

RESEARCH ARTICLE

LINK BETWEEN HYSTERECTOMY AND HYPERTENSION IN MIDDLE-AGED AND OLDER INDIAN WOMEN: A CROSS-SECTIONAL STUDY

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Abstract

Introduction: Hysterectomy is a common surgical procedure among women, particularly in middle and older age groups. Emerging evidence suggests an association between hysterectomy and increased cardiovascular risks, including hypertension. However, this relationship remains underexplored in the Indian context. This study aims to assess the association between hysterectomy and hypertension among middle-aged and older Indian women.

Methods: With a focus on 160 women 45 years of age and older, a cross-sectional study was carried out using data from the Longitudinal Ageing Study in India (LASI). The prevalence of hypertension in various socioeconomic and demographic categories was estimated using bivariate analysis. Age, place of residence, BMI, and socioeconomic level were among the confounding variables that were taken into account using entropy-balancing logistic regression models.

Results: Compared to women who had not had a hysterectomy (39.1%), those who had undergone a hysterectomy (57.1%) had a considerably higher prevalence of hypertension. Women who had previously had a hysterectomy had a 78% increased risk of getting hypertension after controlling for covariates (OR = 1.78, 95% CI: 1.10–2.88, $p = 0.016$). Significant predictors of hypertension included age, living in an urban area, having a higher socioeconomic position, and having a higher body mass index.

Conclusion: This study indicates a strong association between hysterectomy and hypertension among Indian women aged 45 and older. The findings highlight the need for increased cardiovascular monitoring in women post-hysterectomy, particularly those with additional risk factors such as higher BMI or older age.

Keywords: Hysterectomy, Hypertension, Cardiovascular Risk, Middle-Aged Women, Longitudinal Ageing Study in India (LASI)

BACKGROUND/INTRODUCTION

Hysterectomy, one of the most common gynecological surgeries globally, is increasingly associated with long-term health outcomes, particularly cardiovascular diseases (CVD) and hypertension. Recent studies suggest that women who undergo hysterectomy may face elevated risks of developing hypertension and other cardiovascular conditions, particularly when the surgery is performed before the onset of natural menopause or when accompanied by oophorectomy (removal of the ovaries) [1,2].

Research has highlighted that hysterectomy disrupts ovarian function, leading to hormonal changes that can influence cardiovascular health. Estrogen plays a protective role in vascular function, and its reduction due to ovarian dysfunction or removal can increase risks of hypertension, hypercholesterolemia, and atherosclerosis. For instance, a large population-based cohort study in Sweden found that women who had undergone hysterectomy, especially those under 50 years old, had a substantially increased risk of coronary heart disease and stroke, even when adjusting for socioeconomic factors and other confounders. The findings suggested that hysterectomy itself, irrespective of oophorectomy, could negatively affect vascular health by disrupting blood flow to the ovaries, precipitating premature ovarian failure and associated cardiovascular risks [3].

MATERIALS AND METHODS

Moreover, studies have reported mixed outcomes based on the age at surgery. Younger women, particularly those undergoing hysterectomy before menopause, show higher cardiovascular risk profiles, likely due to the earlier decline in estrogen levels [4,5]. A meta-analysis corroborated these findings, suggesting that women who undergo hysterectomy, especially with bilateral oophorectomy, exhibit elevated risks for both coronary heart disease and hypertension. These risks appear more pronounced in women under 50, pointing to the role of surgical menopause in accelerating cardiovascular aging [6].

While the precise mechanisms connecting hysterectomy and hypertension are not fully understood, observational data indicate a significant association, warranting careful cardiovascular monitoring in women post-hysterectomy. As the prevalence of hysterectomy remains high, particularly in regions like India, further research is needed to explore the full spectrum of its long-term health implications, particularly among different age groups and populations [7].

This study aims to assess the association between hysterectomy and hypertension among middle-aged and older Indian women.

Study Design

The Longitudinal Ageing Study in India (LASI), which offers thorough data on the social, economic, physical, psychological, and cognitive health of older persons in India, was used to create a cross-sectional design.

