Urinary Tract Infection and Wound Infection in Obese Women Undergoing Cesarean Section at Women's Health Center

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Abstract: **Background**: Obesity is a serious and growing global health problem. There are approximately 300 million obese adults worldwide and increasing in developing countries more than developed countries. In Egypt 70% of adult women were overweight, added that the prevalence in 30.8% rural women and 49.1% urban women were obese. Pre pregnancy obesity is common and it adversely affects the maternal and perinatal outcomes. Maternal obesity has major impact on health service, especially on relation to the level of care required, the cost and resources implications related to increase complications and risk to the mothers and infant such as increased rates of caesarean section and post partum infections. **Aim of this study:** was to determine whether obese women are at increased risk of urinary tract and wound infection after cesarean section compared to women with a normal body mass index (BMI).**Methods and Materials***:* It is a prospective study of 500 women (250 were obese and 250 non obese) after elective cesarean section from postpartum wards, Obstetrics Department, Women's Health Center, Assiut university Hospital.Special questionnaire for data collection was designed, urine culture was taken to detect (UTIs) and follow up continue after one week until one month after discharge to detect wound infection. **Results:** Women in the obese group were significantly with more complications during pregnancy and higher in post partum infection more than non obese women, Urinary tract infection was (22.8%) compared with (12.4%) in non obese women and wound infection was (12.4%) compared with (3.2%) in non obese women. **Conclusions:** Maternal obesity has major adverse effects on pregnancy outcome

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1 . Introduction

Obesity is a chronic metabolic disorder caused by an imbalance between the intake of food and the expenditure of energy resulting in an excessive amount of adipose tissue. Obese women experience significantly more infections than women with a normal body mass index [(1)]

Obesity has become an epidemic health problem among pregnant women. In Egypt 70 percent of women are overweight or obese [(2)].The incidence of obesity among pregnant women in the United States of America (USA) ranges from 18.5% to 38.3% [(3).]

The world Health Organization (WHO) and (NHI) in America recommend that obesity is measured by the (BMI) and calculated by weight (kg)/height (m^2). A (BMI) of 30-34.9 kg/ m^2 classified as class I (mild obesity), 35-39.9 kg/ m^2 as class II (moderate obesity) and greater than and equal to 40 kg/ m^2 as class III (severe or extreme obesity). Alternatively, (BMI) between 30-34.9 kg /m^2 is considered obese and 35 kg/m^2 or greater is considered morbidly obese [(4).]

A greater rate of infection associated with obese women undergoing Caesarean section (S.C) surgery has been reported. Surgical site infection (SSI) is the second most common infectious complication after urinary tract infections (UTIs) following (S.C) delivery [(5).]

Wound infection after (S.C) occurs in 2%-16% of women depending on many factors such as diabetes, obesity, length of labour, number of vaginal examinations and antibiotics prophylaxis [(6).] (SSIs) is an infection that develops within 30 days after an operation or within one year if an implant was placed and the infection appears to be related to the surgery. Post-operative (SSIs) is the most common healthcare-associated infection in surgical patients, occurring in up to 5 percent of surgical patients. Patients who develop an (SSIs) require significantly more medical care and the development of an (SSIs) increases the hospital length of stay by a median of two weeks. The risk continues after discharge. (SSIs) develop in almost 2 percent of patients after discharge [(7).]

UTIs are abroad term used to describe bacterial infection or inflammation of the bladder (Cystitis), urethra (urethritis), or renal pelvis and kidneys (pyelonephritis) and microbial colonization of the urine. Approximately 10% of women are diagnosed with UTIs in the (USA) yearly more than men because ascending infection from urethral opening and vagina to the perineal area. Infection in the pregnant women

should always be cultured. Colony count as low as 10,000/ml can cause symptomatic infections in women [8].

The frequency of menstrual disturbance in women with severe obesity is three times greater than for women of normal weight. High pre-pregnancy weight is associated with an increased risk of pregnancy hypertension, gestational diabetes, UTIs, C.S delivery and toxemia. Women with obesity are 13 times more likely to have overdue births, longer labors, induced labor and blood loss. Complications after childbirth, related to obesity, include an increased risk of wound, endometrial and UTIs infection [9].

Significance of the study

Obesity is a major public health problem. There are approximately 300 million obese adults worldwide; While in Egypt 70% of adult women were overweight in 1998, added that the prevalence in 30.8% rural women and 49.1% urban women were obese [10].

Prevalence of obesity in women of reproductive age: In 2003, 19.6% of U.S. women of reproductive age (aged18-44 years) were obese (BMI greater than or equal to 30)[11]. Obese women have a greater risk of developing complications during pregnancy, after labour and their babies are also more likely to be admitted to neonatal intensive care units [12].

Aim of this study

This study aimed to estimating the prevalence of urinary tract infection and wound infection in women undergoing cesarean section in obese women compared to non obese women and estimates the most common causative organisms of urinary and wound infection.

2. Subjects and Methods

1-Research design-

A prospective study was used in carrying out this study.

2- Setting

The Study was conducted in postpartum wards of Obstetrics Department in Women's Health Center at Assiut university hospital, which serves all cases from rural and urban areas.

3-Sample

This prospective study included 250 obese women and 250 non obese women who were delivered by elective cesarean section at Women's Health Center.

Sample criteria

Inclusion criteria:-

1- All obese women categories according to the classification of (WHO, 2010)
- Class I obesity 30.00 – 34.9 kg/ m²
- Class II obesity 35.00 - 39.9 kg/ m²
- Class III obesity ≥ 40.00 kg/ m², chosen at any age group at Women's Health Center.

