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The Influence of Obesity on Non-Descent Vaginal Hysterectomy (NDVH): A Retrospective Comparison of Obese and Non-Obese Women Undergoing NDVH

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ABSTRACT

Background: High body mass index (BMI) ≥ 30 kg/m^2 is associated with non-optimal perioperative consequences in women undergoing hysterectomy and is deemed a contraindication for non-descent vaginal hysterectomy (NDVH) by utmost gynecologic surgeons, is this contraindication authentic or assumed?

Objective: To estimate the influence of BMI on perioperative outcomes in patients who underwent NDVH for non-malignant uterine disorders.

Patients and Methods: This retrospective cohort involves 843 patients; 413 patients were non-obese (BMI < 30 kg/m^2) and 430 patients were obese (BMI ≥ 30 kg/m^2).

Results: BMI differed significantly between groups (27.4±6.7 vs. 38.6±11.6, P= 0.0001). Both groups also differed regarding age, parity, preoperative medical comorbidity including hypertension and diabetes mellites, American Society of Anesthesiologists physical status, and endometrial hyperplasia incidence (P<0.05), but were parallel concerning nulliparity, menopausal status, number of prior vaginal birth prior cesarean section, and virgin lower abdomen. No clinically significant alterations were perceived in perioperative consequences as transfusion, ureteral, bladder, or bowel injuries, fever, systemic infections, fistula, conversion to total abdominal hysterectomy, and total postoperative complications. Obese group was associated with significant excess operative blood loos, extended total and actual operative room time, longer postoperative hospital stays, higher rate of deep venous thrombosis (DVT), excess need for general aesthesia, analgesia and venous thromboembolism (VTE) prophylaxis (P<0.05).

Conclusions: The outcomes regarding intraoperative conversion to TAH and perioperative consequences disclose that NDVH is safe and feasible for patients with BMI ≥ 30 kg/m^2 and gynecologist shouldn't consider obesity, even morbid or super or more, as a contraindication for NDVH.

Keywords: Non-descent vaginal hysterectomy, Obesity, BMI, morbid obesity, Perioperative consequences.

INTRODUCTION

Non-descent vaginal hysterectomy (NDVH) is the genuine minimally invasive hysterectomy (MIH) in which the real gynecologic surgeon extirpates the non-prolapsed uterus through the natural vaginal orifice, known as natural orifice surgery (NOS) [1] with a recent modification of utilizing laparoscopy though vaginal orifice known as vaginal natural orifice transluminal endoscopic surgery (vNOTES) [2], in contrast to other routes for hysterectomy (HR) where a portal to the uterus is surgically created either as single laparotomy incision in total abdominal hysterectomy (TAH) and single port laparoscopic hysterectomy (STLH) or multiple abdominal cuts in total laparoscopic hysterectomy (TLH) or robotic assisted laparoscopic hysterectomy(RALH) [3,4].

NDVH is a preferred alternative to TAH, TLH and RALH due to its lower morbidity, shorter hospital resides, and quicker rescue time. However, the completion of NDVH may be influenced by several factors, including patient characteristics, such as obesity [1-4].

Obesity is a major public health concern worldwide, with its prevalence increasing at an alarming rate. Obesity is associated with numerous health complications, including cardiovascular disease, diabetes, and cancer [5]. Obesity has also been identified as a risk factor for several gynecologic conditions, including uterine fibroids, endometrial cancer, and abnormal uterine bleeding. Obesity may increase the complexity of NDVH surgery due to the increased amount of intra-abdominal and pelvic fat, which can lead to technical difficulties during surgery, longer operative time, and increased risk of complications [6-9].

Despite the potential impact of obesity on NDVH outcomes, there is a lack of comprehensive studies investigating the effect of obesity on NDVH [8]. Existing studies didn't concentrate on impact of obesity on consequences of NDVH individually as well as have reported conflicting results, with some showing that obesity is associated with increased surgical complications and prolonged operative time, while others have reported no significant differences [6-9].

This retrospective study aims to compare the NDVH outcomes between obese and non-obese women. This study investigated the impact of obesity on preoperative hospital care, operative time, blood loss, perioperative complications, length of hospital

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residence, conversion of surgical route, and postoperative follow-ups.

PATIENTS AND METHODS

We executed a retrospective investigation examining the medical records of women who underwent NDVH at the Obstetrics and Gynecology Department of Benha University Hospital (BUH), Benha, Egypt, as well as some private centres between January 2010 and September 2023.