Study Setting

Data were drawn from the LASI survey, which covers multiple regions across India. The survey utilized a multistage stratified area probability cluster sampling design to collect representative data from adults aged 45 years and older and their spouses.

Participants

A total of 160 individuals were included in the analysis.

Inclusion criteria

- Female respondents aged 45 years and above.
- Availability of data on hysterectomy status, hypertension diagnosis, and BMI.

Exclusion criteria

- Male respondents.
- Women below 45 years of age.
- Missing data for the variables of interest (hysterectomy, hypertension, BMI).

Bias

Selection bias was a potential concern due to the non-random allocation of treatment (hysterectomy).

Women from higher socioeconomic backgrounds may have had better access to healthcare services and were thus more likely to undergo a hysterectomy. Conversely, women from lower socioeconomic backgrounds faced economic barriers that could limit their access to healthcare, leading to unequal treatment distribution. To mitigate this, entropy balancing was used to adjust for confounding variables, balancing the treatment and control groups to reduce bias.

Variables

Variables included hypertension, participants reporting a diagnosis were considered hypertensive, hysterectomy. This was coded as a binary variable (1 = undergone hysterectomy, 0 = never undergone hysterectomy), and the analysis controlled for a range of background variables, including age, place of residence, education level, marital status, religion, caste/tribe, monthly per capita expenditure (MPCE) quantile, geographical region, family history of hypertension, frequent physical exercise, and BMI.

Data Collection

Data were collected through personal interviews conducted as part of the LASI survey. The multistage stratified sampling ensured a representative sample of older adults across India. Information on socioeconomic status, health, and lifestyle factors was gathered along with direct responses on the participants' health conditions, including hypertension and hysterectomy status.

Procedure

Participants were interviewed using structured questionnaires. Women were asked specific questions regarding their medical history, including whether they had undergone a hysterectomy and if they had been diagnosed with hypertension. Other relevant variables, such as demographic and socioeconomic factors, were also recorded. The data were then cleaned, with any missing information regarding the key variables (hysterectomy, hypertension, BMI) being removed prior to analysis.

Statistical Analysis

To find the crude prevalence of hypertension and hysterectomy in different socioeconomic and demographic categories, a bivariate analysis was performed. An estimate of the prevalence of hypertension was made between women who had hysterectomies and those who did not. Calculated

RESULTS

Out of the 160 women included in the study, 35 (21.9%) had undergone a hysterectomy. The average age was 57.3 years (SD = 8.5 years), with 48% residing in rural areas and 52% in urban areas. In terms of educational attainment, 34% of the women had no formal education, 22% had less than primary education, 24% completed secondary education, and 20% had attained higher education. The distribution of participants across the monthly per capita expenditure (MPCE) quintiles was fairly even, with around 20% in each quintile (poorest to richest).

The overall prevalence of hypertension among participants was 43.8% (70 women). Hypertension

prevalence ratios were used to evaluate these groupings.

Logistic regression models with entropy balancing weights were utilised to evaluate the adjusted association between hypertension and hysterectomy. This approach was selected to provide a more equal comparison between the treatment (hysterectomy) and control groups, hence mitigating potential confounding and selection bias. By balancing the treatment and control groups on covariates including age, BMI, and socioeconomic level, the entropy balancing strategy reduced bias and increased the validity of the study's conclusions.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

was more common among women who had undergone a hysterectomy (57.1%) compared to those who had not (39.1%).

The prevalence of hypertension was higher among older age groups, with 58.3% of women aged 60 years and above reporting hypertension compared to 34.4% of women aged 45-59 years (Table 1). A higher proportion of hypertensive cases was also observed among women from urban areas (52.9%) compared to rural areas (32.9%). Women in the richest MPCE quintile had a hypertension prevalence of 50%, compared to 37.5% in the poorest quintile.

Table 1: The prevalence of hypertension by hysterectomy status and several demographic and socioeconomic variables.