2- All non obese women categories according to the classification of (WHO, 2010)
- Underweight less than 18.5 kg/ m²
- Normal weight 18.5 – 24.9 kg/ m²
- Overweight 25.0 – 29.9 kg/ m²

3- Elective cesarean section.

Exclusion criteria:-

1- Diabetic women

2- Premature rupture of membrane during pregnancy.

3- Ante partum hemorrhage

4 -Tools of the study

- **An interviewing questionnaire:-**

An interviewing questionnaire was designed for this study utilized by the researcher and was used to collect the relevant data from group of obese and non obese women admitted to postpartum department undergone C.S at Women's Health Center at Assiut university hospital.

- The data collected which include the following parts:-

1- Personal data:
- women's and husband's name, age, educational level, socioeconomic level, address, telephone number, occupation, women's height, weight and body mass index (BMI).

2 - Maternal History:
- Menstrual history, E.g.(Age of menarche, Duration, Interval and Rhythm)
- Family planning history, E.g.(Method used, Duration and cause of termination)
- Family history for any disease ,E.g.(Diabetes, Hypertension, Multiple pregnancy, Congenital anomalies and Others hereditary conditions as obesity)
- Past history for any medical and surgical history, E.g.(Diabetes, Hypertension, Cardiovascular disease, Renal disease, Respiratory disease, Hepatic disease, ….etc)
- History for taking any drugs

3- Obstetric History:
- Gravidity, parity, No of abortions, stillbirths, neonatal deaths and No of living children.

4- Outcomes of previous deliveries:
- Number of normal vaginal deliveries, No of abnormal vaginal deliveries, No of cesarean sections and previous indications of cesarean section.

5- Current Antenatal Condition:
- Gestational age / Weeks.
- Current antenatal risk factors, e.g.(None, Previous Cesarean section, Ante- partum hemorrhage, Cardiovascular Disorders, etc).

6- Data related to current Cesarean Section:
- Date of operation.

- Indications of Cesarean section, e.g. (Ante partum hemorrhage, P.I.H, C.P.D, Failure of progress, Failure of induction, etc).
- Attendant of Cesarean section.
- Type of antibiotics.
- Type of anesthesia.
- Operative technique.
- Time of initiation of lactation.
- Status at discharge

7 - Neonatal condition:

- Neonatal Outcomes. (Normal or Still birth)
- Abnormal Neonatal Outcomes, e.g. (Neonatal jaundice, Respiratory distress syndrome, Malformation, Admission to .I.C.U, etc).
- Birth weight / GM
- Apgar score at1&5 minutes.
- Sex of the newborn, E.g. (Male, Female, Twins females, Twins males, Mixed Twins and Triplet).

8- Intra operative complications:

- None, bleeding, bladder injury, bowel injury, ureteric injury, rupture uterus & uterine repair (traumatic), anesthetic complications, etc).

9- Post operative (puerperal) complications:

- None, urinary tract infections, wound infection, bleeding, fever, blood transfusion, chest infection, mastitis (engorgement), etc).

10- Admission to I.C.U:

- Duration of hospitalization: days –Weeks - Month
- Indications for admission

11 - Date of discharge.

12- State of previous wound (clean or septic).

13 - Data related to wound infection if present:

- Diagnosis of wound infection or day of rehospitalization.
- Date of secondary suture of wound if done.
- Diagnosis after discharge.
- Sample taken.
- Abdominal swab. (Done & Not done)
- If done, causative organism is (No Growth, Staphylococcus aureus, Escherichia coli, Klebsiella sporous, Anaerobes, etc).
- Blood culture. (Done & Not done)

14 - Urine culture, the causative organism is (No Growth, Gm-ve Bacilli, Lactose Fermenter (E-Coli), Klebsiella, Anaerobes, .etc).

- **Procedure**

- An official permission was obtained from the Council of Department of Obstetrics & Gynecology in Women's Health Center at Assiut University hospital and an ethical approval was also obtained from Ethical Committees of Faculties of Nursing and Medicine.
- Formal consent was took from every woman (written or verbal) before involved in the study after explanation of the nature of the study and that are no risk or cost in participation.
- The researcher interviewed the woman face to face for explain the purpose of the study, and then took complete history from the women and patient's record after obtain consent and agreement to participate and to fill the questionnaire.
- The researcher measured the women's weight and height to calculate the body mass index according to the equation of BMI.

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}}$$

- The researcher provided health educations about wound care and proper perineal care to minimize wound infection and urinary tract infection.
- The researcher instructed the women how to collect the Clean-catch midstream urine sample and then took urine sample to the lab for culture.
- Follow up for women was scheduled after one week until one month through the outpatient clinic if the women returned for wound dressing and to ensure that the wound clean or through a telephone call to ensure that the wound was clean or became infected.
- If the wound became infected and re-hospitalized, was taken a swab from the infected wound for culture to detect the causative microorganisms.
- The researcher informed women about results of culture and future management.

Urine Culture Technique:

Clean-catch midstream urine collection method:-

- This method helps to protect the urine sample from germs that are normally found on the vagina.
- Women were instructed to wash your hands before collecting the urine and removed carefully the lid of container and set it down with the inner surface up.
- Clean the area around your vagina.
- A woman was spread open the folds of skin around her vagina with one hand, and then used other hand to clean the area around vagina and urethra.
- Wiped the area from front to back to avoid spreading bacteria to the vagina that is normally found around the anus.
- Begun urinating into the toilet or urinal. Placed the collection container in the stream and collected midstream urine without stopping the

flow and finished urinating into the toilet or urinal.
- Carefully replaced the lid on the container.
- Washed your hands.
- Returned the urine sample to the lab.

