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RESEARCH ARTICLE

Correlation of Risk Factors Associated With the Development of Endometrial Cancer: A Cross-Sectional Study From a Tertiary Care Centre in South India

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Abstract: ***Background:*** Endometrial cancer is being diagnosed more often in Indian women, sometimes at younger ages than previously expected. Several reproductive, metabolic, and lifestyle factors influence its development, but the relative impact of these risks varies across populations. Recognising local patterns may improve early detection. ***Aim:*** To examine selected clinical and metabolic risk factors associated with endometrial cancer in women attending a tertiary hospital in Tamil Nadu. ***Methods:*** A cross-sectional study was conducted among 78 women evaluated at Government Mohan Kumaramangalam Medical College and Hospital, Salem, between January 2023 and December 2024. Information on menstrual history, parity, anthropometry, comorbidities, and metabolic markers was collected. Histopathology confirmed the diagnosis, and associations between risk factors and endometrial cancer were assessed. ***Results:*** Women with endometrial cancer more frequently reported prolonged menstrual irregularity, obesity, later menopause, nulliparity, and diabetes. Patterns of unopposed estrogen exposure and metabolic disturbance appeared prominent among affected participants. ***Conclusion:*** Risk profiles common in this region may help clinicians identify women who need earlier evaluation for possible endometrial pathology. Simple clinical cues and metabolic screening at primary contact points could support earlier referral.

Keywords: Endometrial cancer; risk factors; obesity; anovulation; diabetes; reproductive history; South India.

INTRODUCTION

Abnormal uterine bleeding remains one of the most common reasons women attend gynaecology outpatient clinics across India. While many cases can be explained by anovulatory cycles, fibroids, or perimenopausal changes, a smaller group presents with symptoms that persist longer than expected or deviate from their usual pattern. These cases often raise concern, especially because endometrial cancer, traditionally considered a disease of postmenopausal women, is now being reported at comparatively younger ages in several Indian centres. Studies from South India and tertiary cancer hospitals have described a gradual shift in age at diagnosis, with a noticeable proportion of cases occurring in the early fifties and even late forties [1,2]. The link between prolonged estrogen exposure and endometrial carcinoma is well established. Risk factors such as chronic anovulation, obesity, nulliparity, late menopause, and metabolic disorders all contribute to this hormonal imbalance [3]. These patterns are not uncommon among Indian women, particularly in those with irregular cycles or long-standing metabolic disturbances. Obesity and type 2 diabetes, both increasing steadily in the Indian population, further amplify estrogenic stimulation and insulin-mediated growth pathways associated with endometrial carcinogenesis [4,5].

However, how these risks cluster in everyday clinical practice can vary. Many women delay seeking care, often normalising their symptoms or attributing them to stress or "age-related changes." Hospital-based studies in India have noted that a substantial proportion of women with endometrial cancer present at a later stage, partly due to delayed recognition of abnormal bleeding and limited access to early screening [6,7]. In government hospitals, irregular follow-up, financial constraints, and hesitation to report postmenopausal bleeding may further contribute to diagnostic delays.

Against this background, examining which risk factors are most prominent in a local population becomes essential. Understanding these patterns can help clinicians identify women who may benefit from early biopsy or referral. This study was undertaken to explore such associations among women evaluated at a government tertiary centre in Tamil Nadu, to identify practical clinical clues relevant to routine practice.

METHODOLOGY & MATERIALS

Study Setting and Duration

This study was carried out in the Department of Obstetrics and Gynaecology at Government Mohan Kumaramangalam Medical College and Hospital, Salem, Tamil Nadu. The hospital caters to a mixed urban and semi-rural population and functions as a referral centre for surrounding districts. Data were collected between January 2023 and December 2024.

Study Design and Participants

A cross-sectional design was used. Women presenting with abnormal uterine bleeding, postmenopausal bleeding, or other symptoms prompting endometrial evaluation were screened. After applying the inclusion criteria, 78 women who underwent endometrial sampling and provided complete clinical information formed the study cohort.

