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Association of Tubal Sterilization with Menstrual Disorders and Hysterectomy: A Case-Control Study

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ABSTRACT

Introduction Female sterilization is one of the most commonly used permanent contraceptive methods worldwide and is widely accepted because of its effectiveness, safety, and permanence. In India, tubal ligation plays a major role in family planning programs among women who have completed their families. However, concerns have been raised regarding the development of menstrual disturbances following sterilization.

Material and Methods This retrospective case-control study was conducted at a tertiary care hospital from 2023 to 2025 after obtaining approval from the Institutional Ethics Committee and informed consent from all participants. A total of 300 women undergoing abdominal hysterectomy were included and divided into two groups: 150 women with a previous history of tubal sterilization (cases) and 150 women without a history of sterilization (controls).

Results A total of 300 women undergoing abdominal hysterectomy were included in the study, comprising 150 women with previous tubal sterilization (Group I) and 150 women without sterilization (Group II). The demographic characteristics of both groups were comparable. The mean age at hysterectomy was 40.26 ± 8.14 years in Group I and 41.97 ± 8.73 years in Group II, with no statistically significant difference ($p = 0.081$). Similarly, parity distribution and the proportion of menopausal women undergoing hysterectomy were comparable between the groups.

Conclusion Women with a history of tubal sterilization experienced significantly higher rates of menorrhagia and dysmenorrhea compared with non-sterilized women. However, the major indications for hysterectomy, including leiomyoma and dysfunctional uterine bleeding, were similar in both groups. No clear association was observed between age at sterilization and subsequent hysterectomy. These findings suggest that while tubal sterilization may be associated with certain menstrual disturbances, its role in increasing the need for hysterectomy remains inconclusive and warrants further prospective investigation.

Keywords*: Female sterilization; Tubal ligation; Hysterectomy; Menstrual disturbances; Dysmenorrhea.*

INTRODUCTION

Female sterilization is one of the most commonly used permanent contraceptive methods worldwide and is widely accepted because of its effectiveness, safety, and permanence. In India, tubal ligation plays a major role in family planning programs among women who have completed their families. However, concerns have been raised regarding the development of menstrual disturbances following sterilization.[1] Symptoms such as menorrhagia, dysmenorrhea, irregular menstrual cycles, pelvic pain, and premenstrual syndrome have been collectively described as Post Tubal Ligation Syndrome (PTLS). First described in 1980, PTLS includes various physical, hormonal, and psychological symptoms that may appear months or years after sterilization. Despite numerous studies, the existence and underlying mechanisms of PTLS remain controversial.[2]

Several theories have been proposed to explain the development of menstrual disorders following tubal sterilization. One widely accepted hypothesis suggests that interruption of the utero-ovarian blood supply during tubal ligation may adversely affect ovarian function.[3] Damage to the vascular network supplying the ovaries can potentially lead to reduced ovarian perfusion, resulting in hormonal imbalance and altered ovarian steroidogenesis. Consequently, changes in estrogen and progesterone levels may contribute to menstrual irregularities and other gynecological symptoms. Furthermore, certain sterilization techniques, particularly those involving extensive cauterization or tissue destruction, have been implicated in causing greater disruption of ovarian blood flow than mechanical occlusion methods such as clips or rings.[4]

In addition to menstrual disturbances, PTLS has been associated with various symptoms including chronic pelvic pain, hot flushes, night sweats, mood swings, irritability, depression, decreased libido, vaginal dryness, sleep disturbances, and early menopausal manifestations. Some investigators have suggested that these symptoms may result from premature ovarian insufficiency secondary to ovarian ischemia. Others have argued that many of these complaints may be attributable to aging, parity, pre-existing gynecological conditions, or psychosocial factors rather than the sterilization procedure itself. Therefore, distinguishing the true effects of tubal ligation from confounding variables remains a significant challenge.[5]