❖ **Supplies and Equipment:-**

▪ **Media**
- Blood agar
- MacConkey agar

❖ **Procedure of culture**

This procedure was performed on plates of 5% sheep blood agar, which detects growth of most organisms, and on a plate of MacConkey agar or other selective and differential medium for isolation of gram-negative organisms. The plates were incubated at 36°C for 18 to 24 hours and read for growth. The number of colonies is multiplied by the appropriate factor to give the colony count per mL urine. Plates which showed no growth at 24 hours were incubated another day and read again. Growth of more than three species indicated contamination, plates were held and a partial identification (e.g. gram-negative rod, lactose positive) was reported when there were less than 10,000 colony forming units (CFU) per mL. Each colony type giving 10,000 or more CFU/mL was identified and antibiotic susceptibility testing was performed.

3. Results

- Urine culture results were ready in 1 to 3 days. Some organisms took longer to grow in the culture; for this reason, results may not be available for several days.
  - Urine culture Normal (No grows): No bacteria or other organisms (such as fungi) grow in the culture. The culture result was negative.
  - Abnormal: Organisms (usually bacteria) grow in the culture. The culture result was positive. A count of 100,000 or more bacteria per milliliter (mL) of urine caused by an infection.
  - If test results were positive, sensitivity testing was done to help make decisions about treatment.

❖ **Wound swab culture Technique:**

The Swab was taken from the women after re-hospitalization with septic wound for culture to detect the causative organism. Wound Swab was taken from an area of viable tissue for culture. The health-care professional prepared the patient by cleansing the affected area with a sterile solution, such as saline and excessive debris was removed. Antiseptics such as ethyl alcohol were not recommended, because they kill bacteria and cause the culture results to be negative. A cotton-tipped transwab was rubbed lightly across the wound surface in zigzag manner and simultaneously rotating the swab over the entire surface.

Supplies and Equipment:-

▪ **Media**
- Blood agar
- MacConkey agar
- Chocolate agar
- Mannitol salt agar
- Eosin methylene blue agar

❖ **Procedure of swab culture**

▪ **Incubation of media**

The swab was placed in a sterile tube with a small amount of sterile saline. The swabs were platted on Blood, MacConkey and Chocolate agars then the Blood and MacConkey agars were incubated at 35-37c in an ambient air and Chocolate agar were incubated at 35-37c in a candle jar.

❖ **Direct smear**

Gram-stained smear was prepared. In addition to microorganisms, WBC, and aquamous epithelial cells suggestive of surface contamination were examined.

❖ **Culture examination**

1) All Media were examined after overnight incubation.

2) Completed identification and susceptibility testing were performed (if applicable) for up to 3 organisms, especially when any of the following are true:

1] WBC's were seen on the direct smear
2] Culture source is from a normally sterile site
3] The sample had few if any epithelial cells
4] The organism was seen on the direct smear

- Blood agar for staphylococci, streptococci
- Chocholat agar for group –ve bacilli
- MacConkey agar for pneumocooci, Haemophilus influenzae
- Mannitol Salt Agar for differentiate S. auruas from staph organism
- Eosin methylene blue agar for differentiate group –ve bacilli and group +ve bacilli

Pilot study

It was conducted in 10% from sample size which was included in the study to modify the questionnaire and to test validity and reliability of the questionnaire.

Timing of enrollment

It was done after the women delivered by cesarean section and admitted to postpartum ward.

Statistical analysis

Data collected were coded and analyzed. Results were tabulated and statistically compared by computer program (SPSS) version16.0, expressed as Mean + S.D, number, percentage and using Chi square to determine significance between variables and T. test to determine significance between numerical variable. N.S $P>0.05$ (No significance), $P<0.05$ (significance).

3. Results

In table (1) the results of comparison between obese & non obese groups show that more than half of obese women (52.8%) were in the age group 20-29 years old with mean maternal age (24.26 ± 5.86) years compared to non obese, two third of women (70%) in the same age group with mean (25.81± 4.63) years. There was an increase in percentage of obese group (46%) with increase of age ≥30 years old in comparison with non obese group (24.4%) which was found to be of high statistical significance between both groups which means that the obesity increases with aging. As regarding of maternal educational level, about one third of women in obese group (38%) were illiterate and less than half of them (41.6%) were secondary school, in comparison with other group about less than half of women (42.8%) were illiterate and more than one fourth of them (29.6%) were secondary school with high statistical significance between both groups. As regarding to maternal occupation and residence, the highest percentages among both groups were housewife (90.8% & 92.8% respectively) and were living in rural areas (69.6% & 70% respectively) with no statistical significance between both groups.

In Table (2) the results show that the highest percentage in both group related to the surgeon who did the cesarean section, the resident is the most available person who did the operation (84.60% & 92.40% respectively) and also the highest percentage in both group in the type of anesthesia are spinal type (94.80% &95.60% respectively) with no statistical significance between both groups.