Inclusion and Exclusion Criteria

Women were included if they:

- were evaluated for suspected endometrial pathology, and
- had histopathology reports confirming either malignant or non-malignant endometrial changes.

Women were excluded if they:

- had incomplete clinical or laboratory data,
- were on long-term hormonal therapy affecting endometrial assessment, or
- had previously diagnosed gynecological malignancy.

Clinical and Anthropometric Assessment

At presentation, detailed menstrual and reproductive histories were recorded, including parity, age at menarche, and menopausal status where applicable. Body weight, height, and BMI were measured. Known comorbidities, such as diabetes, hypertension, and thyroid dysfunction, were documented from medical records or patient reports.

Evaluation of Risk Factors

Risk factors assessed included:

1. obesity (BMI classification as per WHO guidelines),
2. chronic anovulation or irregular cycles,
3. nulliparity,
4. age at menopause,
5. diabetes and hypertension,
6. family history of malignancy when available.

Lifestyle factors such as long-standing sedentary habits or previous prolonged estrogen exposure were noted when relevant to the clinical picture.

Endometrial Sampling and Diagnosis

All participants underwent endometrial sampling either through outpatient biopsy or dilation and curettage. Histopathology reports were reviewed and classified as:

- Endometrial cancer (type I or type II), or
- Non-malignant pathology (hyperplasia with/without atypia, benign endometrium).

This classification served as the basis for correlating clinical risk factors with endometrial cancer.

Statistical Analysis

Data were anonymised and entered into a secure database. Categorical variables were summarised as frequencies and percentages. Continuous variables were expressed as means with standard deviations. Associations between risk factors and endometrial cancer were analysed using appropriate statistical tests, and a p-value < 0.05 was considered significant.

RESULTS

A total of 78 women underwent endometrial evaluation during the study period. Many presented with abnormal uterine bleeding of varying duration, and a smaller proportion reported postmenopausal bleeding. Obesity, diabetes, and long-standing menstrual irregularity were frequently noted at baseline. Histopathological examination confirmed endometrial cancer in a subset of women, while others showed benign or premalignant findings.

Baseline Characteristics

Table 1 summarises the general demographic and clinical features of the study population. Most women were in the perimenopausal age group, and more than half were either overweight or obese. Diabetes and hypertension were also common.

Table 1. Baseline Characteristics of Study Participants (n = 78)

Parameter	n (%) or Mean ± SD
Age (years)	49.6 ± 8.3
BMI (kg/m²)	28.4 ± 4.8
Overweight/Obese	47 (60.3%)
Irregular cycles (premenopausal)	31 (39.7%)
Postmenopausal	29 (37.2%)
Diabetes mellitus	24 (30.8%)
Hypertension	21 (26.9%)
Nulliparity	12 (15.4%)

Distribution of Risk Factors

Several risk factors for endometrial cancer appeared frequently in the cohort. Obesity and diabetes were particularly notable, and nearly one-third of postmenopausal women reported bleeding for more than one month before seeking evaluation. Table 2 outlines the distribution of major risk factors.

Table 2. Distribution of Key Risk Factors in Study Population

Risk Factor	n (%)

Obesity (BMI ≥ 30 kg/m²)	29 (37.2%)
Chronic anovulation / irregular cycles	31 (39.7%)
Late menopause (> 55 years)	9 (11.5%)
Nulliparity	12 (15.4%)
Diabetes mellitus	24 (30.8%)
Hypertension	21 (26.9%)
Family history of gynecological malignancy	6 (7.7%)

Histopathological Findings

Endometrial cancer was diagnosed in a proportion of women, while others showed hyperplasia (with or without atypia) or benign endometrial patterns. Table 3 summarises these findings and their correlation with selected risk factors.

