

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Samar Zidan Ali¹, Enas Kassem Ali², Safaa Soliman Ahmed³

¹*Assistant Lecturer in Maternity & Neonatal Health Nursing, Faculty of Nursing
- Beni-suf University*

²*Professor of Maternal and Newborn Health Nursing, Faculty of Nursing
- Menoufia University*

³*Assistant Professor of Maternal and Newborn Health Nursing, Faculty of Nursing
- Beni-suf University*

Abstract: Background: A cesarean section is a surgical procedure in which incisions are made through a woman's abdomen and uterus to deliver her baby. Surgical site infections are a common complication among cesarean section patients. Further, SSIs increase maternal morbidity, stay in the hospital and the cost of treatment. The purpose of the study was to evaluate the effect of applying of pre-cesarean section wound care guidelines on occurrence of postoperative infection among women. **Methods:** The quasi-experimental design was utilized. **Sample:** A purposive sample consisted of two hundred pregnant women undergoing cesarean section. **Setting:** The study was carried out at the Obstetrics and Gynecological Department & outpatient clinic at Beni-suef University Hospital in Beni-suef Governorate, Egypt. **Instruments:** An interviewing questionnaire, self-care practice tool, and follow-up assessment tool. **Results:** There was a statistically significant reduction in postoperative infection in the study group compared to the control group. **Conclusion:** The women in the study group who applied wound care guidelines were less exposed to cesarean section incision infection than those who had not received wound care guidelines. **Recommendations:** More knowledge, beliefs, and practices related to cesarean wound healing need to be corrected. Self-wound care guidelines should be incorporated as an essential part of routine antenatal care and post-partum before discharge after a cesarean section.

Keywords: *Cesarean section, Wound care guidelines, Post operative infection*

Introduction

Cesarean section (CS) is a procedure in which surgery was made through a mother's abdominal and uterine wall to deliver the baby (Sung & Mahdy., 2021).

Now, it is the most frequently performed major obstetrical operation among women in both developed and developing countries (Dessu et al.,

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

2021). However, women undergoing CS are at risk of rising postnatal infection eight-fold than that of normal delivery (Gadeer et al., 2020).

According to the data by the Central Agency for Public Mobilisation and Statistics (CAPMAS) on the Health of the Egyptian Family (HEF) C-section births increased to 72 percent in 2021, up from 52 percent in 2014 (El Sawy., 2022). While in Beni-Suef Governorate is 32.6% (Mahmoud., 2019).

Like any surgical procedure, CS can be associated with postpartum surgical site infection (SSIs), as wound infections (Kawakita & Landy., 2017). Centers for Disease Control and Prevention (CDC., 2021) Stated that SSIs as an infection occurring within 30 days from the operative procedure in the part of the body where the surgery took place.

The most essential risk factors for developing post-cesarean infectious morbidity can be divided into patient factors and procedural factors. Patient risk factors include advanced age, nulliparity, malnutrition, hypovolemia, obesity, steroid use, diabetes, use of immunosuppressive agents, smoking, coexistent infection at a remote site, premature rupture of membranes, blood loss, and emergency CS birth, In addition, Low socioeconomic status (Kuplicki., 2017).

In addition to, procedure-related risk factors include the use of foreign material such as drains, leaving dead space, prior infection, multiple vaginal examinations, duration of surgical scrub, preoperative shaving, poor skin preparation, long surgery, poor surgical technique, hypothermia, contamination from the operating room, and prolonged perioperative stay in hospital (Zabaglo & Sharman., 2021).

Different measures can be taken in the pre-operative phase to prevent SSIs (like; preoperative showering, avoiding frequent vaginal examination, hair removal, patient theatre wear, staff

theatre wear, hand jewelry, antibiotic prophylaxis), intra-operative phase (hand decontamination, Sterile gowns, incise drapes, antiseptic skin preparation, maintaining patient homeostasis, antiseptics, and antibiotics before wound closure, wound dressings, and closure methods) and postoperative phases of care (like; postoperative cleansing, and antibiotic treatment of surgical site infection) can reduce risk of infection (Ali et al., 2021).

NICE Guideline Updates Team (UK)., 2019) recommend that for routine CS wound care including removing the dressing 24 hours after the CS, specific monitoring for fever, assessing the wound for signs of infection (such as increasing pain, redness or discharge), separation or dehiscence, encouraging the woman to wear loose, comfortable clothes and cotton underwear, also gently cleaning and drying the wound daily. As well as if needed, planning the removal of sutures or clips.

Significance of the study

Post-cesarean wound infection is a major health problem after CS and has an alarming impact on the postpartum woman's resumption to normal functioning and provision of newborn care (Zejnnullahu et al., 2019). The global rate of SSIs ranges from 3% to 15%, the difference in incidence may reflect variances in population characteristics and risk factors, perioperative practices, and the duration from the procedure until ascertainment (Alfouzan et al., 2019), while the incidence of SSIs in Africa ranges from 5% in Tunisia (Merzougui ET AL., 2018) to 16.7% in Egypt (Abdallah & Sayed., 2018). Patients who develop SSIs were five times more likely to be readmitted to hospital and two times more likely to die compared with patients without SSIs (Mekonnen et al., 2021).

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Maternity nurse plays a crucial role in care for C.S women, so nurse should assess woman's knowledge to guide it to return to

pre-pregnant state and provide health education about a wound care before cesarean delivery. Unfortunately, there is a shortage of studies that evaluate the effect of pre-cesarean section wound care guidelines on occurrence of postoperative infection among women in Beni-Suef Governorate. So, this study's purpose is to evaluate the effect of pre- cesarean section wound care guidelines on the occurrence of postoperative infection among women.