In Figure (1) the results show that the obese women had more post operative complications than non obese group as urinary tract infections (22.8% & 12.4% respectively) and wound infection (12.4% & 3.2% respectively) with high statistical significance in both types of infection , also from the important complication for obese women admission to intensive care unit for complicated eclampsia which represented (8%) than non obese group (4.4%) and found other types of infection

In figure(2) the results show the percentages for the causative organisms of urinary tract infection among both groups, the higher percentage of causative organisms cause urinary tract infections according to the obese group are Gm-ve Bacilli Lactose Fermenter (Klebsiella) which representing (8 %) and (6.4%) in non obese group, Gm-ve Bacilli Lactose Fermenter (E.Coli) which representing (6.8%) and (1.6%) in non obese group with statistical significance, Gm-ve Bacilli non Lactose Fermenter (6%) and (3.6%) in non obese group, Staphylococcus (Pathogenic) representing (4.4%) and (2 %) in non obese group and lower organisms are Staphylococcus (Non Pathogenic) which representing (2.4%) and (1.6%) in non obese group .

In Table (3) the results show that the current antenatal risk factors according to the degrees of obesity the results show that very obese women with high significance compared with obese group as preeclampsia which represents (34.68%) while in obese women represent (21.43%) and concerning with indications of cesarean section also the very obese women with very high significance in increase indication for cesarean section related to multiplication risks for more than one (10.50%) while in obese women represent (0%) and with significance in macrosomic baby (9.67%) than obese women (3.97%) but obese women with very high significance in repeated cesarean section (33.33%) than very obese women (15.33%).

In Figure (3) the results of relationship between degree of obesity with post operative *complications show that very obese women with high significance in post operative* complications than obese women specifically urinary tract infection (26.61%) than obese women (19.04%) and wound infections (17.74%) than obese women (7.14%).

4. Discussion

Health problems of obesity are becoming serious in the present times. Obesity is more common in women than men and reports are showing increased risk of complications among pregnant women who are obese [(13).]

National surveys done during the past decade indicated that there is an increase in the prevalence of obesity and overweight from 51.8% in 1995 to 79.7% in 2005 among Egyptian women. Where it was more than double in the last ten years [20.5% in 1995 and reached 46.5 % in 2005 and Obesity among Egyptian women was higher with increasing age [(14)]

The association between excessive BMI and the need for CS is independent factor. Obese women not only undergo C.S more frequently than women of normal weight but also are at greater risk for intrapartum and postoperative complications such as longer operating time, increased blood loss, and endometritis [(15).]

Three cohort studies addressed the incidence of perinatal mortality according to the amount of pregravid weight excess. Even in moderate overweight women the incidence of perinatal mortality in the infant was 1.15% and 2.5 fold higher than that in normal weight women **(16).**

Table (1): Distribution of women according to sociodemographic characteristics among both groups

Sociodemographic characteristics	Obese group BMI >30.0 N = 250		Non obese group BMI < 30.0 N = 250		X2	P-Value
	Number	Percentage	Number	Percentage		
Age/Years (Mean ± SD)	24.26± 5.86		25.81 ± 4. 63			
<20	3	1.2%	14	5.6%		
20-29	132	52.8%	175	70%		
30-39	97	38.8%	60	24%		
≥ 40	18	7.2%	1	0.4%	37.071***	0.001
Total	250	100%	250	100%		
2- Education						
Illiterate	95	38.00%	107	42.80%		
Read & Write	8	3.20%	10	4.00%		
Primary school	5	2.00%	21	8.40%		
Preparatory school	18	7.20%	14	5.60%		
Secondary school	104	41.60%	74	29.60%		
University	20	8.00%	24	9.60%	16.701**	0.005
Total	250	100%	250	100%		
3- Residence						
Urban	76	30.40%	75	30.00%		
Rural	174	69.60%	175	70.00%	0.000	1.000
Total	250	100%	250	100%		
4- Occupation						
House wife	227	90.80%	232	92.80%		
Employee	23	9.20%	18	7.20%	0.425	0.514
Total	250	100%	250	100%		

Table (2): Distribution of women according to Cesarean section operationamong both groups

Cesarean section operation	Obese group BMI >30.0 N = 250		Non obese group BMI < 30.0 N = 250		X2	P-Value
	Number	Percentage	Number	Percentage		
1- Attendant at Cesarean section						
Resident	212	84.60%	231	92.40%		
Assistant Lecturer	36	14.60%	19	7.60%	8.069	0.018
Senior Staff	2	0.80%	0	0.00%		
Total	250	100%	250	100%		
2- Type of anesthesia						
General	13	5.20%	11	4.40%		
Spinal	237	94.80%	239	95.60%	3.688	0.275
Epidural	0	0.00%	0	0.00%		
Total	250	100%	250	100%		

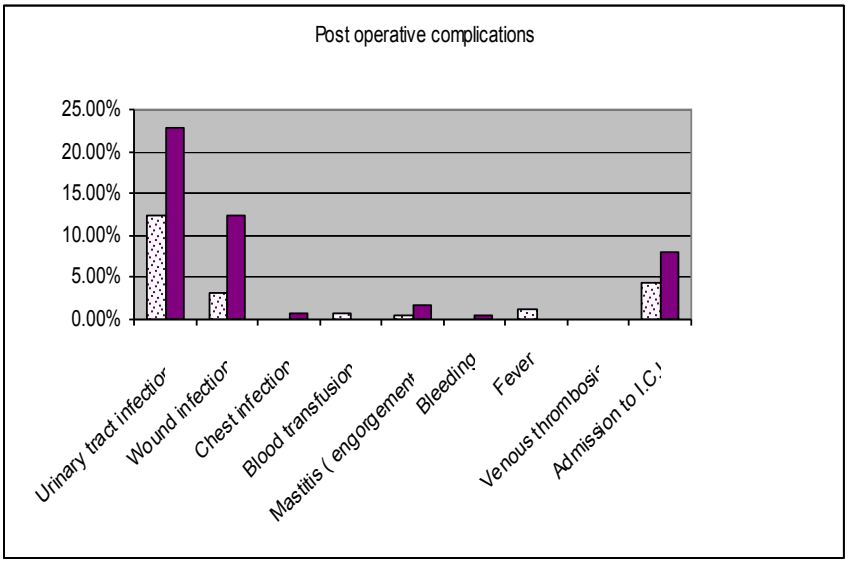

Figure (1): Distribution of women according to post operative complications.

