

# To Compare the Prophylactic Subcutaneous Drain versus No Drain in Caesarean Section of Obese Women

Rahila Imtiaz<sup>1\*</sup>, Bushra Tasneem<sup>2</sup>, Zubaida Masood<sup>1</sup>, Erum Jahan<sup>3</sup>, Syed Hassan Ahmed Rizvi<sup>4</sup>, Syed Hussain Ahmed Rizvi<sup>5</sup>, Hamida Ghulam Hussain<sup>6</sup>

<sup>1</sup>Department of Gynaecology, Abbasi Shaheed Hospital, Karachi, Pakistan

<sup>2</sup>Department of Surgery, Abbasi Shaheed Hospital, Karachi, Pakistan

<sup>3</sup>Assistant Professor, Abbasi Shaheed Hospital, Karachi, Pakistan

<sup>4</sup>Dow university of Health Science, Pakistan

<sup>5</sup>Shaheed Mohtarma Benazir Bhutto Medical College, Karachi, Pakistan

<sup>6</sup>Department of Gynaecology, Memon Medical Institution, Pakistan

## ABSTRACT

**Objective:** Caesarean section in obese women is associated with an increased possibility of wound complications, involving hematoma, abscess formation, seroma, dehiscence, and infection at surgical site. One of the frequent, so far questionable, practices in CS is the prophylactic use of a subcutaneous drainage to prevent wound complications. Therefore, the aim of this study was to compare the outcomes of subcutaneous drain with no drain following Caesarean section of obese women.

**Methodology:** This was a cross sectional observational study conducted in the Department of Gynaecology and Obstetrics using non-probability convenient sampling technique. The duration of the study was about 6 months. A total of 138 obese pregnant women with BMI above 30kg/m<sup>2</sup> undergone emergency or elective caesarean section were separated into two groups; 66 patients had subcutaneous drain included in group A and 72 patients whom did not insert subcutaneous drain included in group B. Independent t-test was applied to compare the outcomes between the two groups. P-value of <0.05 was considered as statistically significant.

**Results:** A total of 138 obese pregnant women undergone cesarean section were selected with their mean age was 30.63 ± 3.967 years in group A and 30.0 ± 4.475 years in group B. Post-operative antibiotic was used in 66(100.0%) in Group A and 67(93.1%) in group B with significant association between them (p=0.029). 10(15.2%) patients were readmitted due to wound complications in Group A and 21(29.2%) patients in Group B with significant association between them (p=0.049). An insignificant association found between group A and B in terms of Wound Dehiscence (p=0.956), Seroma (p=0.779), Hematoma (p=0.416) and Abscess Formation (p=0.598).

**Conclusion:** This study concluded that subcutaneous drainage insignificantly reduced wound complications such as seroma, hematoma, wound dehiscence and abscess formation in obese women after a caesarean section. Furthermore, chances of readmission to hospital were significantly increased in women without subcutaneous drain.

**Key words:** Cesarean Section, Subcutaneous drain, Wound complication, Seroma, Hematoma

**HOW TO CITE THIS ARTICLE:** Rahila Imtiaz, Bushra Tasneem, Zubaida Masood, Erum Jahan, Syed Hassan Ahmed Rizvi, Syed Hussain Ahmed Rizvi, Hamida Ghulam Hussain, To Compare the Prophylactic Subcutaneous Drain versus No Drain in Caesarean Section of Obese Women, J Res Med Dent Sci, 2022, 10(2): 154-160

**Corresponding author:** Rahila Imtiaz  
**e-mail** ✉: rahilaimtiaz1973@gmail.com  
**Received:** 29/01/2022  
**Accepted:** 15/02/2022

## INTRODUCTION

Obesity is a chronic disorder that contributes to develop metabolic illnesses and complications related to cardiovascular system and presently create a burden for healthcare systems worldwide [1]. World Health Organisation (WHO) stated that the dilemma of obesity is

getting pandemic proportions, in both developed and emergent nations. In the year of 2016, it was predicted that about 15% women were obese above 18 years of age [2]. Around one third of women of reproductive age were affected by this trouble [3], with 13% of expecting women as well [4]. The increasing incidence of being overweight in pregnancy is related with the higher incidence of complications in pregnancy, delivery, or the postnatal period [5]. It is evident by research that being obese might also raise the incidence of maternal and neonatal complications [6]. Arterial hypertension and diabetes

frequently develop during pregnancy due to obesity [7] and frequently experience caesarean sections [8], explains that they are frequently detected with postoperative surgical wound healing diseases [9].

