Original Article

Effect of Bilateral Tubal Ligation on Menstrual Blood flow: An Analysis of Menstrual Disorder Following the Procedure

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Abstract

Objective: To determine the effect of bilateral tubal ligation (BTL) on menstrual blood flow by comparing menstrual abnormalities and PBAC scores between interventional (BTL) and non-interventional women.

Methodology: A comparative cross-sectional study was done at Obstetrics and Gynaecology department of Rahbar Medical College Lahore from June 2022 to June 2023. Women aged 18 t0 45 years, who have undergone BTL at least one year prior to the study and visiting the gynaecology OPD and hospital specializing in reproductive health were included. Women were equally distributed in two groups; 85 as cases (intervention of BTL) and 85 as controls (without intervention of BTL). Finally women were assessed for demographic medical history and their current menstrual pattern. PBAC (Pictorial Blood Assessment Chart) score was used to quantify menstrual bleeding and assess its severity. Data was entered and analyzed using SPSS version 26.

Results: Average age of the participants was almost similar, with Group A having a mean age of 38.87 years and Group B at 38.14 years (p=0.237). Although, a significant difference was observed in the Body Mass Index (BMI), where Group A had a higher mean BMI of 28.36 kg/m² compared to 26.26 kg/m² in Group B, (p- 0.001). Among women of Group A (Exposed), 25.9% had menstrual irregularities, compared to only 10.6% in Group B (Unexposed), indicating a statistically significant difference (p=0.001). There was no any significant association of menstrual abnormalities in BTL-exposed women with age of women, parity, and number of previous C-sections and duration of BTL (p -> 0.05).

Conclusion: Study revealed that the BTL is a safe and reliable contraceptive procedure, though it is associated with an increased incidence of menstrual irregularities and heavier menstrual flow, as indicated by higher PBAC scores in the BTL-exposed group compared to the non-exposed group. However, the majority of women in both groups did not experience menstrual irregularities or heavy menstrual bleeding.

Keywords: BTL, Menstrual abnormalities, PBAC score.

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Introduction

It has been indicated that population growth in a country is closely linked to socioeconomic development, environmental sustainability, health promotion, quality of life, and social stability.[1] In mid-2020, the global population was estimated at 7.8 billion, with an average fertility rate of 2.3 children per woman. The least developed countries, characterized by unplanned pregnancies and limited access to contraceptive services, experience the highest birth rates and infant mortality levels.[2] The government of Pakistan is concerned regarding growth of the population due to its economic and social implications from uncontrolled expansion.[3,4] Inability to regulate reproductive rates and the rapid increase in population adversely affects development indicators like education, poverty, and life expectancy, particularly

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impacting the health of mothers and children.[3]

However, low-income countries around the world face a substantial 26% unmet need for modern family planning methods.[5] Additionally, 18% of women who wish to avoid pregnancy are not using any form of contraception.[5] Effective and reliable contraception plays an important role in preventing unplanned pregnancies. Bilateral Tubal Ligation (BTL) is a permanent contraceptive option for women who have decided not to have more children. This method involves surgically blocking the fallopian tubes, typically performed by a trained healthcare professional.[2,6] BTL is carried out through a mini-laparotomy under local anesthesia in an outpatient setting. The procedure can be done at any point during the menstrual cycle, once pregnancy has been excluded, and it does not affect ovulation or disrupt the hormonal functions of the reproductive system.[2,6] This contraceptive methods, possess a failure rate of just 0.5% within the first twelve months and 1.85% after ten years of cumulative use.[5,7]

Though speculative, it has been hypothesized that tubal ligation (TL) may reduce blood flow to the ovaries, potentially impairing follicular development and disrupting gonadotropin signaling and ovarian hormone levels, which could lead to menstrual irregularities.[8] Reported abnormalities following tubal ligation (TL) surgery encompass a wide range of menstrual disorders, including increased frequency of menstrual periods, irregular cycles, heavy bleeding (menorrhagia), painful periods (dysmenorrhea), spotting, and infrequent periods (oligomenorrhea).[8]

According to a recent study the women who undergo tubal ligation (TL) often experience a variety of physical, familial, sexual, and social challenges following the procedure.[9] However the existence of post-tubal ligation syndrome, characterized by menstrual abnormalities, has been a topic of debate for decades, with the evidence surrounding it remaining inconclusive.[10,11] Despite decades of discussion and varying opinions in the medical community, there remains a lack of consensus regarding how BTL influences menstrual patterns. This study aims to evaluate the relationship between BTL and menstrual flow, focusing on both qualitative and quantitative measures. By exploring recent data and incorporating contemporary methodologies, the research seeks to provide updated insights into how BTL may affect menstrual cycles.