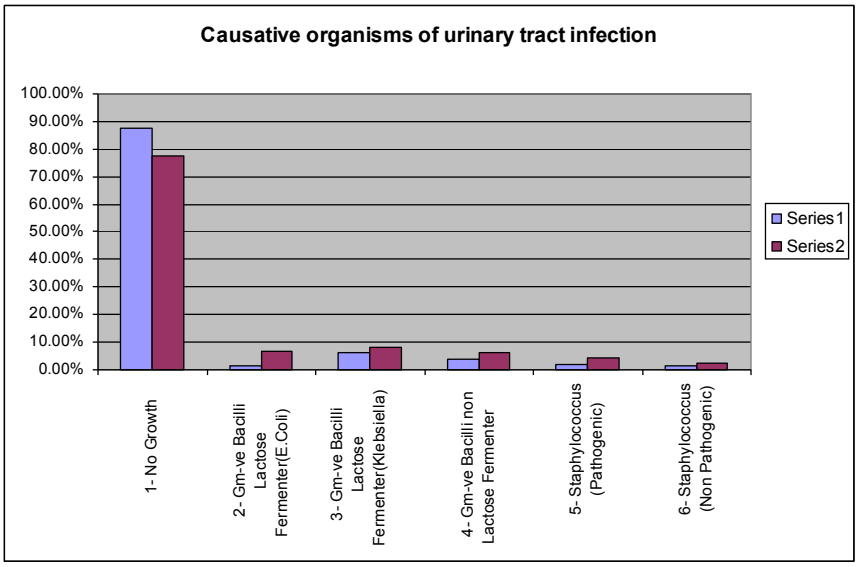

Figure (2): Distribution of women according to causative organisms

Table (3): Relationship between degrees of obesity with current antenatal Conditions

Current antenatal Conditions	Obese group BMI 30.0-34.9 N = 126		Very obese BMI ≥ 35.0 N = 124		X2	P-Value
	Number	Percentage	Number	Percentage		
2- Current antenatal risk factors						
None	51	40.47%	40	32.25%	1.350	0.088
Preeclampsia	27	21.43%	43	34.68%	2.471**	0.007
Contracted pelvis	12	9.53%	3	2.41%	2.365 **	0.009
Rhesus isoimmunization	2	1.58%	2	1.62%	0.016	0.494
I.U.F.D	1	0.80%	1	0.80%	0.011	0.495
I.U.G.R	1	0.80%	1	0.80%	0.011	0.495
Previous Cesarean section + Tender scare	10	7.94%	6	4.84%	1.001	0.158
Oligohydeoimnous	10	7.94%	10	8.06%	0.037	0.485
Polyhydrominous	2	1.58%	2	1.62%	0.016	0.494
Congenital anomalies	2	1.58%	2	1.62%	0.016	0.494
More than one risk factors	8	6.35%	14	11.30%	1.379	0.084
3- Indications of Cesarean section:						
More than one cause	0	0.00%	13	10.50%	3.733***	0.000
Macrosomic baby	5	3.97%	12	9.67%	1.793*	0.036
Repeated Cesarean section	42	33.33%	19	15.33%	3.315***	0.000
Breech presentation	4	3.17%	11	8.88%	1.896*	0.029
Marked oligohydrominous	1	0.80%	6	4.84%	1.938	0.026
SPET	17	13.50%	16	12.91%	0.138	0.445
I.U.F.D	0	0.00%	1	0.80%	1.010	0.156
I.U.G.R	1	0.80%	1	0.80%	0.011	0.495
Contracted pelvis	6	4.76%	3	2.41%	0.994	0.160
Non engaged head	7	5.55%	9	7.25%	0.550	0.291
Infertility	8	6.34%	9	7.25%	0.285	0.388
Congenital anomalies	3	2.39%	1	0.80%	0.992	0.161
Previous Cesarean section + Other cause	20	15.87%	13	10.50%	1.259	0.104
Transverse lie	12	9.52%	10	8.06%	0.407	0.342