Patients were involved if they met all the subsequent conditions: (1) A body mass index (BMI) equal to or greater than 18.5 kg/m^2, (2) underwent NDVH, (3) the accomplishment of hysterectomy using either conventional traditional clamp, cut, and medium absorbable sutures tie techniques or electrosurgical bipolar energy-based vessel sealing (EBVS) including both ERBE BiClamp200C® (Erbe, T€ubingen, Germany) or Covidien LigaSure Impact™ (Autosuture, Valleylab, Boulder, CO, USA). (4) Administration of general or spinal anesthesia during surgical procedures with intension to execute NDVH. (5) Participants were at least 18 years old. (6) Clinical monitoring and assessment of participants were continued until complete recovery or for a minimum of 30 days after the operation. (7) Participants had non-prolapsed uteri that did not exhibit more than first-degree uterine descent, even when under the influence of anesthesia. (8) Participants had benign conditions affecting the uterus.

Patients were disqualified from the study if they met any of the subsequent conditions: (1) those with suspected malignancy, (2) those found to have second-degree uterine descent or greater after anesthesia was administered, (3) those who underwent surgical interventions other than hysterectomy, (4) cases with incomplete medical records or patients who were not followed up for a period of 30 days after the operation. All instances of NDVH were performed by experienced gynecologic surgeons who had a strong interest in using the vaginal route for hysterectomy.

The abstracted preoperative parameters were age, height, weight, body mass index (BMI); calculated as a women's weight in kilograms divided by the square of height in meters(kg/m^2), gravidity, parity, mode of prior deliveries including vaginal or cesarean section, indications for hysterectomy, coexisting morbid medical disorders such as diabetes mellitus (DM), hypertensive disorders (HTN), liver diseases, renal disorders, orthopedical problems, and airway obstructive disorders. Additionally, information regarding previous lower abdominal or vaginal surgery, hemoglobin (HB) and hematocrit (HCT) concentration as measured by complete blood count (CBC), length of preoperative hospital stay to manage comorbid conditions such as uncontrolled diabetes mellitus, percentage of glycated hemoglobin A1C (HBA1C), and how to correct the preoperative anemia status including packed red blood corpuscles (pRBCs) transfer, intravenous iron, erythropoietin and the American Society of Anesthesiologists (ASA) physical status classification were also included. The ASA physical status classification categorizes patients as ASA 1 (regular healthy patient), ASA 2 (patient with mild systemic disease), ASA 3 (patient with severe systemic disease), or ASA 4 (patient with severe systemic disease that poses a constant threat to life).

The abstracted intraoperative parameters were type of VH procedures either conventional or EBVS NDVH as well as additional procedures as PBSO, OBS, the utilized morcellation techniques including cervical amputation, uterine bisection, wedge resection, uterine coring, myomectomies, lateral spiral morcellation, vaginal wound closure techniques either transverse or anteroposterior (vertical) or combined , operative room (OR) time (estimated as a time from entrance to OR to the time of discharge from OR including the patient positioning on operative table and the care in postoperative anesthesia care), the actual operative time (from time of colpotomy to surgery termination), type of anesthesia either general or spinal or both, estimated blood loss (EBL) (based on gauze weight, visual blood volume estimation), intraoperative complications included significant blood vessel as major uterine or its branches or organ injury (including bowel, rectal, bladder and ureter) and need for blood transfusion. The uteri that had been extirpated were promptly weighed upon complete removal and categorized into four groups based on their weight: Tiny (≤100 g), average (101–300 g), substantial (301–600 g), and huge (>600 g) and conversion of NDVH to TAH.

The abstracted postoperative parameters were the concentration of HB, HCT (CBC), the need for a return to the operating theatre, the length of postoperative hospital duration, the number of women with same day discharge (SDD), the occurrence of hospital readmission, the presence of pelvic or vault hematoma, vault cellulitis, vault dehiscence, and vault abscess. Additionally, the abdominal wound status was assessed in women who underwent conversion to TAH, specifically occurrence of cellulitis, seroma collection, wound dehiscence, and the duration of wound care. Other parameters examined included the need for reoperation due to wound complications, the occurrence of postoperative fever more than 38.5° DC, pelvic infection, urinary tract infection (was suspected on clinical basis and sometimes on basis of urinalysis), thromboembolic disease (VTE) (mainly managed once clinically suspected and rarely on investigational basis), need for VTE prophylaxis with either unfractionated or low molecular weight heparin and its durations, vault granuloma and any other deterioration in medical status. The parameters of all participants in this study were

extracted, but their identities were not disclosed and were presented in a summarized tubulated manner after classifying them into non-obese group who had BMI between18.5 kg/m^2 and 29.9 kg/m^2 (control group) and obese group who had BMI at least 30 kg/m^2 (study group).