Methodology

A comparative cross-sectional study was done at Obstetrics and Gynaecology department of Rahbar Medical College Lahore. Study was done during seven months of period from June 2022 to June 2023. All the women aged 18 t0 45 years, who have undergone BTL at least one year prior to the study and visiting the gynaecology OPD and hospital specializing in reproductive health were included. All the women with history of pelvic inflammatory disease, endometriosis, or any other reproductive system disorder, currently on hormonal contraceptives or treatments affecting menstrual cycles and those who did not want to take part of study were excluded. According to sample size calculation total 170 women were targeted, with an equal distribution of 85 as cases (intervention of BTL) and 85 as controls (without intervention of BTL). This size is determined to ensure sufficient statistical power to detect significant differences in menstrual flow characteristics, calculated using a significance level of 0.05 and a confidential level of 95%. Informed consent was obtained from participants and each participant was assured that their personal details and responses would be treated with the utmost confidentiality and used solely for the purpose of research.

Participants were interviewed using a structured questionnaire designed to gather comprehensive demographic information. Furthermore, women were asked to estimate the duration since their bilateral tubal ligation (BTL) procedure. Finally women were assessed for their current menstrual pattern, including cycle length, flow intensity, duration of menstrual bleeding, and any associated symptoms such as dysmenorrhea or mood changes. PBAC (Pictorial Blood Assessment Chart) score was used to quantify menstrual bleeding and assess its severity. All the information was conducted in a private setting to maintain confidentiality and allow participants to share their experiences gradually. Data was entered and analyzed using SPSS version 26. Chi-square test was applied and a p-value <0.05 was taken as significant.

Results

Present study included 170 women, divided into two groups: Group A (Exposed) and Group B (Unexposed). According to parity, in Group A, 30.6% had parity III, while in Group B, 28.2%, with no significant difference (p-0.762). Numbers of previous vaginal deliveries, and cesarean sections were statistically insignificant according to study groups. According to occupational

status, 11.8% of women in Group A were employed compared to 7.1% in Group B, but this difference was not statistically significant (p-0.293). Average age of the participants was almost similar, with Group A having a mean age of 38.87 years and Group B at 38.14 years (p=0.237). Although, a significant difference was observed in the Body Mass Index (BMI), where Group A had a higher mean BMI of 28.36 kg/m² compared to 26.26 kg/m² in Group B, (p- 0.001). Table I.

Table I: Demographic and clinical statistics of the women. (n=170)

Variables		Study groups: Group-A (Exposed)	Study groups: Group-B (Unexposed)	p-value
Parity	II	16	13	0.762
		18.8%	15.3%	
	III	26	24	
		30.6%	28.2%	
	IV	22	21	
		25.9%	24.7%	
	V	21	27	
		24.7%	31.8%	
Previous vaginal deliveries	I	28	24	0.360
		32.9%	28.2%	
	II	27	26	
		31.8%	30.6%	
	III	22	19	
		25.9%	22.4%	
	IV	8	16	
		9.4%	18.8%	
Previous C-sections	I	49	53	0.809
		57.6%	62.4%	
	II	32	28	
		37.6%	32.9%	
	III	4	4	
		4.7%	4.7%	
Occupational status	Employed	10	6	0.293
		11.8%	7.1%	
	Not employed	75	79	
		88.2%	92.9%	
Age	Mean	38.87 years	38.14 years	0.237
	SD	4.29 years	3.70 years	
BMI	Mean	28.36 kg/m^2	26.26 kg/m^2	0.001
	SD	2.82 kg/m^2	2.49 kg/m^2	

Among women of Group A (Exposed), 25.9% had menstrual irregularities, compared to only 10.6% in Group B (Unexposed), indicating a statistically significant difference (p=0.001). The majority of women in both groups did not report menstrual irregularities, with 74.1% in Group A and 89.4% in Group B. Table II.

Study analysis regarding menstrual abnormalities in BTL-exposed women (n=85) showed no significant associations basis on effect modifiers including age of women, parity, number of previous C-sections and duration of BTL (p->0.05) as shown in table III.

Table II: Comparison of menstrual abnormalities and PBAC score among BTL exposed and unexposed group. (n=170)

Variables		STUDY GROUPS: Group-A (Exposed)	STUDY GROUPS: Group-B (Unexposed)	p-value
Menstrual irregularity	**Yes**	22	9	0.001
		25.9%	10.6%	
	No	63	76	
		74.1%	89.4%	
Total		85	85	
		100.0%	100.0%	
PBAC score	**Mean**	95.52	70.1	
	SD	15.91	25.83	0.001

Table III: Menstrual abnormalities according effect modifiers in BTL exposed women. (n=85)

Variables		Menstrual irregularity: Yes	Menstrual irregularity: No	Total	p-value
Age groups	35-40 years	18	42	60	0.179
		21.2%	49.4%	70.6%	
	41-45 years	4	21	25	
		4.7%	24.7%	29.4%	
Parity	1-3	13	29	42	0.292
		15.3%	34.1%	49.4%	
	4-5	9	34	43	
		10.6%	40.0%	50.6%	
Previous c section	I	16	33	49	0.181
		18.8%	38.8%	57.6%	
	II	6	26	32	
		7.1%	30.6%	37.6%	
	III	0	4	4	
		0.0%	4.7%	4.7%	
BMI	Normal	1	3	4	0.162
		1.2%	3.6%	4.8%	
	Overweight	19	41	60	
		22.6%	48.8%	71.4%	
	Obesity	2	18	20	
		2.4%	21.4%	23.8%	
BTL duration	1-3 years	4	25	29	0.067
		4.7%	29.4%	34.1%	
	>3 years	18	38	56	
		21.2%	44.7%	65.9%	