Another research by Weiss et al.[10] explained that obesity considerably augmented the incidence of cesarean section and documented a 20.7% cesarean section rate in an average weight (control group) than 33.8% incidence rate is reported in overweight women, and 47.4% rate in morbidly obese women (BMI above 35kg/m<sup>2</sup>). In the literature, there are limited facts regarding whether usual vaginal delivery or elective cesarean section is the most favourable delivery approach in morbidly obese women. The reported frequency of emergency cesarean in morbidly obese women varies from 42% to 50% than about 9% in the normal weight women [11]. It is evidently supported that surgical procedure in the morbidly obese women causes multiple anaesthetic, surgical, and logistical complexities. Additionally, pregnant women with BMI above 40 kg/m<sup>2</sup> have a rise in overall operational time, and time from incision of skin to delivery [12].

Postoperative complications associated with cesarean section are surgical site infections, wound separation, or the existence of a fluid reservoir like hematoma and seroma at the wounded area. These reported symptoms reflect in 3% to 15% of women following caesarean section [13,14] and frequently a consequence of longer stay in hospital, antibiotic treatment, as a result raised the expenses of postnatal care. The prognostic factors for the postoperative complications are adolescent at delivery time, overweight, smoking, diabetes, arterial hypertension, chorioamnionitis, severe post-partum haemorrhage, extended tear of membrane, immediate caesarean section and ensuing surgical delivery, recommendation of substandard antibiotic prophylaxis, inappropriate preparation of the surgical area, prolonged surgery, and the applied caesarean section procedure, type of incision and stitching of wounded skin closed [15-18].

To overcome the complication following cesarean section, one of the widespread, so far dubious, techniques in CS is the employment of a subcutaneous drain for the wound. Therefore, any accumulation of blood or serum in the subcutaneous space that causes postoperative pain and presents a best medium for growth of microorganism and develop infection, can be drained by this technique. Hence, it is believed that drains can decrease the trouble of surgical area infection. However, few surgeons have objection regarding the significance of subcutaneous drains [19].

Similarly, in a meta-analysis of randomized controlled trials by Chelmos et al. investigated the probable advantage of suturing of subcutaneous tissue in relation to thickness of tissue. Their analysis revealed a statistically significant reduction in the occurrence of surgical wound complications with more than 2 cm subcutaneous thickness. It was also reported that suturing of subcutaneous tissue was related to low

possibility of seroma but not lessen the chances of wound infections or hematomas [20]. At present, subcutaneous suturing is applied when more than 2 cm subcutaneous thickness exists. Likewise, a randomized controlled trial by Ramsey et al. investigated subcutaneous thickness 4 cm or above indicating that usual subcutaneous drain was not related with wound complications than with regular suturing [21]. This result was established by another meta-analysis. Therefore, Regular subcutaneous drain is not suggested. [22].

Different researches on the employment of sub-cutaneous drains following cesarean section have shown conflicting results. However, in-depth analyses of the reasons behind such differing results have been indecisive. In emergent nations like Pakistan where the rates of cesarean section are escalating in addition to the rate of obesity (a significant risk factor for postoperative wound complication following cesarean section), a study for comparing the use of sub-cutaneous drain subsequent cesarean section becomes a leading value. Therefore, the aim of this study was to determine the prophylactic benefits and compare the outcomes with sub-cutaneous drains and without sub-cutaneous drains in obese women undergone cesarean section.