Our primary concern selected for this study was the conversion rate to TAH. Based on the running rate of conversion to laparotomy with TLH on non-obese women seen in BUH which was 6%, [4]–and our estimation that rate of two-fold (12%) conversion to TAH is clinically important in obese group who underwent NDVH. Therefore, our study needs a sample size of 407 women per group to get a power of 85% with a significance level (α) of 0.05.

Ethical consideration: Ethics approval was received from the institutional review board (IRB) of Benha Faculty of Medicine, with the reference number RC:17/9/2023. The study adhered to the ethical guidelines outlined in the World Medical Association's Declaration of Helsinki for research involving human subjects.

Statistical analysis

Statistical analysis was conducted using the Medcalc (Medcalc, Software, Bvba, 2016) (www.medcalc.org). Continuous variables were presented using the mean ± standard deviations and range, while categorical variables were represented using numerical values and percentages. We employed the unpaired student's t-test to analyze the differences in continuous variables and either Fisher's exact test or Pearson's Chi-square test to analyze the differences in categorical variables across the two groups. Quantitative non-parametric data were presented as median and interquartile range (IQR) and will be analysed by Mann Whitney-test. A significance level of $p < 0.05$ was employed in our analysis to determine statistical significance.

RESULTS

A total of 843 women were included, among them, 413 (49%) women had BMI between 18.5 kg/m^2 and 29.9 kg/m^2 (reference group) while 430 (51%) women had BMI at least 30 kg/m^2 (investigational group).

Table 1 displays the clinical and demographic data of participants who had NDVH categorized as non-obese (control group) and obese (study group).

The BMI differs significantly, in non-obese group vs. in obese group. The obese group had older age, higher parity, higher percentage with endometrial hyperplasia, HTN, DM, uncontrolled DM, POHBA1C (%), LOPA (days), ASA 2, ASA 3, and ASA 4.

The groups exhibited comparable characteristics for other baseline factors, as percentage of post-menopausal women, nulliparous women, women without prior vaginal deliveries, women had previous pelvic surgery, women had cesarean section, women with virgin lower abdomen, women treated preoperatively with transfusions, IV Iron, erythropoietin, women who underwent private or non-private managements and means of clinical uterine size (CUS) (weeks), Ultrasound uterine volume (USUV) Cm^3, preoperative HB (g/dl), and HCT %.

Table 1: Basal demographic and clinical characteristics of patients who underwent NDVH in non-obese (BMI < 30 kg/m^2) and obese (BMI ≥ 30 kg/m^2) groups**.**