Hysterectomy is one of the most frequently performed gynecological surgeries after cesarean section. It is commonly indicated for conditions such as dysfunctional uterine bleeding, uterine fibroids, adenomyosis, endometriosis, chronic pelvic pain, and other benign gynecological disorders.[6] Several studies have suggested that women with a history of tubal sterilization may undergo hysterectomy more frequently than non-sterilized women. This observation has generated considerable interest regarding the potential relationship between tubal ligation, menstrual abnormalities, and subsequent hysterectomy. If a causal association exists, the implications would be substantial, as increasing rates of hysterectomy would impose additional physical, psychological, and economic burdens on women and healthcare systems.[7]

The possible association between Post Tubal Ligation Syndrome (PTLS) and hysterectomy remains a subject of ongoing debate and warrants further investigation.[8] Determining whether tubal sterilization contributes to menstrual abnormalities and increases the risk of subsequent hysterectomy is important for patient counseling and clinical decision-making. Women opting for permanent sterilization should be informed about its potential long-term gynecological consequences. Therefore, the present study was undertaken to evaluate the relationship between prior tubal sterilization, menstrual disorders, and hysterectomy. By examining the clinical profile and menstrual history of women undergoing hysterectomy, the study aims to assess whether post-sterilization menstrual disturbances contribute to the eventual need for hysterectomy.

MATERIAL AND METHODS

This retrospective case-control study was conducted at a tertiary care hospital from 2023 to 2025 after obtaining approval from the Institutional Ethics Committee and informed consent from all participants. A total of 300 women undergoing abdominal hysterectomy were included and divided into two groups: 150 women with a previous history of tubal sterilization (cases) and 150 women without a history of sterilization (controls).

Women aged more than 60 years, those with chronic gastrointestinal diseases, connective tissue disorders, bleeding diathesis, previous major pelvic surgery, pre-existing menstrual disorders before sterilization, endometriosis, pelvic malignancy, or recent hormonal therapy were excluded. Detailed demographic and clinical information including age at hysterectomy, parity, age at sterilization, ligation-hysterectomy interval, menstrual complaints, chronic pelvic pain, and indications for hysterectomy were recorded. All participants underwent general and pelvic examinations, ultrasonography, routine preoperative investigations, and histopathological examination of the hysterectomy specimens

Data were analyzed using paired and unpaired Student's t-tests, Chi-square test, and odds ratio calculations. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 300 women undergoing abdominal hysterectomy were included in the study, comprising 150 women with previous tubal sterilization (Group I) and 150 women without sterilization (Group II). The demographic characteristics of both groups were comparable. The mean age at hysterectomy was 40.26 ± 8.14 years in Group I and 41.97 ± 8.73 years in Group II, with no statistically significant difference ($p = 0.081$). Similarly, parity distribution and the proportion of menopausal women undergoing hysterectomy were comparable between the groups (Table 1).

Among sterilized women, the mean age at ligation was 28.55 ± 5.42 years, with the majority undergoing sterilization between 20 and 30 years of age. The average ligation–hysterectomy interval was approximately 11 years, and no significant overall relationship was observed between age at ligation and subsequent hysterectomy interval (Table 2).

Analysis of menstrual symptoms revealed that menorrhagia (38.0% vs 27.3%) and dysmenorrhea (24.0% vs 14.7%) were significantly more common among women with prior sterilization compared to controls ($p < 0.05$). Although polymenorrhea, oligomenorrhea, hypomenorrhea, irregular bleeding, and continuous bleeding were also more frequent in the sterilized group, these differences were not statistically significant (Table 3).

Chronic pelvic pain was reported in 40.0% of women with previous sterilization and 45.3% of controls. Regarding indications for hysterectomy, leiomyoma was the most common diagnosis in both groups, accounting for 26.7% of cases in Group I and 32.7% in Group II. Dysfunctional uterine bleeding was the second most common indication and was more frequent among sterilized women (24.7% vs 21.3%). Other indications included pelvic inflammatory disease, adenomyosis, and their combinations, with comparable distributions between the groups (Table 4).

Overall, the findings suggest that women with a history of tubal sterilization experienced significantly higher rates of menorrhagia and dysmenorrhea, while the major indications for hysterectomy remained similar between sterilized and non-sterilized women (Tables 3 and 4).