Purpose of the Study

This study was conducted with the purpose of evaluating the effect of pre-cesarean section wound care guidelines on occurrence of post-operative infection among women.

Research Hypothesis

- 1) Women undergoing cesarean section who apply wound care guidelines will exhibit a higher score of total knowledge toward C.S care than those who will receive routine care in the hospital.
- 2) Women undergoing cesarean section who apply wound care guidelines will exhibit a higher score of self-care practice toward C.S care than those who will not receive it.
- 3) Women undergoing cesarean section who apply wound care guidelines will acquire positive beliefs towards C.S. wound care than those who will receive routine care in the hospital.
- 4) The women in the study group who apply wound care guidelines will be less exposed to cesarean section incision infection than those who will not receive wound care guidelines.

Operational definitions of study variables

Wound care guidelines are considered standards at a universal level and recognized numerous effective elements of pre-, intra-, and postoperative measures for wound infection prevention. Operationally it refers to a standard of care that include several recommendations followed by a maternal woman and healthcare provider to reduce the incidence of post-cesarean wound infection. This element is measured by instruments three and four.

Postoperative wound infection Is a bacterial infection at the surgical site within 30 days of the operative procedure, further stratified by the depth of infection: superficial incisional, deep incisional, and organ/space. Operationally it refers to a bacterial infection characterized by redness, localized pain, fever, discharge from the wound, and wound dehiscence. This element is measured by instrument five.

Methods

Research Design:

A quasi –experimental design (study and control groups) was used to carry out the present study.

Settings:

The study was carried out at the Obstetrics and Gynecological department & outpatient clinic at Beni-suef University Hospital in Beni-suef Governorate, Egypt.

Sample type and size:

A Purposive sample of 200 pregnant women participated in the present study and was divided equally into group (1) study group (100) women who received wound care guidelines and group (2) control group (100) who received routine hospital care only.

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Data Collection Instruments:

Data was collected using instruments, which are developed by the researcher and revised by qualified experts, then tested for validity and reliability.

Instrument I: A Socio-Demographic

Data Questionnaire: -

This instrument was developed by the researcher after reviewing related literature and under the guidance of the supervisors to obtain complete data about pregnant women. The instrument consisted of five parts that were revised by three professors at the Maternal and Newborn Health Department and then tested for validity and reliability.

It included five parts: -

- **Part 1:** The study participants' demographic data, including their age, address, degree of education, location of residence, job, marital status, and income
- **Part 2:** Previous obstetrical history includes parity, gravidity, abortion, number of living birth, previous mode of delivery, and inter-delivery interval.
- **Part 3:** Data about the current pregnancy includes the data related to antenatal care follow-up, gestational age per week, and problems during the current pregnancy.
- **Part 4:** Caesarean section indication includes the data related to maternal indications, anatomical indications, and fetal indications.
- **Part 5:** Operative data which include preoperative preparation included; hair removal, showering and antibiotic prophylaxis, intraoperative data as a type of anesthesia, type of CS, prepare the skin with an antiseptic agent immediately prior to surgery, type of skin incision, duration of operation, skin closure technique, type of

materials used to close the incision and post-operative vital signs.

Instrument 1 Validity:

The validity of the instrument was ascertained by three qualified experts (one expert in the Maternal and Newborn Health Nursing Department at the Faculty of Nursing, Beni-Suef University, and two experts from the Obstetrics and gynecology department at the Faculty of Medicine, Beni-Suef University) who reviewed the instrument for the content and internal validity. They were also asked to judge the items for completeness and clarity. Modifications were done to ascertain relevance and completeness.

Instrument 1 Reliability:

the researcher for testing the internal consistency of the instrument applied test-retest reliability. It was done through the administration of the same instrument to the same participants under similar conditions on two or more occasions. Scores from repeated testing were compared to test the consistency of the results over time.

Instrument II: Observational Checklist

Was used to evaluate women practice regarding pre cesarean section wound care. It containing the following items (wound care, diet, exercises, hygienic care, sexual relation, bathing, lochia, postpartum warning signs, follow up...etc)

Scoring system of Instrument 2:

Each part of the instrument was scored separately according to the number of correct answers as follows. The correct practice was done. It was scored "1", while if not done it was scored "0". The total score=25 ranged from (0-25). Mean and standard deviation was

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

calculated and then converted into a percent score. This tool is used as a pre/post-test for practice. Then the data was split into two groups, satisfied and not satisfied. The total score was calculated using the summation of all parts.

Instrument 2 Validity:

The validity of the instrument was ascertained by three qualified experts (one expert in the Maternal and Newborn Health Nursing Department at the Faculty of Nursing, Beni-Suef University, and two experts from the Obstetrics and gynecology department at the Faculty of Medicine, Beni-Suef University) who reviewed the instrument for the content and internal validity. They were also asked to judge the items for completeness and clarity. Modifications were done to ascertain relevance and completeness.

Instrument 2 Reliability:

Test-retest reliability was used by the researcher for testing the internal consistency of the instrument. The period between both tests was two weeks. The reliability of the data collection tools was tested using Cronbach's alfa coefficient which was (0.869) for practice which indicates good internal consistency of the study tools. It was done through the administration of the same instrument to the same participants under similar conditions. Scores from repeated testing were compared to test the consistency of the results over time.