Variable	non-obese (BMI < 30 kg/m^2) (n=412)	obese (BMI ≥ 30 kg/m^2) (n=430)	Δ (95% CI)	P value
- BMI (kg/m^2)	27.4 ± 6.7 (18.5– 29.9)	38.6 ± 11.6 (30.4 – 65.6	11.2 (9.91 to 12.49)	0.0001
- Age (year)	44.7 ± 7.3 (36– 68)	48.9 ± 5.8 (35– 75)	4.2 (3.31 to 5.09)	0.0001
- Parity	3.1 ± 1.5 (0 - 8)	3.3 ± 1.4 (0 – 9)	0.2 (0.004 to 0.4)	0.046
- Post-menopausal	198 (48.1%)	206 (48%)	0.1% (6.62% to 6.82%)	0.96
- CUS (weeks)	11.1 ± 6.4 (8– 20)	10.9 ± 5.7 (8 – 20)	0.2 (1.02 to 0.62)	0.63
- USUV (Cm^3)	170 ± 50 (90 – 500)	165 ± 40 (90 – 500)	5 (11.11 to 1.11)	0.11
- Nulliparity	64 (15.5%)	69 (16%)	0.5% (4.45% to 5.42%)	0.72
-Absent of prior VD	95 (23.1%)	106 (24.7%)	1.6% (4.17% to 7.34%)	0.59
- PO HB (g/dl)	11.1 ± 3.8 (9.9-12.9)	10.9 ± 3.9 (9.9-12.8)	0.2 (0.72 to 0.32)	0.45
- PO HCT %	37.3 ± 8.5 (30.9-41.5)	36.3 ± 8.6 (30.4-41.7)	1 (2.16 to 0.16)	0.1
- PO transfusions	5 (1.2%)	6 (1.4%)	0.2% (1.56% to 1.96%)	0.8
- PO IV Iron	198 (48.1%)	213 (49.5%)	1.4% (5.33% to 8.11%)	0.7
- PO erythropoietin	123 (29.8%)	143 (33.3%)	3.5% (11.9% to 17.6%)	0.2
Previous pelvic surgery:	164 (39.8%)	174 (40.5%)	0.7% (5.9% to 7.3%)	0.1
- Cesarean section	132 (32%)	144 (33.5%)	1.5% (4.8% to 7.8%)	0.64
- other	32 (7.8%)	30 (7%)	0.8% (2.78% to 4.43%)	0.66
- virgin lower abdomen	248 (60.2%)	256 (59.5%)	0.7% (5.9% to 7.3%)	0.84
- Comorbidity:	54 (13.1%)	228 (53%)	39.9% (33.96% to 45.41%)	0.0001
- HTN	36 (8.7%)	165 (38.4%)	29.7% (24.25% to 34.94%)	0.0001
- DM	25 (6.1%)	135 (31.4%)	25.3% (20.28% to 30.23%)	0.0001
- uncontrolled DM	5 (1.2%)	76 (17.7%)	16.5% (12.82% to 20.45%)	0.0001
- POHBA1C (%)	6.3 ± 4.2 (4.6%-12.4%)	12.3 ± 3.7 (4.9-20.5%)	6 (5.47 to 6.53)	0.0001
- LOPA (days)	2.1 ± 2.3 (2-8)	6.3 ± 3.9 (2-12)	4.2 (3.76 to 4.64)	0.0001
-ASA score :				
- ASA 1	265 (64.3%)	0 (0%)	64.3% (59.48% to 68.77%)	0.0001
- ASA 2	98 (23.8%)	232 (54%)	30.2% (23.78% to 36.25%)	0.0001
- ASA 3	42 (10.2%)	158 (36.7%)	26.5% (20.98% to 31.81%)	0.0001
- ASA 4	7 (1.7%)	40 (9.3%)	7.6% (4.62% to 10.84%)	0.0001
- Indication for hysterectomy:				0.91
- Leiomyoma	189 (45.9%)	199 (46.3%)	0.4% (6.3% to 7.1%)	0.19
- AUB	193 (46.8%)	182 (42.3%)	4.5% (2.21% to 11.15%)	0.0001
- EH	120 (29.1%)	185 (43%)	13.9% (7.4% to 20.2%)	0.33
- Adenomyosis	135 (32.8%)	155 (36%)	3.2% (3.22% to 9.57%)	0.46
- Pain/endometriosis	55 (13.3%)	65 (15.1%)	1.8% (2.95% to 6.52%)	0.29
- CIN	113 (27.4%)	132 (30.7%)	3.3% (2.84% to 9.39%)	0.83
- Genetic prophylaxis	7 (1.7%)	8 (1.9%)	0.2% (1.79% to 2.18%)	0.29
- Other	23 (5.6%)	32 (7.4%)	1.8% (1.6% to 5.2%)	
- Financials				
Private	298 (72.3%)	320 (74.4%)	2.1% (3.86% to 8.06%)	0.49
Non private	114 (27.7%)	110 (25.6%)	2.1% (3.86% to 8.06%)	

NDVH: Non-descent vaginal hysterectomy, **BMI:** Body mass index, **CUS:** Clinical uterine size, **USUV:** Ultrasound uterine volume, **HTN:** Hypertension, **DM:** Diabetes mellitus, **VD:** Vaginal delivery, **PO:** preoperative, **CS:** Cesarean section, **IV:** Intravenous, **POHBA1C:** Preoperative Glycated Hemoglobin A1C, **DOPHS:** Duration of preoperative hospital stay, **ASA:** American Society of Anesthesiologists, **HB:** Hemoglobin, **HCT:** Hematocrit, **PO:** postoperative, **AUB:** Abnormal uterine Bleeding, **EH:** Endometrial Hyperplasia, **CIN:** Cervical intraepithelial neoplasia, Values were given as mean ± standard deviation (range) or number (percent).

Table 2 shows assessment of intraoperative results of patients who underwent NDVH in non-obese (BMI < 30 kg/m^2) and obese (BMI ≥ 30 kg/m^2) groups. Obese women who underwent NDVH needed longer means of both total OR time (min) and actual OR time (min), had higher intraoperative EBL, increased need for general anesthesia, and lesser postoperative uterine weight as a total mean difference. No statistically significant differences were seen between the groups in terms of intraoperative complications such as visceral injuries including vesical injuries, intestinal injuries, ureteral injuries, vascular injuries, need for blood transfusion, unintended organ injury, total IO complications, bleeding requiring conversion, anesthetic complications, hematoma, strategic or reactive conversion rates, additional IO procedures including