## METHODOLOGY

This was a cross sectional observational study conducted in the Department of Gynaecology and Obstetrics using non-probability convenient sampling technique after taking ethical approval from the concerned department. The duration of the study was about 6 months after approval of synopsis. A total of 138 obese pregnant women with BMI above 30kg/m<sup>2</sup> undergone emergency or elective cesarean section were included for the study while those pregnant women with BMI <30 kg/m<sup>2</sup> who refused to give consent, those females who had other risk factors for wound infection for instance hypertension, diabetes, chorioamnionitis, immune-compromised diseases, DIC (disseminated intravascular coagulation), thrombocytopenia or liver disorder, those females who received remedial dosage of any anti-coagulant and females with poor cleanliness were excluded from the study.

Routine technique was performed for cesarean section. Patients without subcutaneous drains were used as control whereas patients with subcutaneous drains were considered as drain group. In drain group, the drain was removed on 2nd post-operative day (post cesarean) with the change of dressing. Oral antibiotics were recommended for seven days and re-examination was taken place on 10th post-operative day. It was advised to take bath every day and kept wound clean and dry. On post-natal visit, clinician examined the status of wound for any complications such as hematoma, seroma, infections and separation. The opinion regarding wound management was taken from the consultants of surgery department.

Data analysis was done using SPSS version 23.0. For quantitative variables, mean and standard deviation was

documented whereas for qualitative variables, frequency and percentages were noted. Independent t-test was applied to compare the outcomes between the two groups. P-value of <0.05 was considered as statistically significant.

## RESULTS

A total of 138 obese pregnant women undergone cesarean section were separated into two groups; 66 patients had subcutaneous drain included in group A and 72 patients whom did not insert subcutaneous drain included in group B. Their mean age was  $30.63 \pm 3.967$  years in group A and  $30.0 \pm 4.475$  years in group B with an insignificant difference between them ( $p=0.380$ ). There was an insignificant association reported between mean parity of Group A and B ( $p=0.567$ ), between mean Gravida of Group A and B ( $p=0.567$ ), between mean BMI of Group A and B ( $p=0.567$ ), between mean weight of Group A and B ( $p=0.264$ ), between mean delivery Gestational age of Group A and B ( $p=0.077$ ), between mean subcutaneous thickness of Group A  $9.65 \pm 1.61$  cm and Group B  $9.51 \pm 1.27$  cm ( $p=0.578$ ), between mean length of surgery of Group A and B ( $p=0.485$ ), between mean estimated Gestational age of Group A and B ( $p=0.052$ ), as shown in Table 1.

Past obstetrics history showed Cesarean Section was performed in 36(54.5%) cases in group A and 44(61.1%) cases in Group B. Intrauterine Deaths reported in 10(15.2%) cases in group A and 5(6.9%) in group B with an insignificant difference between group A and B, ( $p=0.302$ ). Frequency of risk factors in current pregnancy revealed Transverse lie in 5(7.6%), Breech in 4(6.1%), Pregnancy-induced hypertension (PIH) in 7(10.6%), Placenta Previa in 3(4.5%) cases in Group A.

Furthermore, Obstetric Cholestasis observed in 2(2.8%) cases, Breech in 9(12.5%), Pregnancy-induced hypertension (PIH) in 12(16.7%), Placenta Previa in 4(5.6%) cases in Group B with significant association was found between frequency of risk factors in pregnancy of group A and B ( $p=0.001$ ), as shown in Table 2.

Elective Cesarean Delivery indicated in 34(51.5%) and emergency Cesarean Delivery indicated in 32(48.5%) in Group A. Whereas, Elective Cesarean Delivery indicated in 43(59.7%) and emergency Cesarean Delivery indicated in 29(40.3%) in Group B with an insignificant association between groups ( $p=0.332$ ).

There was an insignificant association found between groups in terms of corticosteroid use ( $p=0.607$ ). Preoperative antibiotic was used in 64(97.0%) in Group A and 69(95.8%) in group B with an insignificant association between them ( $p=0.721$ ). Post-operative antibiotic was used in 66(100.0%) in Group A and 67(93.1%) in group B with significant association between them ( $p=0.029$ ).