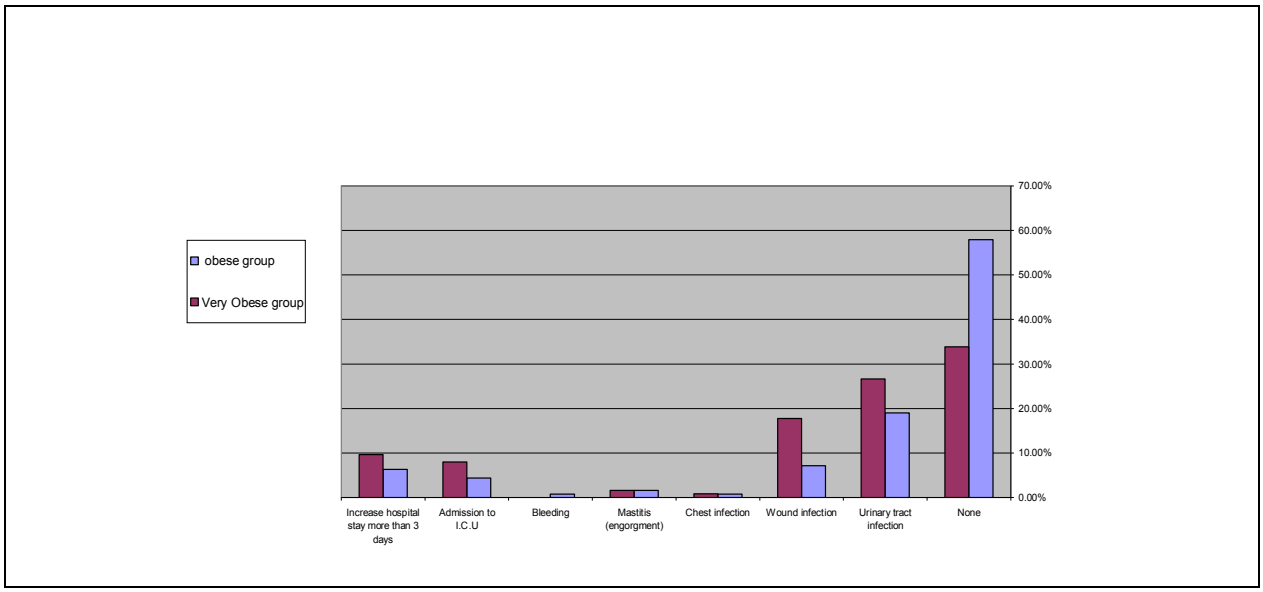

Figure (3): Illustrated the Post operative complications according to the degree of obesity

In a cohort study shows that post-partum infection is increase for concern with the growing cesarean rate. Post-partum infections are costly and time-consuming to treat, increase hospital re-admission and healthcare costs, and often lead to a difficult and frustrating start to motherhood[17]. The rate of C.S wound infections tends to be even higher in fat women. U.S primary cesarean delivery rate is approximately 14.6%, ranging from a low of 11.5% in Utah to a high of 24.3% in Mississippi [18].

Post pregnancy infections remain a significant source of maternal morbidity and mortality. Obstetric infection accounts for more than 12% of maternal deaths. Infection occurs most frequently in women who have cesarean births, and following spontaneous or elective termination of pregnancy. Infection is estimated to be the second highest cause of under-reported maternal death in the (U.S) [19]

Weiss[20] mentioned in his study according to (a population-based screening study) in New York that the obesity is an independent risk factor for adverse obstetric outcome and is significantly associated with an increased cesarean delivery rate. The cesarean delivery rate was 20.7% for non obese, 33.8% for obese and 47.4% for morbidly obese patients and Kaiser[21] showed that women with BMI more than 29 Kg/m2 was associated with 3-4 fold increased in C.S.

Increase C.S rate all are more with the obese pregnant than general population. Despite this significant clinical problem, not many studies have explored the underlying mechanism of pathogenesis for association between obesity and raised C.S rate but most clinician suspect that the rise in C.S rate associated with obesity is due to obstructed labour caused by increased deposition of soft tissue in the maternal pelvis and large babies. But recently a very promising study of Zhang et al[22] from Liverpool women's hospital and university concluded that myometrium of obese women contracted with less force and frequency and had less Ca2+ flux then that of normal. Most of C.S occurs due to delay in first stage. Maternal obesity and hypercholestromia are associated with poor uterine contractility. This contradicts the finding of Young, et al[23] study which showed that C.S is more in second stage of labour mostly because of increased soft tissue mass and obese women had 2-4 fold increased cesarean deliveries rates due to dystocia was increased 6 fold in obese nulliparas**.**

Urinary tract infections (UTIs) are more common in pregnant women than their non pregnant counterparts and the increase of BMI are related to increase patient's risk to develop UTIs [24]. Women who are overweight or obese have an increased risk of various infections, especially urinary and genital tract infections [25]

As regarding of maternal age, the present study revealed that the mean of maternal age was 25.81± 4.63 years in non obese group and was 24.26 ± 5.86 in obese group and increase percent of obese group (46%) with increase of age ≥30 years old in comparison with non obese group (24.4%) which mean that the obesity increases with aging. This finding is in agreement with Kabiru and Rayner[26] in Atlanta who showed that the mean age in non obese women was 24.4±5.7 years and in obese women was 25.2±5.9 years, Nasreen[27] who reported in their study that the mean age of women in normal weight was 29.3+5.8 years and in obese women was

28.9+8.3 years, Aekplakorn , et al[28] in Thailand who reported in their study that the prevalence of overweight and obesity was greater among older compared to younger people and also supported by, **Tracee Cornforth**, [29] who reported that the obesity rates were lowest at ages 18 to 24 (12.1%) and peaked around 30% among 35- to 64-year-olds.

The present study revealed that one third of women in obese group (38%) were illiterate and less than half of them (41.6%) were secondary school, in comparison with other group about less than half of women (42.8%) were illiterate and more than one fourth of them (29.6%) were secondary school which consist with **Zhang,et al**[22] who reported that (39.9%) in obese women were secondary education and (55.5%) in non obese women were secondary education.

As regarding to maternal occupation, most of the highest percentages among both groups were housewife (90.8% & 92.8% respectively). These findings are supported by Abd El-Azez**,** [30] who mentions that the majority of women in both group (92.2%&96.2% respectively) were housewife, Musaiger,[31] who reported that 79% of women were unemployed in Saudi Arabia and supported by McMunn, [32] who reported in their study that evidently the severely obese cannot work because they are bed ridden and working mother have may experience high levels of stress sometimes so for about 38% of stay-at-home mothers were obese and for working mothers the percentage was 23% .

