Original article

Predictive factors of hysterectomy in the City of Ilam: The area under the receiver operating characteristic (ROC) curve model approach.

Anahita Jalilian[1], Reza Valizadeh[1], Milad Rashidbeygi[2], Monireh Mohammed Hassan Nahal [2], MahnazShafieian [2], Reza Marzban[3], Kourosh Sayehmiri [4]

1- Factuly of Medicine ,Ilam University of Medical Sciences, Ilam, Iran

2-Students Research Committee, Ilam University of Medical Sciences, Ilam, Iran

3- Students Research Committee, Iran University of Medical Sciences, Tehran, Iran

4- Assistant Professor of Biostatistics, Center for prevention of psychosocial trauma, Ilam University of Medical Sciences, Ilam, Iran

Corresponding author: Kourosh Sayehmiri Email: sayehmiri@razi.tums.ac.ir

Abstract

Background: Hysterectomy pertains tothe removal of the uterus and the cervix without removal of adenexes. Hysterectomy is one of the most common surgical procedures and in the United States it ranks as the second common operation after cesarean. The objective of this study is to investigate the related variables involved among women with hysterectomy in the Shahid Mustafa Khomeini hospital inthe city of Ilam, Iran.

Methods: A retrospective case-control study was conducted on 150 women including 75 in the control group and 75 as the case group. The cases were women with hysterectomy during 2009-2011, and the control group was randomly selected out of women referred to the hospital in these years and hospitalized due to other causes other than hysterectomy.Data were analyzed using SPSS software, version 17. T-test and Chi-square test were used as appropriated.Precision the prediction models evaluated using a receiver operating characteristic (ROC) curve.

Results: In this study, of the all operations (2009-2011) performed on women in the Shahid Mustafa Khomeini hospital in Ilam, 76 women (3.8%) had undergone hysterectomy.The mean age of women with hysterectomy and the control group were 48.2 and 28.8 respectively. The mean numbers of pregnancies forthe control group as well as women with hysterectomy were 2.18% and 6.33%, respectively. The most common cause of hysterectomy was abnormal uterine bleeding (52%). There was a significant relationship between age and the risk of hysterectomy ($P < 0.001$). Considering the pelvic mass, 4 (5.3 %)of the cases and 33 individuals (44%) who had a history of hysterectomy had such a mass ($P < 0.001$, $OR = 13.94$).

Conclusion: As revealed in this study, hysterectomy in most cases is performed aboutthe menopause age when the incidence of abnormal uterine bleeding is relatively common. Thus, it might be possible to treat the patient with maintenance therapy in order to reduce the prevalence of hysterectomy.

Keywords: *hysterectomy, case-control, menopause*

Introduction

Hysterectomy pertains to the removal of the uterus and the cervix without removing the adenexes (1, 2). Nowadays, hysterectomyis put into operation in two ways;abdominalhysterectomy and vaginal hysterectomy. In the case of vaginal hysterectomy, the uterus is removed through the vagina and it is frequently done in the case of uterine prolapse without a history of pelvic adhesions, additionally in several cases such as leiomyoma, AUB, and adenomyosis; vaginal hysterectomy may be performed following a surgeon's diagnosis instead of abdominal surgery. On the other hand, in abdominal hysterectomy, the uterus is removed through an abdominal incision. In this procedure,in cases of anterior-posterior stenosis of geldosuc, severe adhesions, and some cases of cesarean of hysterectomy wherein the cervix is healthy and there are no likely problems in sexual function after

[Downloaded from intjmi.com on 2026-11-08]

removal, sub-total hysterectomy is used in which the cervix remains intact and not removed (3,4). Depending on the type of the pelvic disease, numerousclinical examinations, ultrasonographyand the history of previous surgery as well as the surgeon's skill; the best procedure is adopted. Today, hysterectomy is one of the most common surgical operations all over the world and in the United Statesit ranks as the second common surgery following cesarean. Annually, 600,000 cases of hysterectomy are performed in the United States and 25% of women till the age of 60 and those aged over 35 commonly are subjected to this operation (2). The rate of hysterectomies done in different regions of the world is different. The highest and the lowest cases are performed in the United States and in Norway, respectively (5). In spite of this, the chance wherein a woman might undergo hysterectomy depends on several variables. Among the personal variables are ones such asage, education, residence, occupation, blood type, and race. There are also obstetrics-relatedvariables such as number of pregnancy, number of delivery, number of abortion, delivery type, prolonged labor, vaginal delivery after cesarean, and the like.Furthermore, medical conditions including coagulation disorders, pelvic masses, and preeclampsia etc. plus surgical records such as a history of pelvic surgery, abdominal surgery, and so on are of the probable variables involved (5). The purpose of this study is to probe into the incidence of hysterectomy and some related variables in patients referred to the ShahidMustafa Khomeini hospital in the city of Ilam in Iran in the years of 2009-2011.