Instrument III: Postnatal Follow up assessment tool

This part was adopted from Kawakita & Landy, (2017). It was used to assess postoperative wound healing and starting during 3rd day of puerperium and then during the first postnatal visit (7th day's puerperium) after that every fifth day until the first thirty days

because SSI may appear at any time from 3rd day of operation until 30 days postpartum, which include exposure to wound infection, type of wound infection, signs of infection, an extension of infection, discharge from wound and days of wound healing.

Instrument 3 Validity:

The validity of the instrument was ascertained by three qualified experts (one expert in the Maternal and Newborn Health Nursing Department at the Faculty of Nursing, Beni-Suef University, and two experts from the Obstetrics and gynecology department at the Faculty of Medicine, Beni-Suef University) who reviewed the instrument for the content and internal validity. They were also asked to judge the items for completeness and clarity. Modifications were done to ascertain relevance and completeness.

Instrument 3 Reliability:

the researcher for testing the internal consistency of the instrument applied test-retest reliability. It was done through the administration of the same instrument to the same participants under similar conditions on two or more occasions. Scores from repeated testing were compared to test the consistency of the results over time.

Ethical consideration:

Approval of the Faculty of Nursing Ethical and Research Committee, Menoufia University was obtained A written consent was obtained from all participants who met the inclusion criteria to participate in the study. Confidentiality and anonymity of nurses was assured through coding all data and all informations obtained would only be used for the purpose of th study. All participants were informed about the purpose, procedure and benefits of the study. They were informed that participation in the study was voluntary

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

and they can withdraw from the study at any time without penalty. Moreover, they were assured that the nature of instruments would not cause any physical or emotional harm to them.

Pilot study:

A pilot study was conducted to test the applicability of the instruments, the feasibility of the study, and estimate the time needed for collecting the data. It was conducted on 10% of the total sample (20 women) according to selection criteria. All pregnant women who participated in the pilot study were excluded from the study participants because the researcher rephrased some questions and sentences and then set the final fieldwork schedule.

Study field work

- A broad review related to the study area was done including electronic studies, available books, articles, and publications to create a knowledge base relevant to the study area.
- The data were gathered over a period of 5 months from beginning of October, 2021 until end of February, 2022.
- The researcher went to the outpatient clinic of obstetrics and gynecology in the previous mentioned hospital three days weekly.
- Participants in the study ranged between 3-4 women each day, then the cases were randomly assigned to (a study and a control group) as mentioned before.
- During the initial contact, the researcher clarified the purpose of the research and gained their acceptance.
- Participants for the study group only were divided into subgroups and they received (3) sessions. The researcher starts to give health education sessions to study group

and used (Arabic Educational Booklet). This booklet containing total knowledge, believes and self-care practice guidelines of pre cesarean section wound care was given to the women to facilitate explanation of knowledge and practice they needed to reduce incidence of wound infection and to be a reference for them. At the end of the sessions the women received a copy of self-learning educational booklet.

- based on the advice of the Pharmacist, Obstetrician and Gynecologist at the study setting, the study pregnant women were teach about the importance of showering with a soap that contains Chloroxylenol, is an antiseptic and disinfectant which is used for skin disinfection that kills bacteria on the human skin, such as Dettol soap, before the operation (either the night before the caesarean section, or the day of the surgery) as this helps to reduce the chances of infection Postoperatively.
- During each follow up, assess and ask woman about the following wound status, signs of wound infection, if the woman exposure to wound infections assess type of SSIs (superficial, deep, or organ space), extension of infection (just one stitch, part of wound, or whole wound), discharge (serous discharge, purulent discharge, or bloody discharge), and days of healing (8-15 days, or more than 15 days)

Statistical analysis: -

Data were coded, transformed, and presented. Data were entered, statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc, Chicago, Illinois, USA).

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Quantitative data were presented by mean and standard deviation (SD). It was analyzed using student t- test for comparison between two means, and ANOVA (F) test for comparison between more than two means. Level of significance was set as P value <0.05 for all significant tests.

Results

Table (1): Showed the socio-demographic characteristics of the study participants. As shown in the table, there was no statistically significant difference ($p > 0.05$) between the control and study groups regarding the general characteristics of both groups which mean that both groups had similar characteristics.

Table (2): Showed the anatomical and fetal indications of cesarean section for study participants. There was no statistically significant difference ($p > 0.05$) between both groups regarding anatomic and fetal indications for CS except for macrosomia ($P = 0.006$) and failure Progress ($P = 0.013$).

Table (3): Showed the preoperative preparation of the study participants. There was statistically significant difference ($p < 0.01$) between both groups regarding method of hair removal, showering by using antiseptic soap (Dettol soap) and antibiotic prophylaxis while there was no statistically significant difference regarding hair removal ($P = 0.462$).

Table (4): Showed the intra-operative characteristics of the study participants. There was a statistically significant

difference ($p < 0.01$) between both groups in intra-operative preparation regarding the type of CS, type of anesthesia, and duration of operation while there was a non-significant difference regarding the type of the materials used to close the incision ($P = 0.621$).

Table (5): Showed that; there was a significant difference in the study group women's total practice score regarding their wound care, nutrition, hygiene, rest, and daily activities before and post-intervention due to improved practice after implementing the standardized wound care guidelines.

Figure (1): describes wound healing follow-up for both groups. The critical point for infection was at 10 days where the highest percentages of SSI were for both control and study groups (30% and 14%) respectively. The critical point for healing was at 25 days when no women in the study group had an infection.