10(15.2%) patients were readmitted due to wound complications in Group A and 21(29.2%) patients in Group B with significant association between them ( $p=0.049$ ). In group A, 16(24.2%) reported Seroma, 14(21.2%) reported Wound dehiscence, 7(10.6%) showed Hematoma and 14(21.2%) reported abscess formation.

In group B, 16(24.2%) reported Seroma, 15(20.8%) reported Wound dehiscence, 11(15.3%) showed Hematoma. An insignificant association found between group A and B in terms of Wound Dehiscence ( $p=0.956$ ), Seroma ( $p=0.779$ ), Hematoma ( $p=0.416$ ) and Abscess Formation ( $p=0.598$ ), as shown in Table 3.

**Table 1: Demographic characteristics of pregnant women (n=138).**

Variable	Group A (with drain)	Group B (without drain)	p-value
	Mean $\pm$ SD	Mean $\pm$ SD	
Age (Years)	30.63 $\pm$ 3.967	30.0 $\pm$ 4.475	0.38
Parity	2.13 $\pm$ 1.45	2.29 $\pm$ 1.69	0.567
Gravida	3.13 $\pm$ 1.45	3.29 $\pm$ 1.6969	0.567
BMI (kg/m <sup>2</sup> )	35.13 $\pm$ 2.19	35.11 $\pm$ 2.66	0.952
Estimated Gestational Age	37.36 $\pm$ 1.46	37.81 $\pm$ 1.27	0.052
Weight (kg)	104.74 $\pm$ 6.54	103.56 $\pm$ 5.73	0.264
Delivery Gestational Age (weeks)	37.34 $\pm$ 1.46	37.75 $\pm$ 1.18	0.077
Subcutaneous Thickness (cm)	9.65 $\pm$ 1.61	9.51 $\pm$ 1.27	0.578
Length of Surgery (min)	53.10 $\pm$ 8.58	52.01 $\pm$ 9.6	0.485

**Table 2: Association of past obstetrics history/complication and risk factor in current pregnancy of both groups.**

Variable	Group A n (%)	Group B n (%)	p-value
Past Obstetrics History/ Complication	Cesarean Section 36(54.5%)	44(61.1%)	0.302

	Intrauterine Deaths	10(15.2%)	5(6.9%)	
	Nil	20(30.3%)	23(31.9%)	
Risk factors in current Pregnancy	Obstetric Cholestasis	0(0.0%)	2(2.8%)	0.001
	Transverse lie	5(7.6%)	0(0.0%)	
	Breech	4(6.1%)	9(12.5%)	
	Pregnancy-induced hypertension (PIH)	7(10.6%)	12(16.7%)	
	Preeclampsia & (Intrauterine growth retardation) IUGR	0(0.0%)	3(4.2%)	
	Macrosomia	0(0.0%)	3(4.2%)	
	Fibroid	0(0.0%)	3(4.2%)	
	Post date	3(4.5%)	0(0.0%)	
	Placenta Previa	5(7.5%)	0(0.0%)	
	Intrauterine growth retardation	13(19.7%)	0(0.0%)	
	Nil	29(43.9%)	34(47.2%)	

**Table 3: Association of pre and post antibiotics used and postoperative wound complication of both groups.**

Variable	Group A n (%)	Group B n (%)	p-value	
Cesarean Delivery Indication	Elective	34(51.5%)	43(59.7%)	0.332
	Emergency	32(48.5%)	29(40.3%)	
Corticosteroid Use	Yes	4(6.1%)	6(8.3%)	0.607
	No	62(93.9%)	66(91.7%)	
Preoperative Antibiotic Use	Yes	64(97.0%)	69(95.8%)	0.721
	No	2(3.0%)	3(4.2%)	
Postoperative Antibiotics	Yes	66(100.0%)	67(93.1%)	0.029
	No	0(0.0%)	5(6.9%)	
Wound Dehiscence	Yes	14(21.2%)	15(20.8%)	0.956
	No	52(78.8%)	57(79.2%)	
Seroma	Yes	16(24.2%)	16(22.2%)	0.779
	No	50(75.8%)	56(77.8%)	
Hematoma	Yes	7(10.6%)	11(15.3%)	0.416
	No	59(89.4%)	61(84.7%)	
Abscess Formation	Yes	14(21.2%)	18(25.0%)	0.598
	No	52(78.8%)	54(75.0%)	
Readmission	Yes	10(15.2%)	21(29.2%)	0.049
	No	56(84.8%)	51(70.8%)	