Table 3. Correlation of Risk Factors With Endometrial Cancer

Risk Factor	Present in Cancer Cases n (%)	Present in Non-Cancer Cases n (%)
Obesity	18 (62.1%)	11 (25.0%)
Diabetes mellitus	14 (48.3%)	10 (22.7%)
Nulliparity	7 (24.1%)	5 (11.4%)
Postmenopausal bleeding	16 (55.2%)	13 (29.5%)
Late menopause	6 (20.7%)	3 (6.8%)
Chronic anovulation / irregular cycles	17 (58.6%)	14 (31.8%)

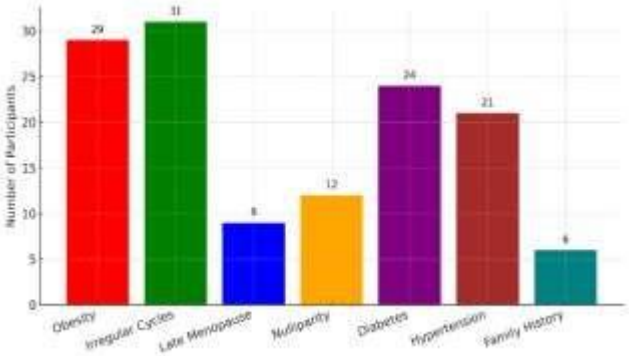
Clinical Interpretation

Women diagnosed with endometrial cancer tended to have a higher burden of metabolic and reproductive risk factors. Obesity and diabetes showed the most noticeable clustering in malignant cases. Irregular cycles, often suggestive of long-term unopposed estrogen exposure, were also more frequent among affected women. Postmenopausal bleeding remained an important clinical clue, with more than half of the cancer group reporting it.

In contrast, women with benign findings commonly presented earlier or had fewer overlapping risk factors. Several women with hyperplasia showed patterns that overlapped with the cancer group, emphasising the continuum of risk and the importance of timely sampling.

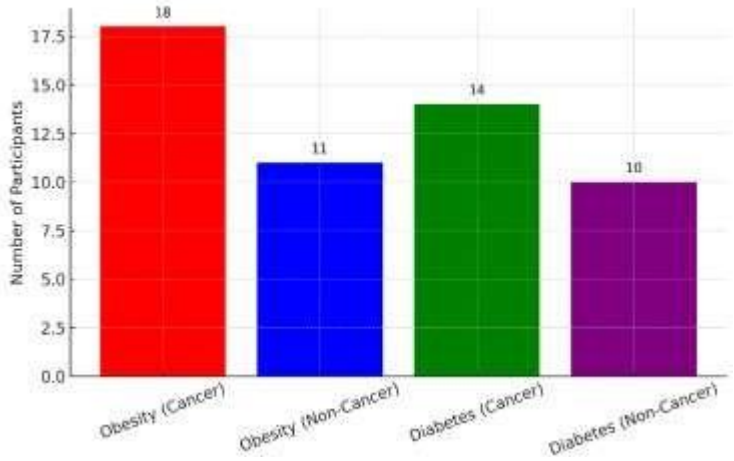
Figures 1–3 will illustrate the distribution of risk factors, proportion of malignant vs. non-malignant findings, and the relative clustering of obesity and metabolic disorders among cancer cases.

Figure 1. Distribution of major risk factors among the study participants.



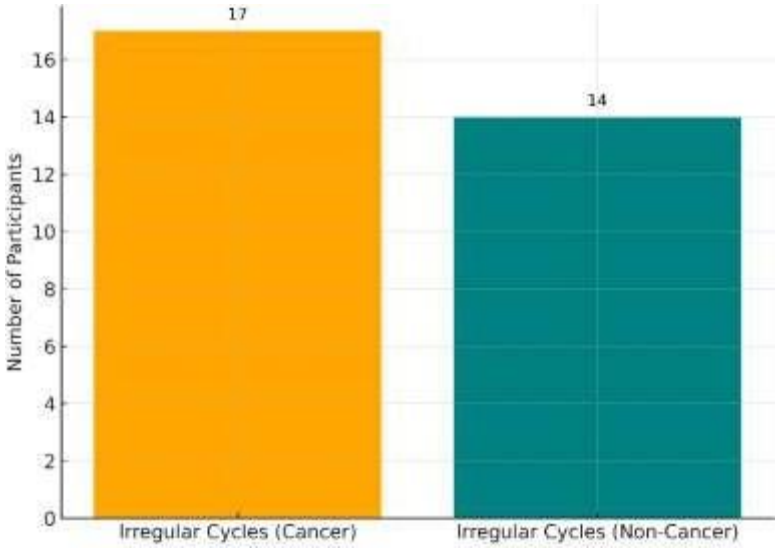
Each bar represents the number of women exhibiting a specific risk factor for endometrial cancer, with unique colours assigned for clarity.

