is among the main leading causes of menstrual disorders. Caesarian may cause abnormal uterine bleeding by such morphologic alterations and defects as prolapse, diverticulitis, as well as abscess at scar site and such histological changes at inferior segment of the uterus as endometrium congestion above prolapse with lymphocyte infil-

tration and vasodilatation<sup>5,13,27-28</sup>. Armstrong et al found that defects at caesarian scar may result in congestion at the site leading to increased duration of menstruation due to weakness of uterine contractions<sup>6</sup>. Other studies have also referred to weakness of uterine contractions at caesarian scar site as a cause for menstrual disorders<sup>3,5,27-31</sup>. It can be concluded that any injury in uterus muscle and disturbance in regular uterine contractions would inevitably cause menstrual disorders. The author could not find any relevant evidence in literature for discussion.

The major limitation of the current study is that the analysis was based on, to some extent, retrospective data. Therefore, recall bias could be a concern.

## Conclusion

In conclusion, the present study showed that women with C-section had three times more chance to have menstrual disorders than those with NVD in their medical history. There are still many important questions for investigation about possible effects of delivery type on menstrual disorders. This study conveys an important message that delivery types may influence menstrual disorders, hence the pregnant women should be consulted and instructed by health providers such as midwives and gynecologists regarding advantages compared to disadvantages of caesarian. Furthermore, these menstrual disorders negatively affect Muslim women religious practices. When they have continuous menstrual disorders this can cause stress and behavioral and psychological problems. Consequently, it is suggested that unnecessary caesarians should be avoided. However, we need more evidence based on cohort studies to confirm the results of the present study.

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## Conflict of interest statement

The authors have no conflict of interests to declare.

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