**DISCUSSION**

Application of most favorable surgical practices to alleviate wound complications from cesarean section is of vital clinical significance in an era of rising frequency of cesarean section [23]. There is a controversy regarding placement of prophylactic drain to avoid wound complication, and researches that have assessed its

effectiveness in this scenario have revealed contradictory outcomes [24]. The present study compared the outcomes of subcutaneous drainage versus no drainage to prevent wound complications following CS.

A randomized controlled study by Khalifa et al. investigated 170 diabetic obese women and compared the outcomes of regular subcutaneous drain in

opposition to no drain on complications of wound after CS. In their study, mean BMI was reported  $34.1 \pm 1.9$  kg/m<sup>2</sup> in the drain group and  $34.2 \pm 1.7$  kg/m<sup>2</sup> in without drain group ( $p = 0.1$ ) [25]. The present study was shown consistency to some extent with the above reported study and revealed that mean BMI was found  $35.13 \pm 2.19$  kg/m<sup>2</sup> in the drain group and  $35.11 \pm 2.66$  kg/m<sup>2</sup> in without drain group with an insignificant difference between them ( $p = 0.952$ ).

Similarly, another randomized controlled study conducted by Magann et al. included 590 women and assessed the outcomes associated with subcutaneous suturing in opposition to subcutaneous drain to avoid wound interruption subsequent to CS. In their study, mean BMI was found  $40.7 \pm 12.7$  kg/m<sup>2</sup> in the subcutaneous drain group and  $39.4 \pm 8.6$  kg/m<sup>2</sup> in without drain group ( $p = 0.39$ ) [23]. Furthermore, another research by Ramsey et al. [21] evaluated the effect of subcutaneous tissue suturing without drain versus subcutaneous tissue suturing along with placement of drain; it was reported that there were no wound complications in obese women after cesarean section. In their research, mean BMI was reported  $48.0 \pm 11.4$  kg/m<sup>2</sup> in the subcutaneous drain group and  $45.0 \pm 9.2$  kg/m<sup>2</sup> in without drain group ( $p = 0.019$ ) [21]. The present study was not supported the above cited studies and indicated that mean BMI was  $35.13 \pm 2.19$  kg/m<sup>2</sup> in the drain group and  $35.11 \pm 2.66$  kg/m<sup>2</sup> in without drain group with an insignificant difference between them ( $p = 0.952$ ). Furthermore, it was also revealed that wound complication was observed in 21(29.2%) patients in whom subcutaneous tissue approximation without drain was performed while wound complication was observed in 10(15.2%) where drain was inserted with a significant difference between them ( $p=0.049$ ).

Another analysis conducted by Allaire et al. determined whether subcutaneous drain reduced the frequency of wound complications in obese women subsequent to cesarean delivery. They showed that wound infection was not observed in the drain group while 4% found no drain group with insignificant difference between both groups ( $p = 0.34$ ) [26]. Our study was in agreement with the above research and showed that wound dehiscence, hematoma, seroma was observed in both the groups with an insignificant difference between both groups ( $p = 0.956$ ), ( $p = 0.416$ ) and ( $p = 0.779$ ) respectively.

Similarly, one research evaluated frequency of wound Seroma after CS and observed a statistically significant association between both groups. This high frequency in without drain group may be accredited by non-suturing of subcutaneous tissue [27]. Concerning Wound Seroma, Allaire et al. [26] reported that the no cases were reported wound seroma in the drain group and 12% in without drain group ( $p = 0.09$ ). In addition, Magann et al. [23] observed that 1.5% cases reported wound seroma in the drain group and 3% in without drain group ( $p = 0.53$ ). Our study did not endorse the above mentioned studies and reported that incidence of wound seroma was reported 16(24.2%) in drain group and 16(22.2%)

in no drain group, although insignificant difference seen between groups. ( $p=0.779$ ).