OBS, PBSO, debulking, conversion to TAH and percentage of removed uteri either tiny, average, substantial or huge. There were twelve instances of conversion to TAH observed in both study groups, the conversion was necessitated by the presence of a single intracavitary myoma, which resulted in a significant increase in uterine size or inability to proceed more due to extensive adhesions following caesarean section as change in the intended surgical route in eight cases, while in 4 cases conversion were reactive to excessive vaginal bleeding. The utilization of either the LigaSure Impact™ and BiClamp® was in participants who underwent NDVH January 2018 and was mainly in private patients. Out of a total of 843 cases, 15 incidents (1.7%) of vesical injuries occurred, 7 (1.6%) in control group and 8 (1.8%) in study group. Notably, all these injuries were promptly corrected by the primary operator. Furthermore, it is worth mentioning that all women who experienced an incidental cystotomy and subsequently underwent primary repair exhibited favorable postoperative outcomes with respect to these complications.

Table 2: Assessment of intraoperative results of patients who underwent NDVH in non-obese (BMI < 30 kg/m^2) and obese (BMI ≥ 30 kg/m^2) groups**.**

Outcome	**Non-obese (BMI < 30 kg/m^2) (n=412)**	**Obese (BMI ≥ 30 kg/m^2) (n=430)**	**Δ (95% CI)**	**P value**
Total OR time (min)	189 ± 87 (110– 340)	245 ± 125 (210-460)	56(41.3 to 70.6)	0.0001
Actual OR time (min)	84 ± 28 (30– 210)	125 ± 45 (60-220)	41 (35.9 to 46.1)	0.0001
EBL (ml)	265 ± 110 (60-1600)	415 ± 180 (100 -1700)	150 (129.7 to 170.3)	0.0001
IO blood transfusion	21 (5.1%)	29 (6.7%)	1.6% (1.66% to 4.87%)	0.33
Spinal anesthesia	412 (100%)	430 (100%)	0% (0.89% to 0.92%)	1
General anesthesia	84 (20.4%)	119 (29%)	8.6% (0.11% to 11.25%)	0.01
Endotracheal tube	21 (%)	45 (%)		0.004
Morcellations techniques	281 (68.2%)	299 (69.5%)	1.3% (4.94% to 7.54%)	0.68
bisection	130 (31.5%)	158 (36.7%)	5.2% (1.21% to 11.53%)	0.11
myometrial coring	70 (17%)	78 (18.1%)	1.1% (4.06% to 6.23%)	0.67
wedge resection	85 (20.6%)	79 (18.4%)	2.2% (3.15% to 7.56%)	0.42
myomectomy	89 (21.6%)	97 (22.6%)	1% (4.62% to 6.59%)	0.73
spiral morcellate	45 (10.9%)	65 (15.1%)	4.2% (0.37% to 8.75%)	0.07
- NDVH techniques				
Traditional	156 (37.9%)	189 (44%)	6.1% (0.54% to 12.66%)	0.07
Energy based	256 (62.1%)	241 (56%)	6.1% (0.54% to 12.66%)	
IO complications				
- vesical injuries	7 (1.6%)	8 (1.8%)	0.2% (1.17% to 1.88%)	0.64
- intestinal injuries	1 (0.24%)	1 (0.23%)	0.01% (-1.07% to 1.4%)	1
- ureteral injuries	0 (0%)	0 (0%)	0% (0.92% to 0.89%)	1
- vascular injuries	5 (1.2%)	6 (1.4%)	0.2% (-1.5% to 1.9%)	0.82
- blood transfusion	3 (0.7%)	4 (0.9%)	0.2% (1.3% to 1.7%)	1
- conversion to laparotomy	5 (1.2%)	7 (1.6%)	0.4% (1.39% to 2.22%)	0.64
- unintended organ injury	4 (1%)	3 (0.7%)	0.3% (1.17% to 1.88%)	0.72
- total IO complications	5 (1.2%)	7 (1.6%)	0.4% (1.39% to 2.22%)	0.61
- bleeding requiring conversion	2 (0.5%)	2 (0.46%)	0.04% (1.22% to 1.36%)	1
- anesthetic complications	5 (1.2%)	8 (1.9%)	0.7% (1.14% to 2.61%)	0.45
- hematoma	2 (0.5%)	5 (1.2%)	0.7% (0.74% to 2.29%)	0.45
- strategic conversion	3 (0.7%)	5 (1.2%)	0.5% (1.04% to 2.11%)	0.73
Additional procedures				
- VOBS	314 (76.2%)	317 (73.7%)	2.5% (3.36% to 8.32%)	0.4
- VPBSO	58 (14.1%)	63 (14.7%)	0.6% (4.18% to 5.35%)	0.8
- Debulking	281(68.2%)	299 (69.5%)	1.3% (4.94% to 7.54%)	0.68
- Conversion to TAH	5 (1.2%)	7 (1.6%)	0.4% (1.39% to 2.22%)	0.61
-PO uterine weight (g)	180 ± 66 (60 – 1300)	168 ± 75 (70 –1400)	12(2.42-21.57)	0.01
-Uterus weight (category)				
- Tiny (≤100 g)	134 (32.5%)	156 (36.3%)	3.8% (2.62% to 10.16%)	0.25
- Average (101–280 g)	190 (46.1%)	178 (41.4%)	4.7% (1.99% to 11.34%)	0.17
- Substantial (280–600 g)	58 (14.1%)	67 (15.6%)	1.5% (3.34% to 6.31%)	0.54
- Huge (>600 g)	30 (7.3%)	29 (6.7%)	0.6% (2.89% to 4.14%)	0.73