Method

A retrospective case-control study was conducted on 150 women composed of 75 as controlgroup and 75 as case group. The selected cases werewomen who had undergone hysterectomy during 2009-2011 and the control group was randomly selected among women referred to the hospital and hospitalized in these years due to other causes other than hysterectomy. The required information including age, education, occupation, residence, number of pregnancy, number of delivery, abortion, delivery type, history of pelvic masses, history of pelvic surgery, history of hormonal drugs use, were obtained and recorded in the related questionnaire. Then the information collected was classifiedand the relevant tables and diagrams were drawn. The sampling error with respect to 5% α and 90% test power as well as taking into account the relevant variables such as incidence of pelvic inflammatory disease (P_1) in individuals with hysterectomy and the incidence in the control group(P_2) with regard to OR = 3 were estimated.

Statistical Analysis

Data were analyzed using SPSS software, version 17 for windows (IBM Inc., NY, US).Frequency, mean and standard deviation (SD) were used to describe data. To compare age, number of pregnancy in case and control groups T-test was implemented. The comparison of the pelvic masses in cases and the control group was done using Chi-square test and logistic regression. Precision the prediction models evaluated using a receiver operating characteristic (ROC) curve.

Result

This study revealed that over the years 2009-2011, of the surgical operations performed on women at the Shahid Mustafa Khomeini hospital in Ilam, Iran. 76 women (3.8%) had undergone hysterectomy. The mean age of women with hysterectomy and the control group were 48.2 and 28.8, respectively. Regarding education,38 (67.9%) of the women with hysterectomy were illiterate, 16 (28.6%) were less than diploma, and 2 (3.6%)were high school graduates or they hadhigher education; while in the control group,6 women (8.2%) were illiterate, 28 (38.4%) were less than diploma and 39 (53.4%) were high school graduatesor they had higher education. The mean number of pregnancy in the control group was 2.18 and themean number of pregnancyamong women with hysterectomy was 6.33pregnancies. The results showed that the most cases of hysterectomy were performed among women who had more deliveries (Table 1). The results of the study also revealed that the mean number of deliveriesin the control group was less than 1 but in the cases with hysterectomy it was 6.1 (Table 1). Considering a history of pelvic masses, 4 (5.3%) of women in the control group and 33 (44%) of women who had a history of hysterectomy had a history of pelvic mass, too (Table 2). With regard to hormonal medicationsuse, 2 (2.7%) of the control group and 24 (32%) of those with hysterectomy had taken hormonal medications (Table 2). The most common causes leading to hysterectomy were respectively abnormal uterine bleeding; 39 cases (52%), leiomyoma;24 cases (32%), and pelvic prolapsed; 11 cases (14.6%).On the relationship between hysterectomy and the number of delivery and drugs useemploying logistic regression:

Model 1

$$:Log\frac{p}{1-p}=-5/1+1/45\ para+1/86\ drug$$

The model1 shows that using the variables such as the number of deliveryand hormonal drugs use, it is

[Downloaded from intjmi.com on 2026-11-08]

possible to predict how likely hysterectomy in women is. The sensitivity and specificity of the model 1 are 95.3% and 95.9% respectively. The equation of logistic regressionshows that the chance of having hysterectomy among women who have taken drugs increases6.45 times and among women who had more deliveries, the chance of hysterectomy increases 4.25 times and these two variables havea significant relationship with hysterectomy (P<0.01)(Table 3).

Model 2

$$:Log\frac{p}{1-p} = -15/31 + 2/1Mass + 0/387\ age$$

The model 2 shows that considering the variables of age and history of pelvic masse, we can predict the likelihood of hysterectomyamong individuals. The sensitivity and specificity of the model 2 are 91.9% and 92%, respectively. The chance of hysterectomy risk among the ones who have had pelvic massesincreases up to 8 times, as well, with an increase in age, the chance of hysterectomy rises to 1.4 times (Table 3).

Table 4shows that the specificity of the logistic regression model is 92% and its sensitivity is 91.9%. It means if the logistic regression model (model 2) is employed as a diagnostic test and the variables of pelvic mass as well as the patient's age are considered; of 100 patients, the conditions of about 92 people will be predicted correctly.