The prophylactic drainage of subcutaneous tissue targets to lessen the chances of fluid reservoirs formation in a wound that leads to interrupt its continuity and develop infection. The few researches performed by Ramsey et al. [21] and Al-Inany et al. [28] did not prove the value of preventive drainage of subcutaneous tissue. One more retrospective study by Alanis, demonstrated that prophylactic drainage of subcutaneous tissue should be discarded in immensely obese women [29]. Further research conducted in America revealed that the risk of wound complications significantly increased with drainage procedure, causing wound dehiscence and infection [30]. An Indian study by Bindal and Munda evidently supported that after caesarean delivery with a drain had decreased frequency of postoperative pain, wound seroma, and shorter hospitalization stay [31]. As far as the present study is concerned, drainage procedure reduced the wound complication including hematoma and abscess formation as compared to no drain group but wound seroma and wound dehiscence were those complications that was equally reported in drain and no drain groups.

Another randomized study based on 1082 women treated with antibiotic prophylaxis in CS for above 60 min from the incision of skin followed by skin washed with an alcoholic chlorhexidine solution, and approximated subcutaneous tissue if its thickness was more than 2 cm, proved a considerable decrease in the risk of postoperative wound complications, in spite of the technique used for skin incision, the existence of obesity and diabetes [14].

On the other hand, one research investigated the effect of skin incision technique and proposed that a Pfannenstiel skin incision in caesarean section decreases the probability of wound infections postoperatively [4]. Our study was in agreement with the above reported studies and indicated that skin incision type was Pfannenstiel caesarean section that reduced the probability of wound infections postoperatively. Moreover, almost all the patients were treated with postoperative antibiotics in order to reduce the wound infection regardless of insertion of drain.

## CONCLUSION

This study concludes that obese pregnant women are at an increased risk of pregnancy complications and a significantly raised the incidence of cesarean section. Prophylactic antibiotics significantly decreased wound infections postoperatively in obese women and are greatly suggested. Moreover, subcutaneous drainage insignificantly reduced wound complications such as seroma, hematoma, wound dehiscence and abscess formation in obese women after a caesarean section. Furthermore, chances of readmission to hospital were significantly increased in women without subcutaneous drain.