Discussion

Bilateral tubal ligation (BTL), commonly known as tubal sterilization is a surgical procedure that involves closing or disconnecting the fallopian tubes to prevent conception. While BTL is primarily used as a permanent form of contraception, it may have varying effects on menstrual blood flow in some women. This study was conducted to evaluate the effect of bilateral tubal ligation (BTL) on menstrual blood flow by comparing menstrual abnormalities and PBAC (Pictorial Blood Assessment Chart) scores between women who underwent the procedure (interventional group) and those who did not (non-interventional group). The results showed that 25.9% of women in

Group A (BTL-exposed) experienced menstrual irregularities, compared to 10.6% in Group B (unexposed), indicating a statistically significant difference (p = 0.001). Despite this, the majority of women in both groups did not report menstrual irregularities, with 74.1% in Group A and 89.4% in Group B reporting no issues. In aligns to this study Sadatmahalleh SJ et al[8] reported that the women who underwent tubal ligation (TL) experienced more menstrual irregularities compared to those without TL (24.3% versus 10% respectively) (P=0.002).

Specifically, women with TL had higher rates of hypermenorrhea, polymenorrhea, menorrhagia, and menometrorrhagia. Additionally, there was a significant difference in the PBLAC (Pictorial Blood Loss Assessment Chart) score between women with and without TL (P-0.0001).[8] According to another study by Özerkan1ACDEFG K, et al[12] reported that the bleeding and painful menstruation were the most commonly observed issues following tubal sterilization.

Consistently in a study conducted by Al-Assadi HA et al**,** the findings indicated that menstrual disorders were more prevalent in women who had undergone tubal ligation. This research suggests that tubal ligation may contribute to irregular menstruation and lead to menorrhagia. The exact mechanisms behind the potential effects of BTL on the menstrual cycle are not well understood. Some experts suggest that surgically removing or blocking the fallopian tubes may disrupt the delicate hormonal balance that regulates the menstrual cycle. Additionally, inflammation and scar tissue formation related to the BTL procedure could potentially impact uterine function and influence monthly cycles. Furthermore several studies found inconsistent findings that there were no significant effects of BTL on menstrual cycle. Like Verma P et al[14] reported that in post-tubal ligation group, 39.22% of patients experienced polymenorrhea, and 29.41% had menorrhagia, and these findings were almost similar in the non-tubal ligation group, as 38.78% of patients had polymenorrhea, and 30.61% had menorrhagia (p-1.00).

Shobeiri MJ et al[15] also reported that there was no significant difference in menstrual abnormalities between the case and control groups**.** In the study by Çiçek ÖS et al[16] concluded that there is no significant change in menstrual disturbances, dysmenorrhea, or PMS symptoms over time in women who have undergone postpartum BTL. Therefore, women should not avoid BTL due to concerns about the long-term development of menstrual problems following the procedure. Although Yasmeen S et al[10] also observed that the rate of ovulation appears to improve slightly following bilateral tubal ligation, while ovarian reserves remain unaffected. However Abbas HY et al[17] found consistent findings as Bilateral tubal ligation is linked to menstrual irregularities, with 58.7% of patients reporting disturbances such as polymenorrhea, menorrhagia, and intermenstrual bleeding, especially among older women. While Lt Col Prashant Sharma et al[18] found inconsistent results in their study. Causes for above contradictory results is unclear, however it could be due to factors like as study design, studies sample sizes, and the particular surgical procedures employed for the tubal ligation procedure. Furthermore, individual variability in the physiological response to the procedure may be responsible for the differences found in these observations. Finally, the current research on the impact of tubal ligation on the menstrual cycle yields conflicting results. Although certain research investigations identified significant changes in menstrual problems, others found no discernible impact. Additional studies with larger and more diverse study populations could assist clarify the association between tubal ligation and menstrual cycle variations.

Conclusion

Study revealed that the BTL is associated with some higher incidence of menstrual irregularities and increased menstrual blood flow, as reflected by higher PBAC scores among the BTL-exposed group when compared to the non-exposed group. Although, it is important to note that the majority of women in both groups did not experience significant menstrual abnormalities or heavy menstrual bleeding, suggesting that while BTL may impact some women's menstrual patterns, the overall effect is not universal. Association between BTL and menstrual changes recommended for further investigation. Future longitudinal studies with larger sample sizes are recommended to validate these findings and to evaluate whether other factors, such as hormonal influences or underlying reproductive health conditions, may contribute to the observed abnormalities.

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