Figure (2): displays the comparison between the days of wound healing for study subjects. The majority of subjects in the study group (92%) revealed healing within 8-15 days compared to only two-thirds (65%) of subjects in control group who revealed healing within the same period. Only small percentage of study group (8%) who take more than 15 days for healing. Chi square test revealed that the differences in healing periods between both groups were significant statistically ($\chi^2 = 21.59$, $P = 0.000$).

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Table (1): Socio-demographic Characteristics of the Study Participants (N = 200).

Variables	Control (No=100)		Study (No=100)		X ²	Test of sig. P-value
	N	%	N	%		
Age groups						
- Less than 20	10	10	12	12	0.395	P=0.821(>0.05)
- 20-35	70	70	66	66		
- More than 35	20	20	22	22		
Mean±SD	33.34±5.78		31.98±6.87		-	-
level of education						
- Read and write	36	36	24	24	3.546	P=0.315(>0.05)
- Basic education	24	24	28	28		
- Secondary education	28	28	32	32		
- Higher education	12	12	16	16		
Body mass index (BMI)						
- Normal (BMI < 25)	18	18	20	20	0.880	P=0.644(>0.05)
- Overweight (≥ 25 BMI < 30)	50	50	54	54		
- Obesity (BMI ≥ 30)	32	32	26	26		
Occupation						
- Housewife	86	86	86	86	0.000	P=1.00(>0.05)
- Working	14	14	14	14		
Residence						
- Urban	82	82	82	82	0.000	P=1.00(>0.05)
- Rural	18	18	18	18		

Table (2): Anatomical and fetal indications of caesarean section among the Study Participants(N=200).

Variables	Control (N=100)		Study (N=100)		Test of sig. P-value
	N	%	N	%	
Anatomic indications					
- Placenta previa	8	8	4	4	X ² = 1.418 P = 0.234(>0.05)
- Placental abruption	0	0	2	2	X ² = 2.020 P = 0.15(>0.05)
- History of uterine incision dehiscence	2	2	0	0	X ² = 2.020 P = 0.155(>0.05)
Fetal indications					
- Failure Progress	6	6	0	0	X ² = 6.186 P = 0.013(<0.05)
- Mal-presentation	14	14	16	16	X ² = 0.157 P = 0.692(>0.05)
- Macrosomia	12	12	2	2	X ² = 7.680 P = 0.006(<0.01)
- Congenital anomaly	4	4	2	2	X ² = 0.687 P = 0.407(>0.05)
- Fetal Distress	2	2	2	2	X ² = 0.000 P = 1.000(>0.05)

**significant difference at P<0.01, * significant difference at P<0.05

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Table (3): Preoperative Preparation of the Study Participants (N=200).

Variables	Control (N=100)		Study (N=100)		Test of sig. P-value
	N	%	N	%	
Hair removal					
- Yes	86	86	82	82	X²= 0.542 P = 0.462 (>0.05)
- No	14	14	18	18	
Method of hair removal					
- Electric Clipper	4	4	12	12	X²= 19.97 P = 0.001 (<0.01)
- Shaving "razor"	14	14	2	2	
- Chemical depilation	8	8	20	20	
- Sweet	60	4	48	48	
Showering by using antiseptic soap (Dettol soap)					
- Yes	8	8	94	94	X²= 147.97 P = 0.000 (<0.01)
- No	92	92	6	6	
Antibiotic prophylaxis within 60 min prior to incision					
- Yes	38	38	18	18	X²= 9.921 P = 0.002 (<0.01)
- No	62	62	82	82	

**significant difference at P<0.01

Table (4): Intra-operative characteristics of the Study Participants(N=200).

Variables	Control (N=100)		Study (N=100)		Test of sig. P-value
	N	%	N	%	
Type of caesarean section					
- Emergency	70	70	28	28	X²= 35.29 P = 0.000 (<0.01)
- Elective	30	30	72	72	
Type of anesthesia used					
- Spinal	88	88	98	98	X²= 7.680 P = 0.006 (<0.01)
- General	12	12	2	2	
Duration of operation					
- ≤60 min	88	88	98	98	X²= 7.680 P = 0.006 (<0.01)
- >60 min	12	12	2	2	
Type of materials used to close incision					
- absorbable	8	8	10	10	X²= 0.244 P = 0.621 (>0.05)
- non-absorbable sutures	92	92	90	90	