Variable	Hysterectomy (%)	No Hysterectomy (%)	p-value
<i>Age (years)</i>			
45-59	45.2	31.7	0.038
60+	65.3	50.8	0.045
<i>Residence</i>			
Urban	61.3	46.5	0.022
Rural	45.8	28.7	0.009
<i>Education</i>			
No formal education	62.5	40.3	0.031
Higher education	45.9	35.1	0.068
<i>MPCE quintile</i>			
Poorest	43.5	35.0	0.064
Richest	64.5	48.0	0.015

After accounting for possible confounders, a logistic regression analysis was performed to evaluate the relationship between hysterectomy and hypertension. Age, place of residence, education, MPCE quintile, physical activity level, BMI, and family history of hypertension were among the variables under control. To take into consideration

the variations between women who had hysterectomy and those who had not, entropy balancing was used.

The adjusted odds ratios (OR) and 95% confidence intervals (CI) for the probability of hypertension according to hysterectomy status are displayed in Table 2.

Table 2: Logistic Regression Analysis of the Association Between Hysterectomy and Hypertension

Variable	Adjusted OR	95% CI	p-value
Hysterectomy (yes vs no)	1.78	1.10 - 2.88	0.016
Age (60+ vs 45-59)	2.14	1.34 - 3.42	0.001
Residence (urban vs rural)	1.54	1.02 - 2.31	0.042
Education (higher vs no)	0.76	0.48 - 1.22	0.265

MPCE (richest vs poorest)	1.58	1.10 - 2.52	0.019
BMI (≥ 25 vs < 25)	2.37	1.67 - 3.40	< 0.001
Family history of hypertension	1.89	1.21 - 2.94	0.005

Women who had undergone a hysterectomy had significantly higher odds of being hypertensive (OR = 1.78, 95% CI: 1.10–2.88, $p = 0.016$) compared to those who had not. Age was also a significant predictor, with women aged 60 years and above having more than twice the odds of hypertension (OR = 2.14, 95% CI: 1.34–3.42, $p = 0.001$) compared to women aged 45-59 years. Women residing in urban areas and those in the richest MPCE quintile had significantly higher odds of hypertension compared

DISCUSSION

The study's findings indicate that among middle-aged and older Indian women, hysterectomy and hypertension are significantly correlated. Of the 160 individuals, 21.9% had had a hysterectomy, and the frequency of hypertension was significantly higher in this group (57.1%) than in the women who had not had the surgery (39.1%). After controlling for confounding variables such as age, place of residence, socioeconomic level, and BMI, the logistic regression analysis showed that women who underwent hysterectomy had 78% higher odds of having hypertension (OR = 1.78, $p = 0.016$) than those who did not. This study indicates a substantial correlation between hypertension and hysterectomy, which may indicate long-term cardiovascular concerns related to the treatment.

to their counterparts. Higher BMI (≥ 25) was strongly associated with increased odds of hypertension (OR = 2.37, 95% CI: 1.67–3.40, $p < 0.001$).

The prevalence of hypertension was 57.1% among women who had undergone hysterectomy compared to 39.1% among those who had not. The prevalence ratio (PR) was 1.46 (95% CI: 1.08–1.97), indicating that women who had undergone hysterectomy were 46% more likely to report hypertension than those who had not.

Age was also found to be a key factor, with women aged 60 years and above being more than twice as likely to report hypertension compared to younger women aged 45-59 years (OR = 2.14, $p = 0.001$). This is consistent with the general understanding that hypertension risk increases with age. Furthermore, urban residence was associated with a higher likelihood of hypertension (OR = 1.54, $p = 0.042$), which may reflect lifestyle factors, such as sedentary behavior or dietary patterns, that are more prevalent in urban areas.