NDVH: Non-descent vaginal hysterectomy, **Δ(95% CI)**: Point estimate difference with 95% confidence interval, **OR:** operative room, **EBL:** estimated blood loss**. VOBS:** Vaginal opportunistic bilateral salpingectomy, **VPBSO:** Vaginal prophylactic bilateral salpingo-oophorectomy, **IO:** intraoperative, **PO:** postoperative, **TAH:** total abdominal hysterectomy. Values were given as mean ± standard deviation(range) or number (percent).

Table 3 presents the early and late postoperative outcomes as seen in this retrospective analysis. There were statistically higher significant differences observed between the obese over non-obese groups of participants who underwent NDVH in terms of the percentage of women with severe pain experienced at six hours and 24 hours after the surgery, women with PO nausea and vomiting, women with venous thromboembolism (VTE) namely DVT, women with need for VTE prophylaxis, and the means amount of consumed analgesic drugs (both narcotic and non-steroidal anti-inflammatory drugs), absolute change in HB (g/dl), lengthier time required to get out of bed, longer time to pass flatus, slower return to usual activity, extended length of postoperative hospital stay, delayed resumption of coitus, prolonged duration of VTE prophylaxis, longer postoperative vaginal length.

Table 3: Assessment of early and late postoperative results of patients who underwent NDVH in non-obese (BMI < 30 kg/m^2) and obese (BMI ≥ 30 kg/m^2) groups.