Discussion

This study revealed that the occurrence of hysterectomy in patients referred to the Shahid Mustafa Khomeini hospital in the city of Ilam over three years is 3.8%. Pokras and Hufnagel reported that of 97 million American women over the age of 15, approximately 18.5 million women (5.2%) have undergone hysterectomy (6). Dickinson and Hillpointedfind out that the hysterectomy rate in the United States is 25 to 50 percent more than hysterectomy rate in Western Europe (7). Therefore, differences in the prevalence of hysterectomy in different communities might originate from a series of social and cultural differences, awareness level of individuals, income, insurance type, and control and more attention in detections and analysis of information (8). This study showed that the greatest causes leading to hysterectomy are respectively abnormal uterine bleeding (52%), leiomyoma (32%), and pelvicprolapsed (14.6%). The present study was consistent with the study conducted by Davis (1994) and otherswho highlighted the abnormal uterine bleeding as the most common cause of hysterectomy (9).

This study was not, however, in line with studies by Behrashi and others (11, 10, 12) in which the leading cause of hysterectomy was mentioned as leiomyoma (11, 10, 12). In current study, totally 32% had hysterectomy due to leiomyoma, a study by Rittaluto and colleagues in Finland had mentioned the cause of hysterectomy of 50% (11), but further studies have revealed this rate 30% (13, 14) which is consonant with our study. Also current study revealed that 1.3% of the women inflicted with cancer had undergone hysterectomy. Such a percentage was reported as 2.7% in Behrashi and others (12) and in other studies,this rate has been reported 7% (11, 9). The conflicting results in most cases may be due to lack of biopsy before surgery. The most common indication for hysterectomy in the United States is leiomyoma in the uterus, about30% to 40% (15, 16). In other studies in the city of Mashhad in Iran and in Riyadh, Saudi Arabia, the most common indication for surgery has been reported as uterine bleeding and leiomyoma is ranked as the second outbreak (18,17), which is consistent with our study. A study in Pakistan also reported the most common indication for hysterectomy, leiomyomain 34% of cases (19).

In this study, the mean age of cases with hysterectomy was 48.29 years old. In Behrashistudy, 44.7% of the women were in the age group of 45-55 (12). In Rahimi study, the mean age was45.8 ± 8.09 (20). In Naderi study, 40% of women weremore than 45 years old and 60% were less than 45 years of age. All the above studies were in good correlation with our study (21). But the present study is not consistent with a study by Holly and others who reported the most common cases of hysterectomy for the age group 35- 44 years old (22). In a study reported in the city of Mashhad, Iran, the mean age of the patients has been reported 48 years old (18) and in another study in Riyadh, Saudi Arabia, the mean age has been 48.8 ± 9.8 years old (17). The mean age of the American patients has been reported 42-46 years old and 75% of hysterectomies are done in the United States at the age of 20-49 years old (23, 15, 24), in this respect, our study is similar to the study conducted in the United States. This study moreover showed that among the women who had hysterectomy 67.9% were illiterate, and 3.6%were high school graduates or had higher education. In the control group also 53.4% of the individuals were high school graduates or they had higher education and 8.2% was illiterate. In the study by Behrashy, 88 cases (58.6%) were illiterate, which is in agreement with our study (12).

This study showed that the mean number of pregnancy in the control group is 2.18% and among those in the hysterectomy groupis 6.33.In Rahimi

[Downloaded from intjmi.com on 2026-11-08]

study, the patients reported an average of 6.48±2.81 cases of pregnancy that was in correlation with our study (20). The average number of pregnant patients in a study done in Riyadh, Saudi Arabia, was reported 6.5 ± 3.8 times (17) that is compatible with our study. In addition, our study highlighted that the average number of delivery in the control group was less than 1 and in the groups with hysterectomy, it was 6.1. In the study by Behrashy and colleagues, considering the number of delivery, the most cases (65.6%) were in the group of 1-5 deliveries (12) which was in agreement with our study.

This study also showed that 33 cases (44%) of individuals with hysterectomy and 4 patients (5.3%) of the individuals in the control group had a history of pelvic masses and 42 people (56%) who had hysterectomy and 71people in the control group (94.7%) had not mentioned a history of pelvic masses, in this regard, the most common indication of hysterectomy in Rahimiwas leiomyoma (42.2%) (20). The most common variable leading to hysterectomy in the study by Behrashy and colleagues based on clinical findings was mentioned as leiomyoma (49.3%) that was in agreement with the our study (12). In connectijon with the history of hormonal drugs use, our study showed that 32% of patients with hysterectomy and 2.7% of the control group had a history of hormonal drugs.

Conclusion

As revealed in this study, the most cases of hysterectomyoccur about the menopause age when the incidence of abnormal uterine bleeding is relatively common and the patient'smight be treated with maintenance therapy in order to reduce the prevalence of hysterectomy. Since the present study was a retrospective case-control one, some variablessuch as prolonged labor, vaginal delivery after cesarean, coagulation disorders, preeclampsia history, the reason for previous cesarean was not accessible in the patients' medical records. Thus we could not evaluate the effects of these variables on hysterectomy. Therefore, we recommended that future studies should examine these variables in the form of a prospective study.