**significant difference at P<0.01

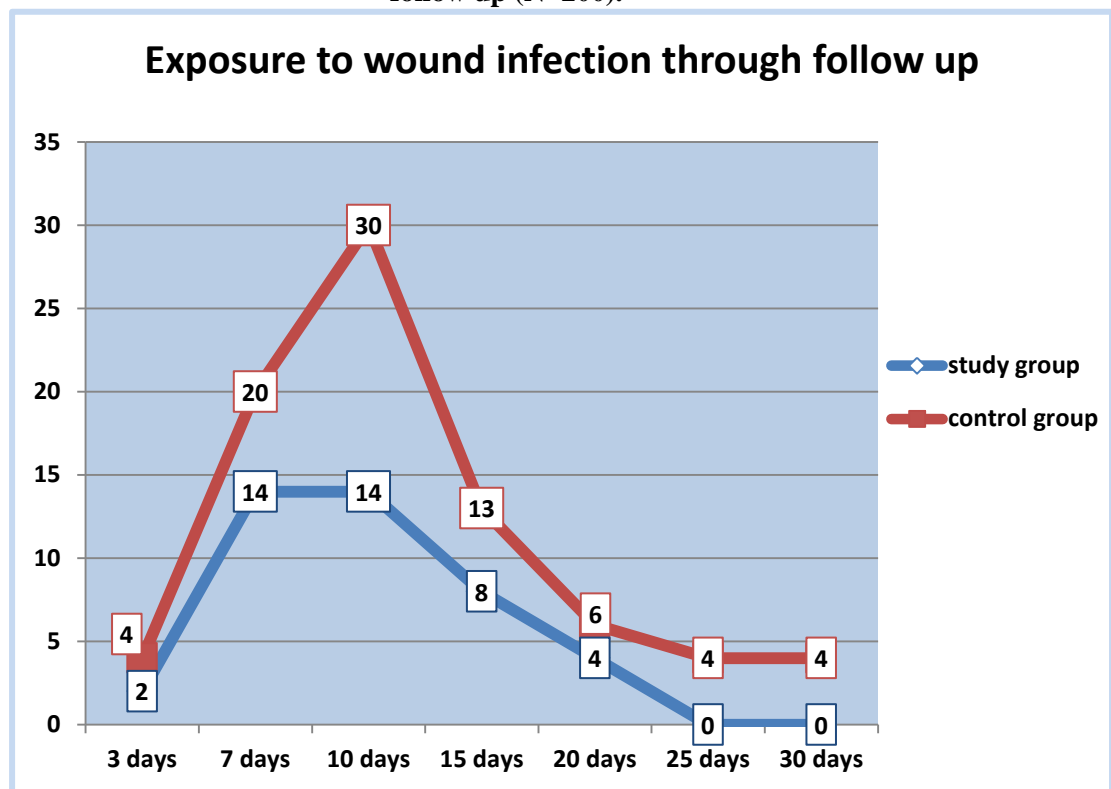
Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Table (5): Comparison between study group satisfaction before and after intervention regarding their practice about CS (n=100):

Variables	Before intervention		Post-intervention		X2	P-Value
	N	%	N	%		
General preoperative preparation						
- Satisfactory	80	80	74	74	1.016	0.313
- Unsatisfactory	20	20	26	26		
Wound Care After Suture Removed or Absorbable						
- Satisfactory	66	66	100	100	40.964	0.000**
- Unsatisfactory	34	34	0	0		
Nutrition, Hygiene, and Rest						
- Satisfactory	28	28	98	98	105.10	0.000**
- Unsatisfactory	72	72	2	2		
Daily Activities						
- Satisfactory	96	96	100	100	4.082	0.043**
- Unsatisfactory	4	4	0	0		
Total Practice						
- Satisfactory	67.5	67.5	93	93	20.778	0.000**
- Unsatisfactory	32.5	32.5	7	7		

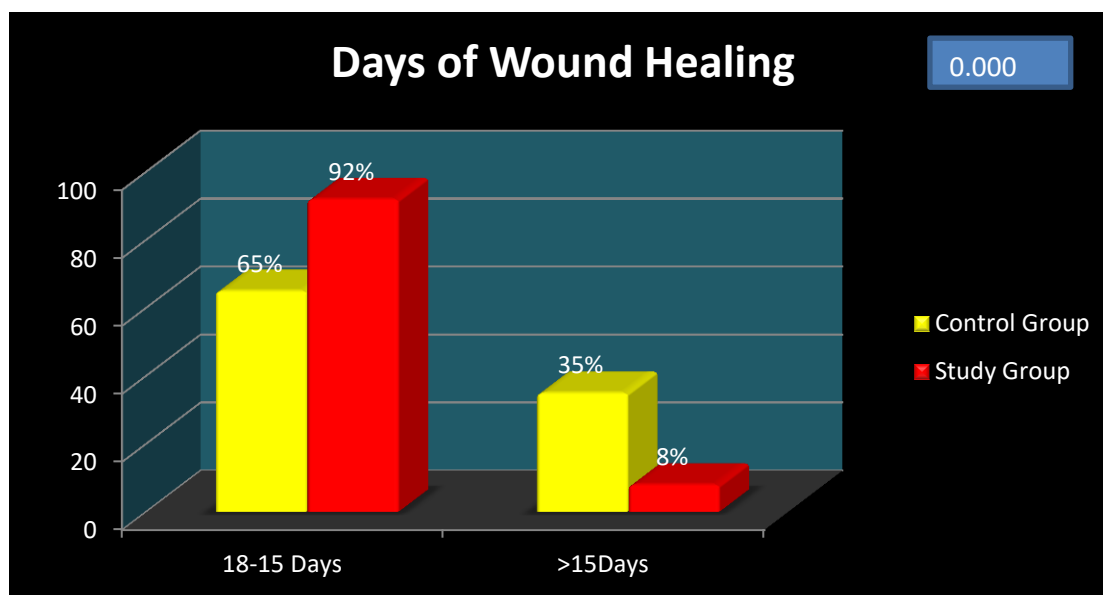
**significant difference at P<0.01

Figure (1): comparing control and study group regarding wound infection through follow up (N=200).



*Significant

Figure (2): Duration of wound healing for study groups.



**significant difference at $P < 0.000$

Discussion:

Cesarean section is one of the most common surgical procedures performed worldwide (Elnakib et al., 2019), occurs in one in three women in the United States, and in up to four out of five women in some regions of the world (Antoine & Young., 2021). However, infectious morbidity after CS can have a great impact on the postpartum woman's return to normal function and ability to care for the baby (Mohammad et al., 2018).