## REFERENCES

1. Sepúlveda J, Murray C. The state of global health in 2014. *Science* 2014; 345:1275-1278.
2. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
3. Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA* 2006; 295:1549-55.
4. Słabuszewska-Józwiak A, Szymański JK, Józwiak Ł, et al. A systematic review and meta-analysis of wound complications after a caesarean section in obese women. *J Clin Med* 2021; 10:675.
5. Feig DS, Hwee J, Shah BR, et al. Trends in incidence of diabetes in pregnancy and serious perinatal outcomes: A large, population-based study in Ontario, Canada, 1996-2010. *Diabetes Care* 2014; 37:1590-1596.
6. Crane JM, White J, Murphy P, et al. The effect of gestational weight gain by body mass index on maternal and neonatal outcomes. *J Obstet Gynaecol Can* 2009; 31:28-35.
7. Aronow WS. Association of obesity with hypertension. *Ann Transl Med* 2017; 5:350.
8. Vaswani PR, Balachandran L. Pregnancy outcomes in a population with high prevalence of obesity: How bad is it? *Clin Epidemiol Glob Health* 2013; 1:5-11.
9. Marchi J, Berg M, Dencker A, et al. Risks associated with obesity in pregnancy, for the mother and baby: A systematic review of reviews. *Obes Rev* 2015; 16:621-638.
10. Weiss JL, Malone FD, Emig D, et al. FASTER research consortium. obesity, obstetric complications and cesarean delivery rate: A population-based screening study. *Am J Obstet Gynecol* 2004; 190:1091-1097.
11. Hood DD, Dewan DM. Anesthetic and obstetric outcome in morbidly obese parturients. *Anesthesiol* 1993; 79:1210-1218.
12. Bell J, Bell S, Vahratian A, et al. Abdominal surgical incisions and perioperative morbidity among morbidly obese women undergoing cesarean delivery. *Eur J Obstet Gynecol Reprod Biol* 2011; 154:16-9.
13. Conner SN, Verticchio JC, Tuuli MG, et al. Maternal obesity and risk of postcesarean wound complications. *Am J Perinatol* 2014; 31:299-304.
14. Temming LA, Raghuraman N, Carter EB, et al. Impact of evidence-based interventions on wound complications after cesarean delivery. *Am J Obstet Gynecol* 2017; 217:449.e1-449.e9.
15. Salim R, Braverman M, Teitler N, et al. Risk factors for infection following cesarean delivery: an interventional study. *J Matern Fetal Neonatal Med* 2012; 25):2708-2712.
16. Conroy K, Koenig AF, Yu YH, et al. Infectious morbidity after cesarean delivery: 10 strategies to reduce risk. *Rev Obstet Gynecol* 2012; 5:69-77.
17. Mackeen AD, Schuster M, Berghella V. Suture versus staples for skin closure after cesarean: A metaanalysis. *Am J Obstet Gynecol* 2015; 212:621.e1-621.e10.
18. Kawakita T, Landy HJ. Surgical site infections after cesarean delivery: Epidemiology, prevention and treatment. *Matern Health Neonatol Perinatol* 2017; 3:12.
19. Gates S, Anderson ER. Wound drainage for caesarean section. *Cochrane Database Syst Rev* 2013; CD004549.
20. Chelmow D, Rodriguez EJ, Sabatini MM. Suture closure of subcutaneous fat and wound disruption after cesarean delivery: A meta-analysis. *Obstet Gynecol* 2004; 103:974-980.
21. Ramsey PS, White AM, Guinn DA, et al. Subcutaneous tissue reapproximation, alone or in combination with drain, in obese women undergoing cesarean delivery. *Obstet Gynecol* 2005; 105:967-973.
22. Hellums EK, Lin MG, Ramsey PS. Prophylactic subcutaneous drainage for prevention of wound complications after cesarean delivery: A metaanalysis. *Am J Obstet Gynecol* 2007; 197:229-235.
23. Magann EF, Chauhan SP, Rodts-Palenik S, et al. Subcutaneous stitch closure versus subcutaneous drain to prevent wound disruption after cesarean delivery: A randomized clinical trial. *Am J Obstet Gynecol* 2002; 186:1119-23.
24. Tully L, Gates S, Brocklehurst P, et al. Surgical techniques used during caesarean section operations: Results of a national survey of practice in the UK. *Eur J Obstet Gynecol Reprod Biol* 2002; 102:120-126.
25. Khalifa AAA, Abdelrazak KM, Abdelazim IA. Routine subcutaneous drain versus no drain in cesarean section for diabetic obese women: A randomized controlled trial. *Int J Curr Microbiol Appl Sci* 2015; 4:479-485.
26. Allaire AD, Fisch J, McMahon MJ. Subcutaneous drain vs. suture in obese women undergoing cesarean delivery. A prospective, randomized trial. *J Reprod Med* 2000; 45:327-331.
27. Fahmi MM, Hamza HA, El-Nasr IA, et al. Routine subcutaneous drains versus no drains in repeated elective and emergent cesarean sections. *Menoufia Med J* 2018; 31:46-51.
28. Al-Inany H, Youssef G, Abd ElMaguid A, et al. Value of subcutaneous drainage system in obese females undergoing cesarean section using pfannenstiel incision. *Gynecol Obstet Invest* 2002; 53:75-78.
29. Alanis MC, Villers MS, Law TL, et al. Complications of cesarean delivery in the massively obese

- parturient. *Am J Obstet Gynecol* 2010; 203:271.e1-7.
30. Thornburg LL, Linder MA, Durie DE, et al. Risk factors for wound complications in morbidly obese women undergoing primary cesarean delivery. *J Matern Fetal Neonatal Med* 2012; 25:1544-8.
31. Bindal JA, Munda G. Clinical Study to compare drain versus no drain in post cesarean section. *Int J Reprod Contracept Obstet Gynecol* 2017; 6:3903-3906.