Table 1. Demographic and Reproductive Characteristics of Study Participants

Parameter	Group I (Sterilized)	Group II (Non-sterilized)	p value
Age at hysterectomy (years)	40.26 ± 8.14	41.97 ± 8.73	0.081
Parity 0–1	2 (1.3%)	8 (5.3%)	
Parity 2–4	106 (70.7%)	96 (64.0%)	NS
Parity >4	42 (28.0%)	46 (30.7%)	
Menopausal hysterectomy	5 (3.3%)	5 (3.3%)	NS

Table 2. Ligation Characteristics among Sterilized Women (n=150)

Variable	Value
Mean age at ligation (years)	28.55 ± 5.42
Mean ligation-hysterectomy interval (years)	11.28 ± 6.24*
Most common age at ligation	26–30 years (35.3%)
Second most common age at ligation	20–25 years (34.0%)

*Approximate pooled value from subgroup intervals.

Table 3. Menstrual Complaints in Study Group

Symptom	Group I n (%)	Group II n (%)	p value
Menorrhagia	57 (38.0)	41 (27.3)	<0.05
Dysmenorrhea	36 (24.0)	22 (14.7)	<0.05
Polymenorrhea	34 (22.7)	32 (21.3)	>0.05
Continuous bleeding	14 (9.3)	16 (10.7)	>0.05
Hypomenorrhea	6 (4.0)	3 (2.0)	>0.05
Oligomenorrhea	8 (5.3)	2 (1.3)	>0.05
Irregular bleeding	16 (10.7)	13 (8.7)	>0.05

Table 4. Clinical Profile and Indications for Hysterectomy

Variable	Group I n (%)	Group II n (%)
Chronic pelvic pain	60 (40.0)	68 (45.3)
Leiomyoma	40 (26.7)	49 (32.7)
Dysfunctional uterine bleeding	37 (24.7)	32 (21.3)
Pelvic inflammatory disease	21 (14.0)	27 (18.0)
Adenomyosis	13 (8.7)	10 (6.7)
Adenomyosis + Leiomyoma	12 (8.0)	9 (6.0)
PID + Adenomyosis	16 (10.7)	10 (6.7)
PID + Leiomyoma	11 (7.3)	13 8.7)

DISCUSSION

Tubal sterilization remains one of the most widely practiced methods of permanent contraception worldwide and plays a major role in family planning programs in developing countries. Despite its effectiveness and safety, concerns regarding its possible long-term gynecological consequences, particularly menstrual disturbances and the subsequent need for hysterectomy, have persisted for decades. The present study was undertaken to evaluate the relationship between previous tubal sterilization, menstrual disorders, and hysterectomy by comparing women with a history of tubal ligation to those without sterilization.

The mean age at hysterectomy was comparable between the two groups, with no statistically significant difference observed. This finding suggests that age alone was unlikely to influence the occurrence of hysterectomy in the study population. Similarly, parity distribution was comparable in both groups, with the majority of women undergoing hysterectomy having a parity of 2–4. These findings are consistent with previous studies, which reported that age and parity

are important demographic characteristics but do not independently explain the differences in menstrual symptoms observed after sterilization.

The mean age at tubal ligation in the present study was approximately 28.5 years, and most sterilizations were performed between 20 and 30 years of age. Analysis of the ligation–hysterectomy interval revealed no consistent relationship between age at sterilization and the subsequent timing of hysterectomy. Although a statistically significant difference was noted between certain age-at-ligation subgroups, the overall comparison failed to demonstrate a meaningful association. These observations suggest that factors other than age at sterilization may influence the likelihood of subsequent hysterectomy.

One of the most important findings of the present study was the significantly higher prevalence of menorrhagia and dysmenorrhea among women with a history of tubal sterilization. Menorrhagia was observed in 38.0% of sterilized women compared with 27.3% of controls, while dysmenorrhea occurred in 24.0% and 14.7% of women, respectively. These findings support the hypothesis that tubal sterilization may be associated with alterations in menstrual patterns. Similar observations have been reported by several investigators who proposed that disruption of the utero-ovarian blood supply during tubal ligation may adversely affect ovarian function and hormonal regulation, thereby contributing to menstrual abnormalities. However, the exact mechanism remains uncertain and continues to be debated.