This study was quasi-experimental research hypothesized that Women undergoing cesarean section who applied wound care guidelines had less exposed to cesarean section incision infection than those who will not receive wound care guidelines.

The current study found no statistically significant difference between the study and control groups in terms of socio-demographic variables (age, body mass index, education, employment, and residence). The majority of the study participants between the ages of 20 and 35, had a secondary education, had

overweight, and had housewives and rural residents. According to the researchers, these results indicate that both study groups were homogeneous and comparable. The fact that both studies were conducted in the same town may help to explain this commonality.

This result comes in agreement with Elgaied et al (2020) who studied "Influence of Different Scrubbing Methods of Surgical Team on Surgical Site Infection in Cesarean Section" in Egypt and stated that there was no significant difference between the study and control groups regarding socio-demographic data as age, body mass index, education, employment, and Residence.

Regarding anatomical and fetal indication for cesarean section, the present findings revealed that, for the anatomical indications, the main indication for both groups was for placenta previa, while for fetal indications, the highest percentage for each group was for mal-presentations.

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

The researcher's point of view may be related to the most women suffered from fetal mal-presentation delivered by cesarean section.

The result of the present study is inconsistent with Abdel-Tawab et al., (2018) who studied " Cesarean section deliveries in Egypt: Trends, practices, perceptions, and cost" and reported that; the main fetal indication for CS was fetal distress.

Concerning preoperative showering, nearly all the participants in the study group had preoperative showering and there was a significant difference between both groups. The researcher's point of view may be this a significant difference after the intervention, related to women's practice was higher in the study group than in the control group also this result may be attributed to a decrease in the incidence of surgical site infections because whole-body showering with a skin antiseptic is effective in preventing SSIs.

The present findings were dissimilar to Makhni et al., (2018) who revealed that there was no statistically significant difference was noted in the use of chlorhexidine at home before surgical preparation.

Concerning to use of antibiotic prophylaxis within 60 min prior to skin incision, the majority of women had no antibiotic prophylaxis before incision and there were significant differences between both groups. This finding is supported by Dlamini et al., (2015) who studied "Antibiotic prophylaxis for cesarean section at a Ugandan hospital: A randomized trial" They reported that the risk of overall postoperative infection was significantly lower when prophylaxis was given within an hour before incision and they stated that there was a statistically significant difference in this risk ratio between both groups.

Regarding the intra-operative characteristics, the study and control groups were similar concerning those

characteristics that may increase the risk of postpartum infection, including the type of cesarean section, type of anesthesia used, and type of skin incision and there were significant differences between both groups in intra-operative characteristics regarding the type of CS, and type of anesthesia.

This study finding is in disagreement with the finding of the study conducted by Alemye et al., (2021) who investigated "post-cesarean section surgical site infection and associated factors among women who delivered in public hospitals: a hospital-based analytic cross-sectional study". They stated that both groups were similar concerning the type of cesarean section, a transverse abdominal incision, and reported that women who received general anesthesia for CS operation had twice the risk of SSI compared to those who received spinal anesthesia.

Regarding the intraoperative skin closure technique, the current study highlighted that all women in the sample had continuous skin closure. From the researcher's point of view, the method of skin closure may have a role in preventing the development of SSI. Compared with interrupted sutures, continuous sutures can provide a better seal preventing the exogenous bacterial invasion of the surgical wound. These findings were in agreement with Azeze et al., (2019) who stated that both groups were similar concerning the type of skin closure and reported that interrupted skin closure technique was an independent risk factor for surgical site infection.

Regarding the pregnant women practice about cesarean section wound care before intervention; the current study revealed that there was a significant difference in the study group women's total practice score regarding their wound care, nutrition, hygiene, rest, and daily activities before and post-intervention due to improved practice

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

after implementing the standardized wound care guidelines.

In a similar finding, previous studies conducted by Rajan & Nayak., (2014) evaluate the effectiveness of self-instructional module on knowledge of post-operative self-care among cesarean mothers with pretest post-test assessment and revealed that there was a significant difference found between the mean pre-test knowledge score and mean post-test knowledge score which showed that educational instructional module was effective in improving the knowledge of women on post caesareans care.

Regarding the incidence of infection, this study showed that the number of patients who had surgical site infection increased on days 7 and 10 than on day 15 among both groups. Then, it decreased on day 20 and continued in decreasing in day 25 and day 30 for the control group while no women in the study group had an infection on day 25 and day 30. the present results go on the same line with Elgaied et al (2021) who showed that the number of patients who had surgical site infection increased on day 10 and 15 than on day 5 among group A and group B. Then, it decreased on day 20 and continued in decreasing on day 25 and day 30.

Regarding wound healing follow-up for both groups. The critical point for infection was at 10 days where the highest percentages of SSI were for both control and study groups (30% and 14%) respectively, while the critical point for healing was at 25 days where no women in study group had infection. The finding was in agreement with Dlamini et al (2015) who reported that hotness and redness increased among the two groups at day 10 then it decreased at day 25 and 30 postoperative.

Conclusion

In light of the present study results, it can be concluded that wound care guidelines prior to cesarean delivery significantly reduce the risk of postoperative infection. The incidence of post-cesarean wound infection was significantly reduced in the intervention group when compared with the control group. The study highlights the importance of wound care guidelines to support safe recovery and reduce SSIs in C-sections wounds.