Acknowledgments

This study is supported by the Ilam University of Medical Sciences. The authors express their appreciation to all the personnel at Shahid Mustafa Khomeini who cooperated with the present study.

References

1 –Roch JA, Jones HW. Tlindesoperatire Gynecology, 9 th ed. Philadelphia: Lippincott Williams & Wilkins 2005; 799 - 845.

2 – Katherine G, Dragisic, Magdy P. Sexual functioning and patient expectations of sexual functioning after hysterectomy. Am J ob and Gyn 2004;190 (5): 1416 - 1418.

3 - Nezhat C, nezhat F, luciano A, siegler A, Metzger D, Nezhat CH. operatire Gynecologic laparoscopy principles and Techniques. New York: McGraw-Hill 1995.

4 – Jonathan SB. Novak's Gynecology. 3th ed. Lippinincott Williams & Wilkins co;2001; 590.

5 – Farquhar CM, Steiner CA. Hysterectomy rates in the United States 1990-1997. J Obstes Gynecol 2002; 99 (2); 229-34.

6 –Pokars R, Hufnagel VG. Hystere in the United States, 1965-1984. AGPH 2005; 852-853.

7 – Dickinson JA, Hill AM. The incidence of hysterectomy and its effect on the probability of developing uterine censers. Common Health Stud 1998; 12: 176.

8 – Hass S, Acker D. Variation in hysterectomy rates across small geographic areas of Massachusetts. Am J Obstet Gynecol 1993;150-169.

9 – Davis A. Indications and alternative to hysterectomy. Baillieres Clin Obstet Gynecol 1994; 11: 61-75.

10 –Gholipour A. A study on causes of hysterectomy considering the sand and pathology of the patients in Imam Hussein hospital in Tehran from 1989-1990. Doctor of Medicine Thesis. Shahid Beheshti University of Medical Sciences 1991.

11 –Rittaluto R. Incidence causes and surgical methods for hysterectomy in Finland 1987-1989. Int J Epidemiol 1994; 23: 384-353.

12–Behrashy M. On the prevalence of hysterectomy in patients referred to Dr. Shabihkhani hospital in the city of Kashan during 1995-1996. The Faiz Journal 1999.

13 – Jones HW. Novak's textbook of gynecology. 12th ed. Baltimore: Williams & Wilkins 1996; 405-438.

14 – Rock JA, Thompson JD. Telinde's operative gynecology. 8th ed. Philadelphia: WB Saunders 1997; 771 - 780.

[Downloaded from intjmi.com on 2026-11-08]

15 - Berek JS, Adashi EY, Hillard PA. Novak's Gynecology, 12th ed. Baltimore: Willims& Wilkins 1996; 727-67.

16 –Roch JA. Jones HW. Telindes Operative Gynecology, 9th ed. Philadelphia: Lippincott Williams & Wilkins 2005; 799-845.

17 - Al-Nuam LA, Esset J, Banu F, Chowdhury N. An appraisal of the appropriateness of the indications for hysterectomy. J Obstet Gynaecol 1997; 17 (5): 461-4.

18 –Torabzadeh A. Hysterectomy causes, pathological findings and postoperative complications during two years in the Medical Center of Ghaem in Mashhad, Journal of Medical University of Mashhad 1998;58:56-59.

19 –Shergill SK, Shergill HK, Gupta M, Kaur S. Clinico pathological study of Hysterectomies. J Indian Med Assoc 2002; 100 (4): 238-9.

20 –Rahimi G. Evaluation of indications and methods of hysterectomy in the educational medical center of Alavi in Ardebil during 2000-2001, Journal of Ardabil University of Medical Sciences 2005; 5(1):59-64.

21 – Nadei T. A comparison of the performance of outpatient endometrial biopsy, dilatation, cortege, and hysterectomy in diagnosis of endometrial lesions. Journal of Kerman University of Medical Sciences 2005;13(3):163-159.

22-Holly H. Age specific hysterectomy and ophorectomy prevalence rates and the risk for cancer of reproductive system. Am j public Health 1984; 11:560-563.

23-Weaver F, Hynes D, Goldberg JM, Khuri S, et al. Hysterectomy in Veterans Affairs Medical Centers. J Obstet Gynecol 2001;97 (6):880-4.

24-Broder MS, Kanouse DE, Mittman BS, Bernstein SJ. The appropriateness of recommendations for hysterectomy. J Obstet Gynecol 2000; 95 (2) :199-205.

[Downloaded from intjmi.com on 2026-11-08]