The present study revealed that the most of women in both groups were living in rural areas (69.6% & 70% respectively), agree with Abdel-Rahman[33] who reported that most of women were from rural areas . On the other hand, these findings are contradicted with Aekplakorn, et al[28] in Thailand who that most of women in both group live in residents of urban (34.8% and 9.9%) compared to rural areas (26.4% and 5.9%) .

Many findings suggest that low level of education and poverty among individuals in the lower socioeconomic status may have been responsible for the inverse relationship between socioeconomic status and each of overweight and obesity, these may have resulted from poor food habits, where quantity is valued above quality[34]

Concerning the rate of UTIs, in the present study finding show that the incidence of UTIs in obese women (22.8%) higher than non obese women (12.4%). These findings are supported by Zinnat[35] who revealed in his study that the UTIs in obese women was (24%) and in normal weight women was (6%) with the same number of subject in both groups with the present study.

In the same line Pitchard, et al[36] in their study which conducted in sidhu hospital in India reported that the incidence of UTIs in normal weight was (16.7%), in obese (29.0%) and in morbid obese women was (37.5%). Pract, et al[37] in their study reported that the incidence of UTIs in morbidly obese women was (6%) in 100 of women compared with (0%) in 209 normal weight women.

Mukherjee, [38] in London, their study found a significant increase in hypertension, diabetes, thrombophlebitis and UTIs in obese women than non obese women.

Concerning with previous abortion, the present study mention that the obese women higher in loss of the fetus more than non obese women (35.6% & 24.8% respectively) which supported by Sturdee, et al[39] who reported in their study that the risks of early miscarriage (at 6–12 weeks of gestational age) and recurrent early miscarriage were significantly higher among obese women.

Obesity was recognized as a risk factor in pregnancy more than 50 years ago, so numerous retrospective studies have demonstrated the association between maternal obesity and various pregnancy complications [40]. Many studies evaluated the correlation between BMI and the out come of pregnancy and found that massive obesity can contribute to many complications during pregnancy [41]. The pregravid overweight increases maternal and fetal morbidity [42]

Several studies have documented the increased risks of adverse outcome associated with obesity and pregnancy. Hypertensive disorders are more prevalent among pregnant women who are obese at the time of conception [43] and Obesity is also strongly associated with the development of preeclampsia [44]

The present study reflected there is increase risk of antenatal complication in obese women than non obese women, such as preeclampsia which developed in (11%) in non obese compared with (21.43%) in obese and (34.68%) in morbid obese women. This is supported with William, et al[45] in Edinburg who showed in their study that preeclampsia were (5%) in non obese, (14.7%) in obese and (28.2%) in morbid obese women . Cedergen elucidated that preeclampsia was five times more common in a morbidly obese population BMI>40Kg/m2 [46]

In the same line O'Toole et al[47] who found a strong association between increasing BMI and pregnancy induced hypertension and the risk of pre-eclampsia is doubled with each 5 to 7 Kg/m2 increase in pre-pregnancy BMI, found a 3 times higher risk of pre-eclampsia in obese women and a 7 times higher risk in morbidly obese women . Baeten, et al[48] reported in their study that the proportion of women who developed preeclampsia or eclampsia

consistently increased with BMI, which found that the percentage of preeclampsia (13.5%) in obese women and (9.1%) normal weight women.

The present study showed high percentage of preterm baby between both groups (32.80% & 36.00% respectively) which supported by Abd El-Azez [30] reported in their study that the incidence of prematurity was (42.5%).

The present study showed significance difference to indication of C.S in obese group than non obese group as sever preeclampsia which reported in the previous paragraphs, and unengaged head related to masrosomic baby represent (23.2%) than non obese group (10%). This is supported by Rosenberg[49], Watkins, et al[50] and Zinnat[35] who reported in their studies that found a consistent association between women weight and macrosomia (30.9%) in obese versus (10.3%) in non obese women.

Nuthalapaty and Rouse[51] mentioned in their study that the infants born to obese women are significantly more likely to weigh more than 4000 g, obesity has been identified as an independent risk factor for macrosomia (even in non-diabetic women).

Fetal macrosomia is more common in the obese non-diabetic mother compared to the lean mother with gestational diabetes. Increased glucose concentrations in the diabetic mother led to fetal hyperglycemia and hyperinsulinaemia causing increased fetal growth. Obesity is associated with maternal insulin resistance and fetal hyperinsulinaemia even in the absence of maternal diabetes, the combination of an increased energy flux to the fetus and fetal hyperinsulinaemia may explain the increased frequency of large for gestational age infants seen in the obese non-diabetic women [52].

The present study has also shown a small but significant increase in fetal death or still birth related to a raised maternal BMI (5.2%) compared with (1.2%) in non obese women, supported with Abd El-Azez, [30] reported in her study that the stillbirth was (4.5%) in obese and (2.2%) in non obese women and also in the present study the percentages of previous stillbirth and neonatal death in obese women significantly higher than non obese women. This is supported by (ElZein [53] who reported in their study that previous stillbirth and neonatal death increase in obese than non obese women.

In the same line Tilton et al[52] have reported that the combination of rapid fetal growth induced by the endogenous hyperinsulinaemia in obese women and the functional limitations of the placenta to transfer sufficient oxygen to meet the requirements of the fetus, may lead to hypoxia and death in some cases. Infant's ability to adapt to postnatal life.