In addition, the present study also concluded that wound care instructions were effective in increasing the level of women's knowledge and practice as well as acquiring positive beliefs toward cesarean section wound care.

Based on the present study findings; the research hypothesis was accepted.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- 1) Wound care guidelines should be incorporated as an essential part of routine postnatal care to enhance puerperal women's their knowledge post-cesarean.
- 2) Wound care guidelines should be incorporated as an essential part of routine antenatal care before cesarean section to enhance the pregnant women undergoing cesarean-section their practices post-cesarean.
- 3) Further research is needed to focus on conducting multinational interventional studies to evaluate the effect of pre cesarean section wound care guidelines on occurrence of post-operative infection and to achieve generalization of the results.

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

Acknowledgment

We would like to thank all pregnant women participant for their cooperation and help during data collection.

Reference

- Abdallah A, Sayed Rafeek ME. (2018). Risk factors of surgical site infection of cesarean section and role of skin cleansing and prophylactic antibiotic. *Int J Reprod Med Gynecol.* 2018;4(2):047–51.
- Abdel-Tawab N, Oraby D, Hassanein N& El-Nakib S(2018). Cesarean section deliveries in Egypt: Trends, practices, perceptions, and cost. Available at: www.popcouncil.org
- Afaya, A., Dzomeku, V.M., Baku, E.A. et al. (2020). Women’s experiences of midwifery care immediately before and after caesarean section deliveries at a public Hospital in the Western Region of Ghana. *BMC Pregnancy Childbirth* 20, 8. <https://doi.org/10.1186/s12884-019-2698-4>.
- Alemye T, Oljira L, Fekadu G, Mengesha MM. (2021). Post cesarean section surgical site infection and associated factors among women who delivered in public hospitals in Harar city, Eastern Ethiopia: A hospital-based analytic crosssectional study. *PLoS ONE* 16(6): e0253194. <https://doi.org/10.1371/journal.pone.0253194>
- Alfouzan W, Al Fadhli M, Abdo N, Alali W, Dhar R (2019). Surgical site infection following cesarean section in a general hospital in Kuwait: trends and risk factors. *Epidemiology and Infection* 147, e287, 1–5. <https://doi.org/10.1017/S0950268819001675>
- Ali, Oumer & Kassahun, Dawit & Kelkay, Bayew & Atnafu, Asmamaw. (2022). Maternal factors are important predictors for surgical site infection following cesarean section in Northwest Ethiopian. *Clinical Epidemiology and Global Health.* 13. 100936. [10.1016/j.cegh.2021.100936](https://doi.org/10.1016/j.cegh.2021.100936).
- Ali, Oumer & Kassahun, Dawit & Kelkay, Bayew & Atnafu, Asmamaw. (2022). Maternal factors are important predictors for surgical site infection following cesarean section in Northwest Ethiopian. *Clinical Epidemiology and Global Health.* 13. 100936. [10.1016/j.cegh.2021.100936](https://doi.org/10.1016/j.cegh.2021.100936).
- Antoine C& Young B (2021). Cesarean section one hundred years 1920–2020: the Good, the Bad and the Ugly. *J. Perinat. Med.* 2021; 49(1): 5–16, Available at: <https://doi.org/10.1515/jpm-2020-0305>
- Azeze, G.G., Bizuneh, A.D (2019). Surgical site infection and its associated factors following cesarean section in Ethiopia: a cross-sectional study. *BMC Res Notes* 12, 288. Available at: <https://doi.org/10.1186/s13104-019-4325-x>
- Centers for Disease Control and Prevention (CDC) (2021). *NHSN Surgical Site Infection Checklist – CDC.* <https://www.cdc.gov/nhsn/pdfs>.
- Dessu S, Samuel S, Gebremeskel F, Basazin A, Tariku Z& Markos M (2021). Determinants of post cesarean section surgical site infection at public hospitals in Dire Dawa administration, Eastern Ethiopia: Case control study. Available at: [https://doi.org/10.1371/journal.pone.16\(4\):0250174](https://doi.org/10.1371/journal.pone.16(4):0250174).