Outcome	**non-obese (BMI < 30 kg/m^2) (n=412)**	**obese (BMI ≥ 30 kg/m^2) (n=430)**	**Δ(95% CI)**	**P value**
PO severe pain - at 6h - at 24 h	193 (46.8%) 95 (23.1%)	245 (56.9%) 142 (33.0%)	10.1% (3.34% to 16.7%) 9.9% (3.83% to 15.85%)	0.003 0.001
Analgesic requirements over 24h -Total narcotic (mg) -Total parental NSAID (mg)	 13.8 ± 9.2 (10-40) 110 ± 65 (100-200)	 18.2 ± 9.8 (10-40) 150 ± 70 (100-250)	 4.4 (3.11 to 5.69) 40 (30.85 to 49.15)	 0.0001 0.0001
PO nausea and vomiting	34 (8.3%)	62 (14.4%)	6.1% (1.8% to 10.4%)	0.005
PO blood transfusion	2 (0.5%)	3 (0.7%)	0.2% (1.16% to 1.58%)	1
Perioperative BT	8 (1.9%)	9 (2.1%)	0.2% (1.88% to 2.27%)	0.88
PO HB (g/dl)	10.2 ± 1.2 (9.8-11.8)	10.1 ± 1.1 (9.9-12.3)	0.1 (0.26 to 0.06)	0.21
PO HCT (%)	37.8 ± 10.4 (35-47)	38.4 ± 11.3 (35-48)	0.6 (0.87 to 2.07)	0.42
Time to get out of bed (h)	3.5 ± 3.4 (2-6)	4.9 ± 3.6 (2-7)	1.4 (0.93 to 1.87)	0.0001
Time to flatus (h)	5.8 ± 2.2 (3-12)	6.8 ± 2.8 (2-10)	1 (0.66 to 1.34)	0.0001
Absolute change in HB (g/dl)	0.8 ± 0.3 (0.8-1.3)	0.9 ± 0.4 (0.5-1.2)	0.1 (0.05 to 0.15)	0.0001
Return to usual activity time (days)	12.6 ± 7.6 (4-30)	13.9 ± 8.9 (5-29)	1.3 (0.18 to 2.42)	0.02
Resumption of coitus (days)	18.6 ± 3.4 (5-45)	17.5 ± 5.8 (7-46)	1.1 (1.75 to 0.45)	0.0009
Vaginal spotting	145 (35.2%)	170 (39.5%)	4.3% (2.23% to 10.77%)	0.2
Infectious morbidity				
Pelvic cellulitis	16 (3.9%)	18 (4.2%)	0.3% (2.49% to 3.07%)	0.83
Granuloma formation	5 (1.2%)	6(1.3%)	0.1%(-1.64%to1.82%)	0.82
Cystitis	50 (12.1%)	66 (15.3%)	3.2% (1.47% to 7.85%)	0.18
SSI within 30 d	1 (0.2%)	3 (0.7%)	0.5% (0.68% to 1.85%)	0.62
Febrile morbidity	60 (14.6%)	70 (16.3%)	1.7% (3.21% to 6.58%)	0.5
Wound complications	1 (0.2%)	3 (0.7%)	0.5% (0.68% to 1.85%)	0.62
Reoperation for wound	1 (0.2%)	3 (0.7%)	0.5% (0.68% to 1.85%)	0.62
VTE morbidity DVT Pulmonary embolism	 4 (1%) 1 (0.2%)	 20 (4.7%) 4 (0.9%)	 3.7% (1.48% to 6.21%) 0.7% (0.52% to 2.13%)	 0.001 0.37
Need for VTE prophylaxis	20 (5%)	90 (21%)	16% (11.6% to 20.4%)	0.0001
Duration of VTE prophylaxis (days)	0.4 ± 0.1 (0.5-2)	1.9 ± 0.6 (0.5-9)	1.5 (1.44 to 1.56)	0.0001
PO vaginal length (cm)	6.8 ± 1.5 (7-9)	7.1 ± 1.4 (7-9)	0.3 (0.1 to 0.5)	0.003
Vesicovaginal fistula	1 (0.24%)	1 (0.23%)	0.01% (1.08% to 1.14%)	1
Total PO complications	132 (32%)	138 (32.1%)	0.1% (6.19% to 6.38%)	0.99
Admission variables				
LOHD (days)	1.1 ± 0.3 (0.4-4)	1.2 ± 0.4 (0.5-4)	0.1 (0.05 to 0.15)	0.0001
SDD	345 (83.7%)	356 (82.8%)	0.9% (4.17% to 5.94%)	0.73
LOHD more than 3 days	5 (1.2%)	5 (1.16%)	0.04% (1.64% to 1.76%)	0.95
Return to ED	120 (29.1%)	140 (32.6%)	3.5% (2.74% to 9.69%)	0.28
Readmission within 30 days	23 (5.6%)	29 (6.7%)	1.1% (2.23% to 4.42%)	0.48

NDVH: Non-Descent Vaginal Hysterectomy, **BMI:** Body Mass Index, **PO:** Postoperative, **Δ(95% CI):** Point estimate difference with 95% confidence interval, **NSAID:** Non-steroidal anti-inflammatory drugs, **VTE:** venous thromboembolism, **LOHD:** length of PO hospital duration, **SDD:** same day discharge, **IO:** Intraoperative, **SSI:** surgical site infection, **PE:** Pulmonary embolism, **DVT:** deep venous thrombosis, **ED:** emergency department, **HB:** Hemoglobin, **HCT:** Hematocrit, **BT:** blood transfusion, **h:** hours, **d:** days, Values were given as mean ± standard deviation or number (percent).

DISCUSSION

Obesity is presently a universal pandemic, with mounting trends worldwide. Statistics from the WHO, the USA CDC, the UK, and Canada show a mounting tendency, with 50% and 25% of the US population projected to be obese and morbidly obese by 2030 [10]. Obesity increases cardiovascular disease threats, DM disorders, metabolic syndrome consequences, and several malignancies including endometrial carcinoma. Hysterectomy with increased BMI over 30 kg/m^2 is associated with numerous logistical challenges as well as escalated surgical [6,9] and perioperative hazards and raised cost [9-11].

AUC's study in 2121, based on WHO population 2020 review stated that Egypt is the 19th in world,7th in Arab and population count of 102 million estimated that 32% of Egyptian female are obese, and the rank of Egypt per number of obese individuals is the 1st Arabic and the 7th worldwide [12]. **Aboulghate *et al.*** in 2121, based on "100 million health" survey estimates the burden of obesity in Egypt and they stated that, 49.5% of Egyptian adult females are with BMI ≥ 30 kg/m^2, up to 5 million Egyptian women had DM type 2, up to 3 million Egyptian women had disability adjusted life years (DALYs) due to obesity, and the total annual cost of treatment of diseases attributable to obesity was estimated to be 62,413 million EGP [13]. An earlier study in 2008 stated that the prevalence of central obesity was 34.1% when identified by waist circumference (WC) and 44.9% when identified by waist hip ratio (WHR) in Egyptian adult female [14].