Figure 2. Comparison of obesity and diabetes in women with and without endometrial cancer.



Unique bar colours highlight differences in the prevalence of obesity and diabetes between malignant and non-malignant cases.

Figure 3. Frequency of irregular menstrual cycles in cancer and non-cancer groups.



Distinct colours illustrate the distribution of chronic anovulation or irregular cycles across both groups.

DISCUSSION

Many women who presented to our clinic with abnormal bleeding had been living with their symptoms for months or even years. Several had become accustomed to irregular cycles, while others waited until bleeding became heavier or more erratic before seeking help. When we reviewed the cases diagnosed as endometrial cancer, certain patterns emerged. Several women had a history suggestive of prolonged anovulation or long-standing metabolic issues. Indian case–control studies also describe similar clustering of risks, especially in women exposed to unopposed estrogen for extended periods [8,9].

Obesity was one of the clearest trends in our cohort. A larger proportion of women with cancer fell into the obese range, a finding that aligns with Indian and international data linking higher BMI with increased estrogen production from adipose tissue [10,11]. Diabetes also appeared frequently. Earlier Indian studies have pointed out the combined effect of insulin resistance and chronic inflammation on endometrial proliferation, which may explain why diabetes often appears as a coexisting risk factor [12].

Reproductive patterns contributed as well. Nulliparity and later menopause were more common in the cancer group. Both conditions extend lifetime estrogen exposure without the counterbalancing effect of progesterone, a mechanism long recognised in studies from both Indian and Western populations [13]. Some women did not immediately report these details unless prompted, which may partly explain delays in presentation.

Among premenopausal women diagnosed with cancer, a history of irregular cycles was prominent. Even without documented PCOS, their bleeding history

resembled chronic anovulation. Prior research in Indian and Australian cohorts highlights the risk of endometrial hyperplasia and carcinoma in women with prolonged anovulatory intervals [14]. Several women mentioned ignoring these symptoms because the bleeding was manageable or consistent with what they believed was "normal" for them.

Postmenopausal bleeding remained the strongest clinical indicator. More than half of the cancer cases reported some form of bleeding after menopause. Although extensive literature recognises this as a key warning sign [15], real-world delays still occur. In our clinic, a few women waited weeks or months before presenting, either due to uncertainty about the seriousness of their symptoms or limited access to care.

Taken together, the findings reinforce the importance of recognising basic risk patterns, obesity, diabetes, irregular cycles, and reproductive history as early signals for possible endometrial pathology. These are factors that can be identified during routine outpatient visits. In government hospitals, where access to imaging or rapid histopathology may be limited, careful clinical assessment remains a powerful tool. Collaborating with primary care to monitor metabolic health may further reduce missed opportunities for early diagnosis.

Limitations

This study was carried out in a single government hospital, and the women who attended may not represent the broader community. A few participants were unable to return for all follow-up visits, so some information, especially about the duration of symptoms or metabolic control, relied on what they could recall. Biochemical markers were not repeated for every woman because of cost or logistics, which limits how precisely we could assess metabolic influences. The cross-sectional design also means we observed patterns rather than establishing causation. Despite these constraints, the data still offer a realistic picture of the kind of risk profiles commonly seen in routine practice.

CONCLUSION

Endometrial cancer in this cohort was closely tied to obesity, diabetes, irregular or anovulatory cycles, and certain reproductive patterns, factors that are often identifiable long before malignancy develops. Many of these risks are common in the local population, and their early recognition during routine outpatient visits can help shorten the time to biopsy or referral. In government hospital settings, where investigations may be limited or delayed, careful attention to menstrual history, metabolic health, and any postmenopausal bleeding remains a practical and effective way to identify women at higher risk. Strengthening this clinical vigilance may improve the chances of detecting disease at an earlier, more treatable stage.

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