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

- Dlamini, L. D., Sekikubo, M., Tumukunde, J., Kojjo, C., Ocen, D., Wabule, A., & Kwizera, A. (2015). Antibiotic prophylaxis for caesarean section at a Ugandan hospital: a randomised clinical trial evaluating the effect of administration time on the incidence of postoperative infections. *BMC pregnancy and childbirth*, 15, 91. <https://doi.org/10.1186/s12884-015-0514-3>
- El Sawy N (2022). Egypt acts to reduce 72% C-section birth rate. Available at: <https://www.thenationalnews.com>
- Elgaied, Alaa & Nofal, Ahmed & Kasemy, Zeinab & Elaziz, Mohamed & Nasr, Ibrahiem. (2021). Influence of Different Scrubbing Methods of Surgical Team on Surgical Site Infection in Cesarean Section. *The Egyptian Journal of Hospital Medicine*. 83. 1082-1087. 10.21608/ejhm.160876.
- Elgaied, Alaa & Nofal, Ahmed & Kasemy, Zeinab & Elaziz, Mohamed & Nasr, Ibrahiem. (2021). Influence of Different Scrubbing Methods of Surgical Team on Surgical Site Infection in Cesarean Section. *The Egyptian Journal of Hospital Medicine*. 83. 1082-1087. 10.21608/ejhm.2021.160876.
- Farahat S, Kassem I, El sayed H & Ahmed M. (2019): Effect of preoperative vaginal cleansing to reduce post caesarean infection. Doctorate in nursing science thesis, Menoufia university.
- Funk S., Champagne M., Wiese Al-Kharabsheh, R., Ahmad, M., Al Soudi, M., & Al-Ramadneh, A. (2021). Wound Infection Incidence and Obesity in Elective Cesarean Sections in Jordan. *Medical archives (Sarajevo, Bosnia and Herzegovina)*, 75(2), 138–143. <https://doi.org/10.5455/medarh.2021.75.138-143>.
- Gadeer R, Baatiah NY, Alageel N, Khaled M (2020). Incidence and Risk Factors of Wound Infection in Women Who Underwent Cesarean Section in 2014 at King Abdulaziz Medical City, Jeddah. *Cureus*. 2020 Dec 19;12(12):e12164. doi: 10.7759/cureus.12164. PMID: 33489576; PMCID: PMC7814933.
- Kawakita T& Landy H (2017). Surgical site infections after cesarean delivery: epidemiology, prevention and treatment. *Maternal Health, Neonatology, and Perinatology* (2017) 3:12 DOI 10.1186/s40748-017-0051-3.
- Kuplicki S (2017). Prevention of Surgical Site Infections. <https://www.woundsource.com>
- Mahmoud M, Zaki M& El-Bahie A (2019). Incidence, indications and outcome of caesarean section in Beni-Suef Governorate, Egypt. *Abstracts / European Journal of Obstetrics & Gynecology and Reproductive Biology* 234, e1–e131.
- Makhni, M. C., Jegede, K., Lombardi, J., Whittier, S., Gorroochurn, P., Lehman, R. A., & Riew, K. D. (2018). No Clear Benefit of Chlorhexidine Use at Home Before Surgical Preparation. *The Journal of the American Academy of Orthopaedic Surgeons*, 26(2), e39–e47. <https://doi.org/10.5435/JAAOS-D-16-00866>.
- Mekonnen, A.G., Mittiku, Y.M. (2021). Surgical site infection and its association with rupture of membrane following cesarean section in Africa: a systematic

Effect of Pre-Cesarean Section Wound Care Guidelines on Occurrence of Post-Operative Infection among Women

- review and meta-analysis of published studies. *matern health, neonatol and perinatol* 7, 2 (2021).
<https://doi.org/10.1186/s40748-020-00122-2>
- Merzougui L, Marwen N, Hannachi H, Asma M, Elhaj OB, Waddah M, Fatnassi R. (2018). Incidence et facteurs de risque de l'infection du site opératoire après césarienne dans une maternité de Tunisie. *Sante Publique*. 2018;30(3):339–47
- Mohammad m.f. fathalla, m.d., d., asma m. Abd el-naby, m.sc., i. (2018). The Efficacy of Subcutaneous Swabbing of Cesarean Section Wounds with Povidone Iodine to Prevent Post-Operative Wound Infection: A Randomized Controlled Study. *The Medical Journal of Cairo University*, 86(December), 3943-3950. doi: 10.21608/mjcu.2018.61866
- Nguhuni, B., De Nardo, P., Gentilotti, E., Chaula, Z., Damian, C., Mencarini, P., Nicastrì, E., Fulment, A., Piscini, A., Vairo, F., Aiken, A. M., & Ippolito, G. (2017). Reliability and validity of using telephone calls for post-discharge surveillance of surgical site infection following caesarean section at a tertiary hospital in Tanzania. *Antimicrobial resistance and infection control*, 6, 43. <https://doi.org/10.1186/s13756-017-0205-0>.
- NICE Guideline Updates Team (UK). (2019). Evidence reviews for the effectiveness of skin antiseptics in the prevention of surgical site infection: Surgical site infections: prevention and treatment: Evidence review B. London: National Institute for Health and Care Excellence (UK); 2019 Apr. (NICE Guideline, No. 125.) Available from: <https://www.ncbi.nlm.nih.gov/books/NBK569835>.
- Rajan, Elizabeth & Nayak, Sabitha. (2014). Effectiveness Of Self-Instructional Module on Knowledge of Post Operative Self Care for Mothers Undergoing Elective Caesarean Section in Selected Hospitals, Mangalore. *Journal of Health and Allied Sciences NU*. 04. 039-041. 10.1055/s-0040-1703829.
- Sung S, Mahdy H. (2021). Cesarean Section. [Updated 2021 Apr 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546707>.
- Zagloul, M., Naser, El., & Hassan, H. (2020). Influence of Hot Compresses versus Cabbage Leaves on Engorged Breast in Early Puerperium. *International Journal of Studies in Nursing*, 5(2), 7-14. <https://doi.org/10.20849/ijns.v5i2.740>
- Zejnnullahu, V.A., Isjanovska, R., Sejfiija, Z. et al. (2019). Surgical site infections after cesarean sections at the University Clinical Center of Kosovo: rates, microbiological profile and risk factors. *BMC Infect Dis* 19, 752 (2019). <https://doi.org/10.1186/s12879-019-4383-7>.
- Zejnnullahu, V.A., Isjanovska, R., Sejfiija, Z. et al. (2019). Surgical site infections after cesarean sections at the University Clinical Center of Kosovo: rates, microbiological profile and risk factors. *BMC Infect Dis* 19, 752 (2019). <https://doi.org/10.1186/s12879-019-4383-7>