Other menstrual disturbances such as polymenorrhea, oligomenorrhea, hypomenorrhea, continuous bleeding, and irregular bleeding were more frequent among sterilized women but did not reach statistical significance. This finding suggests that while certain menstrual symptoms may be associated with prior sterilization, not all menstrual abnormalities can be directly attributed to the procedure. The variability of findings reported in the literature may be due to differences in study design, sterilization techniques, patient characteristics, and duration of follow-up.

Chronic pelvic pain was reported by a substantial proportion of women in both groups, although it was slightly less common among sterilized women. This observation differs from some previous studies that identified chronic pelvic pain as a prominent feature of Post Tubal Ligation Syndrome. The discrepancy may reflect differences in patient populations or diagnostic criteria used across studies. Therefore, the relationship between tubal sterilization and chronic pelvic pain remains inconclusive.

Regarding indications for hysterectomy, leiomyoma was the most common diagnosis in both groups, followed by dysfunctional uterine bleeding. The frequency of pelvic inflammatory disease, adenomyosis, and combined pathological conditions was broadly similar between sterilized and non-sterilized women. These findings indicate that the major pathological reasons for hysterectomy remain largely unchanged irrespective of sterilization status. Nevertheless, the higher prevalence of menstrual symptoms among sterilized women may contribute to increased healthcare-seeking behavior and clinical evaluation, eventually leading to surgical intervention in some cases.

In the case group (post-tubal ligated) study published by Verma et al., 2023[9], maximum patients of 39.22% were having polymenorrhea and 29.41% patients had menorrhagia, whereas in the control group (non-tubal ligated), maximum patients of 38.78% had polymenorrhea and 30.61% had menorrhagia, respectively but was insignificant.

Sadatmahalleh et al., 2016[10] reported higher rates of menorrhagia, polymenorrhea, and menstrual irregularities among women who underwent tubal ligation, supporting your finding of increased menorrhagia and dysmenorrhea in sterilized women.

DeStefano et al. 1985[11] found increased risks of abnormal menstrual cycles and multiple adverse menstrual outcomes in women several years after sterilization. A case-control study demonstrated an association between bilateral tubal ligation and menstrual abnormalities, including heavier bleeding and dysmenorrhea by Lafta et al., 2022.[12]

However a study by Verma et al., 2023[13] Reported no statistically significant difference in menstrual disorders between sterilized and non-sterilized women. As a retrospective case-control study, the possibility of recall bias regarding menstrual history and age-related variables cannot be completely excluded. Additionally, socioeconomic factors, educational status, healthcare accessibility, and individual perceptions of symptoms may have influenced the decision to undergo hysterectomy. Furthermore, the study did not assess hormonal profiles or ovarian reserve parameters that could have provided insight into the biological mechanisms underlying post-sterilization menstrual changes.

Despite these limitations, the study provides valuable information regarding the long-term gynecological outcomes of tubal sterilization. The findings suggest that although sterilized women experience a higher frequency of menorrhagia and dysmenorrhea, tubal ligation does not appear to substantially alter the major pathological indications for hysterectomy. Further prospective studies with long-term follow-up are required to clarify the existence and clinical significance of Post Tubal Ligation Syndrome and its potential association with hysterectomy.

CONCLUSION

Women with a history of tubal sterilization experienced significantly higher rates of menorrhagia and dysmenorrhea compared with non-sterilized women. However, the major indications for hysterectomy, including leiomyoma and dysfunctional uterine bleeding, were similar in both groups. No clear association was observed between age at sterilization

and subsequent hysterectomy. These findings suggest that while tubal sterilization may be associated with certain menstrual disturbances, its role in increasing the need for hysterectomy remains inconclusive and warrants further prospective investigation.

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