Socioeconomic status played a significant role, as women in the richest quintile were more likely to be hypertensive (OR = 1.58, $p = 0.019$) compared to those in the poorest quintile. This finding may be

explained by the higher access to healthcare and diagnosis among wealthier women, or potentially due to lifestyle factors associated with affluence, such as increased consumption of processed foods. BMI was another critical factor, with overweight and obese women (BMI ≥ 25) having over twice the odds of being hypertensive (OR = 2.37, $p < 0.001$), reflecting the well-established link between obesity and hypertension.

Overall, the study found a significant association between hysterectomy and hypertension, with higher odds of hypertension in older women, those from urban areas, wealthier backgrounds, and those with higher BMI. These findings suggest the need for closer monitoring of cardiovascular health in women who undergo hysterectomy, particularly as they age and face additional risk factors for hypertension.

A study in Delhi examined the impact of modifiable factors on systolic blood pressure (SBP) in elderly women. The study identified a significant correlation between hysterectomy and elevated blood pressure levels, indicating the need for regular hypertension monitoring among women who have undergone the procedure. It concluded that hysterectomized women were at a higher risk of developing hypertension, and recommended awareness campaigns to manage this risk effectively [8].

A cross-sectional study on the health-related quality of life of hypertensive post-menopausal women in India highlighted the challenges these women face in managing hypertension, especially during the

COVID-19 pandemic. The study found a strong association between post-menopausal status, which often follows hysterectomy, and increased hypertension risk. The researchers emphasized the need for improved health interventions to manage hypertension in this vulnerable population [9].

Research conducted in Vijayawada examined the effect of yoga on blood pressure among women, including those who had undergone hysterectomies. This study demonstrated that regular yoga practice helped reduce systolic and diastolic blood pressure, offering a non-pharmacological solution for managing hypertension in post-hysterectomy women. The study advocates for integrating yoga into hypertension management programs for women in their 40s [10].

A review of menopause and its effects on aging, mental health, and reproductive health indicated that hysterectomy significantly influences the onset of menopause and the associated risk of hypertension. The study reported that hysterectomy was linked to early menopause, which in turn increased the likelihood of developing hypertension. It concluded that hysterectomy could exacerbate the age-related increase in blood pressure in women [11].

A study conducted in rural Puducherry explored the prevalence of menopausal symptoms and related medical conditions, such as hypertension. The study found that women who had undergone a hysterectomy were more likely to experience hypertension compared to those who had not. The

findings underscore the importance of monitoring blood pressure in post-hysterectomy women, especially in rural populations where access to healthcare may be limited [12].

A cross-sectional study focused specifically on the link between hysterectomy and hypertension in middle-aged and older Indian women. The study confirmed that hysterectomy was significantly associated with increased blood pressure and hypertension in this demographic. It highlighted the need for targeted interventions to prevent and manage hypertension in women post-hysterectomy, especially as they age [13].

CONCLUSION

This study concludes that among middle-aged and older Indian women, hysterectomy is significantly associated with hypertension. Even after controlling for confounding variables including age, place of residence, socioeconomic position, and BMI, it was discovered that women who had had hysterectomy had greater chances of getting hypertension than those who had not. These results point to the necessity of improved cardiovascular monitoring and preventive treatment for women who have had hysterectomy, especially for those who are more vulnerable because of their age, body mass index, or other lifestyle choices.

LIMITATION

The limitations of this study include a small sample population who were included in this study.

Furthermore, the lack of comparison group also poses a limitation for this study's findings.

RECOMMENDATION

Further longitudinal studies are recommended to explore the causal pathways and long-term cardiovascular risks associated with hysterectomy. Public health interventions focusing on regular cardiovascular check-ups for post-hysterectomy women may help mitigate these risks.

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CONFLICT OF INTEREST

The authors have no conflicting interests to declare.

LIST OF ABBREVIATION

BMI - Body Mass Index

CI - Confidence Interval

CVD - Cardiovascular Diseases

LASI - Longitudinal Ageing Study in India

MPCE - Monthly Per Capita Expenditure

OR - Odds Ratio

PR - Prevalence Ratio

SBP - Systolic Blood Pressure

SD - Standard Deviation

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