The results from our cohort demonstrate that obesity didn't impact the main clinically valuable outcomes in women undergoing NDVH for benign indications including conversion rate to TAH, unintended organ damage, need for blood transfusion and major VTE sequels, however less clinically important ancillary outcomes were noticed to be statistically significant as longer operative room time, longer operative time, more estimated operative loss, longer postoperative hospital stay, more incidence of DVT, more need for analgesia, and more need for postoperative anticoagulant. Similar results were reported in literature comparing obese to non-obese underwent VH with prolapse [15] or without either as a retrospective studies executed by **Harmanli *et al.*** [7], **Chen *et al.*** [16], **Sheth** [17] or as a prospective studies executed by **Rafii *et al.*** [18], **Locher *et al.*** [19] or evaluating the impact of obesity on different routes of hysterectomy in obese and morbid obese alone as studies executed by **Schmitt *et al.*** [20], **Bogani *et al.*** [21], or in women with different BMI categories for all routs as studies executed by **Brezina *et al.*** [6], **Le Neveu *et al.*,** [8], **Shah *et al.*** [9], **Cybulsky *et al.*** [11], **Muffly and Kow** [22], or two routs including vaginal as studies executed by **Housmans *et al.*** [2], **Lee *et al.*** [3], **Sandberg *et al.*** [4] or add a modification to vaginal route as studies executed by **Tierney *et al.*** [23], **Bouchez *et al.*** [24].

Most authors concentrate on a less value ancillary outcome as **Bohlin *et al.*** who reported a significant impact of obesity on vaginal hysterectomy as the relative risk (RR) of EBL>500 mL and OR time >120 min with BMI ≥ 30 were (1.63; 95% CI 1.22-2.17) and (2.00; 95% CI 1.60-2.50) when compared to women with BMI ≤ 30 respectively [25].

The proficiency to surgically remove non-descended uteri through the vaginal route is considered a defining characteristic of a skilled gynecologic surgeon [26,27].

NDVH is considered the preferred method for treating benign uterine conditions when the uterus size is up to 12 weeks or up to 280 grams, in general and in obese women, as stated by authoritative organizations such as the ACOG 0n 2015, 2017 and its reaffirm in 2019, 2020 SOGC [28, 29], DHA [30], ISGE [31], and the SGS [32]. This preference is based on the cost-effectiveness and value-based nature of NDVH compared to TAH and TLH of the Cochrane review of 42 and 62RCTs in 2015 and 2023 [1, 33].

Our study strengths include the incorporation of substantial number of cases underwent the most identifiable surgery to gynecologic surgeon namely the NDVH, the multicentred nature, the diverse character of the incorporated patient population that makes the results generalizable, the retrospective approach, with its cost-effectiveness and ability to assess actual work conditions, the relatively larger sample size allows for more robust interpretations of BMI impacts on NDVH, the focus on BMI impacts on main surgical consequences of NDVH in obese and morbid obese challenging the widely recognized contraindication of NDVH, the investigation of unexamined aspects in the literature in Egyptian and Arabic communities namely the NDVH in obese women, the introduction of effective preoperative interventions, specifically intravenous iron and subcutaneous erythropoietin, as alternatives to common practice of blood transfusions in Egyptian and Arabic communities to correct preoperative anemia, the examining of the appropriateness of performing NDVH in patients with poor fitness levels (ASA3, ASA4), as opposed to more invasive procedures that may not be suitable, the trends of utilizing regional anesthesia and unneeded laparotomy deemed the preoperative tight lowering the HBA1C unneeded and consequently shorting the POHA.

Furthermore, the findings of this study contribute to the understanding that NDVH provides a value-based approach to managing obese and morbid obese in need for hysterectomy in low-income countries like Egypt. The study is subjected to several limitations, including selection biases, reporting biases, recall biases, and confounding factors such as the varying surgical competence levels of gynecologists operating NDVH, so the generalizability of the results is limited.

CONCLUSION

Data from our study supporting the hypothesis that obesity did not disturbs main important clinical outcomes in women underwent NDVH like conversion rate to TAH, vesical injuries and even the admission related variables but may affects ancillary consequences as OR time and EBL, so we recommended the choice of vaginal route for hysterectomy even in obese and morbid obese as it upholds both quality and safety at least in our hands.

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