Almost 95% of cases of UTIs are caused by bacteria that typically multiply at the opening of the urethra and travel up to the bladder and bacteria spread to the kidney from the bloodstream [54].

In the present study mention the most common causative organisms in obese group are Gm-ve Bacilli Lactose Fermenter (Klebsiella) representing (8 %), Gm-ve Bacilli Lactose Fermenter (E.Coli) representing (6.8%), Gm-ve Bacilli non Lactose Fermenter (6%), Staphylococcus (Pathogenic) representing (4.4%) and lower organisms are Staphylococcus (Non Pathogenic) representing (2.4%).

This finding is consistent with Foster[55] who reported that the Klebsiella, Escherichia (E.) coli and Staphylococcus account the most of remaining bacterial organisms that cause UTIs in older women and Enterococci bacteria, proteus mirabilis ureaplasma urealyticum and Mycoplasma hominis account the rare bacterial causes of UTIs which are generally harmless organisms.

This finding is contradicted with Alper & Curry[56] who reported that the (E.coli) account for about 60% to 80% of all UTIs, as it usually found in the perineal and anal region and close to urethral opening and found other organisms include klebsiella, staphylococcus aureus, proteus, pseudomonas and heamophilus contributes to the development of UTIs.

In the same line Alikhan [57] in the northwest of Iran who reported in his study that the Escherichia coli was the most common etiological agent of UTI (74.6%), followed by Klebsiella spp (11.7%), Staphylococcus saprophyticus (6.4%), and Pseudomonas aeruginosa (2.2%).

Surgical site infection (SSI) is the second most common infectious complication after UTIs following C.S delivery [58]**.** Wound infection often requires a prolonged hospital stay and leading to increase costs[6]

Wound infections are also more common in obese women. This association remains significant even when the procedure is elective and prophylactic antibiotics are administered[59].

Concerning the rate of wound infection, the present study finding revealed that the incidence of post cesarean wound infection was higher in obese women (12.4%) compared with non obese women was (3.2%) which is supported by the report of Pelle, et al[60] who reported in their study that the most important risk suggested to contribute to (SSI) is (BMI). A greater rate of infection associated with obese women undergoing C.S surgery has been reported which in others studies as Johnson, et al [1] who mentioned in their study that SSI in obese

women was (19.7%) and (9.0%) in normal weight women.

In the same line Zinnat[35] in Bangladesh mentioned in their study that wound infection in obese women was 2% more than non obese women 0.4% with the same number of subject in both groups with the present study

In the present study according to classification of women's body weight and it relation with post partum wound infections, the finding revealed that the incidence of post cesarean wound infections in women who were non-obese was 3.2%, while 7.14% of the women who were obese and 17.74% of the women who were very or morbid obese which is supported by the report of Robinson, et al[61] who reported in their study that the risk of SSI is more common in women with an elevated BMI, compared maternal outcomes based on women weight. The incidence of cesarean wound infections in women who were non-obese was 0.8%, whereas 5.3% of the women who were morbid obese.

Conclusions

Obesity causes significant complications for the mother and fetus during pregnancy and morbid post partum infection. The present study described the outcomes of 250 obese women compared with 250 non obese women; the results concluded that, obese women were more likely to present several obstetric complications, delivered by Caesarean section more than non obese women, increase admission to ICU and increase length of hospital stay. The incidences of urinary tract infections are significantly higher in obese women (22.8%) rather than non obese women (12.4%), and the most common causative organism is Klebsiella then Escherichia Coli and also the incidences of surgical site infections are significantly higher in obese women (12.4%) compared to non obese women (3.2%).

Recommendations

On the basis of the most important findings of the study, the following recommendations are suggested:-

- Obesity is epidemic health problems, the antenatal healthcare systems, obstetricians and midwives will be forced to deal with the problems and risks related to obesity (obesity precautions).
- The obesity intervention programs for pregnant women were based on a number of extra visits with a specially trained midwife. The cornerstone in the programs was a motivational interview/talk in early Pregnancy, 20 with the aim of motivating the obese pregnant woman to change her behaviors and to obtain information relevant to her needs.
- Maternal and fetal surveillance may need to be heightened during pregnancy; a multidisciplinary approach is useful. Women need to be informed about both maternal and fetal complications and about the measures that are necessary to optimize outcomes.
- Prompt recognition and treatment of post pregnancy infection is required to prevent the onset of systemic infection. The majority of postpartum infections are detected following hospital discharge as wound infection.
- Enhancing or reducing women postpartum infection through direct education about ideal wound care and perineal care at home by specialist and trained health care provider.
- Directed patient education regarding risk factors and symptoms of postpartum infection must be included as part of comprehensive, quality follow-up care of women postpartum.
- Evaluating women for any signs of fever or other signs and symptoms of infection has been suggested as one means to improve care in special place in hospital for follow-up of all women after delivery and with planned schedule for visits.
- Consistent documentation and reporting of women characteristics as weight and height to identified body mass index for all women to concerning care in obese women tor reduce risk and post pregnancy infections are needed to improve epidemiologic evaluation of the true magnitude of this problem for women.
- Implementation of such a standard of care and infection control strategies in preoperative, intraoperative and mainly post operative periods would serve to improve prevention and identification of post pregnancy infections in women and reduce the associated burden of morbidity and mortality on the lives of women and their families
- Nurses must be encouraged to attend specific meetings as workshops, seminars and continuing educational programmes held to prevention of post partum complications especially infection which increasing length of hospital stay and costs.

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