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# Assessment of Causes of Wounds Infection (WI) after Caesarean Section at Al - Batol Teaching Hospital in Iraq

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**الخلاصة:**
**الأهداف:** هدفت الدراسة الى التعرف على أسباب حدوث خمج الجرح بعد العملية القيصرية و معرفة العلاقة بين الأسباب وبعض البيانات الاجتماعية والديموغرافية.
**المنهجية:** أجريت دراسة وصفية على النساء اللواتي يعانين من خمج الجروح بعد العملية القيصرية في مستشفى البتول التعليمي في مدينة بعقوبة ، للفترة من 20 ديسمبر 2020 إلى 15 أبريل 2021. على عينة غير احتمالية من (110) نساء مصابات بخمج الجروح بعد العملية القيصرية. وجمعت البيانات عن طريق الاستبانة تم تحليل البيانات من خلال استخدام الاحصاء الوصفي والاستنتاجي لتحليل البيانات باستخدام الحقيبة الاحصائية (SPSS) الاصدار 22.0
**النتائج:** أظهرت نتائج الدراسة أنه لا توجد علاقات مهمة بين استجابة الأمهات وبياناتهن الاجتماعية والديموغرافية حيث ظهر أن العلاقات الضعيفة تم حسابها عند P>0.05 . اغلب البيانات الانجابية للنساء لم تظهر فروقات ذات دلالة احصائية بين الاسباب العوامل المرتبطة بخمج الجروح ما عدا متغير عدد مرات الحمل مع الاسباب والمدة التي ظهر فيها خمج الجروح مع العوامل المرتبطة ب (WI) بعد العملية القيصرية.
**التوصيات:** وأوصت الدراسة بضرورة الاهتمام بمتابعة الحمل لدى النساء في مركز الرعاية الصحية الأولية وخاصة النساء ذوات الحمل الاول, المقيمات في المناطق الريفية والتركيز على علاج الأمراض مثل فقر الدم كخطوة نحو الحد من مضاعفات CS. كما أن زيادة الوعي ستكون قادرة على منع /أو خفيض WI، من خلال تزويد النساء اللواتي خضعن للعملية القيصرية دليل ارشادي مطبوع

**ABSTRACT**

**Objectives:** the study aimed to identify the causes of wound infection occurrence of post cesarean section and to find out the relationship between causes and some socio-demographic data.

**Methodology**: A descriptive study was conducted on women who suffering from wounds infection after caesarean section at Al-Batol Teaching Hospital in Baqubah city, for the period from 20 of December 2020 to the 15 of April 2021. A purposive non-probability sample of (110) women suffer from wounds infection after caesarean section. The data were collected by questionnaire and analyzed through using the Statistical Package of Social Science (SPSS version 22.0) performed using

descriptive and inferential statistical analysis procedure.

**Results:** Results of the study shows that no significant relationships between mothers' responding and their socio-demographic data where shows that weak relationships are a proved were accounted at P>0.05. Most of the women reproductive variables had no significant relationship with causes except "Parity" with the cause's main domain.

**Recommendation:** that the need to pay attention to the follow-up of pregnancy women in primary health care center especially younger women with primigravida, resident in rural areas and to focusing on treating disease such as anemia as step toward reducing complication of CS. Also, raising awareness would be able to prevent and/or reduced SSI, by providing women who have undergone cesarean section a published instruction manual.

**Keywords:** Wound infection, Causes, Cesarean delivery.

## INTRODUCTION

A Caesarean Section (CS) is a medical operation in which a newborn is delivered through an incision in both the abdominal wall and the uterus. It is the most common surgical method in obstetrics. They have increased to a higher frequency than is regarded to be optimal over the last three decades. In the last ten years, the global rate of this operation has doubled to 21%, and it continues to rise at a pace of 4% each year (29)

Because surgery is such an important part of health care, infections and problems after surgery result in maternal morbidity and mortality. According to a WHO research, the CS has become more prevalent in both developed and developing countries for a variety of causes. (32)(26)

The incidence CS-SSI are varying, in developed countries ranges from 1.5% to 7%, and approximately 6% to 15% in developing countries. (11) This disparity in the occurrence is due to strong control system in the developed world. (30)

Surgical site infection (SSI) or wound infection is an infection that develops within 30 days of a surgical operation that involves the skin, subcutaneous tissue, or soft tissue (20). Patients with (SSI) are more likely to die than those without (SSI) (14), and eight times of post-CS infection-related maternal morbidity than post-vaginal delivery. (31)(3)

The highest percentage of wound infections are caused by Staphylococcus aureus also other organisms like E. coli, Proteus mirabilis, Pseudomonas, Acinetobacte and Klebsiella are isolated from CS-SSI wound. (7)

## AIMS OF THE STUDY

1- To identify the causes of wound infection occurrence of post cesarean section
2- To find out the relationship between causes and some socio-demographic data.

## METHODOLOGY

**Study Design:** A descriptive and analytical study was conducted on Assessment of Causes of Wounds Infection after Caesarean Section at Al - Batol Teaching Hospital in Baqubah city, The study was carried out to identify the causes of wound infection occurrence of post cesarean section, and to find out the relationship between causes and some socio-demographic data.

**Data Gathering:** Data are collected through the utilization of the constructed questionnaire and the interview technique as a means of data collection and also took information from the patient's file. The data collection is carried out from 20 December 2020 to 15 April 2021. The present study.

**Study Sample:** A purposive Non- probability sample of (110) women who admitted to maternity hospitals suffering from wounds infection after caesarean section.

**Study instrument:** Through review of the related literature and previous studies, the questionnaire was designed and constructed by the investigator to measure the variable underlying the present study. It is comprised of three main parts.

**Part Ⅰ: Socio-Demographic information:** It includes demographic characteristics concerning the age, Residence, level of education, occupation, Monthly Income.

**Part Ⅱ: Reproductive data:** The studied "Reproductive Information" include: Number of pregnancies, Number of delivery, type of delivery, Number of dead birth, Number of abortion, Number of living birth, The number of times of vaginal examination, The case of rupture of the membrane during the current birth, When signs of wound infection appeared after birth.

**Part Ⅲ: Causes:** This part consists of the questionnaire concerning with the causes of wound infection after cesarean section. It includes (17) items.

**Reliability of Data:** Reliability test of the knowledge questionnaire was (0.886) by using a Pearson's Correlation Coefficient.

**Data Analysis:** The current study's data were analyzed with the Statistical Package for Social Sciences (SPSS) version (21).

**Ethical Considerations:** The Institutional Review Board (IRB) at the University of Baghdad, College of Nursing approved the study to be conducted. The study protocol meets both the global and the Committee on Publication Ethics (COPE) standards of respecting humans' subjects rights.

## RESULTS

**Table (1): Socio Demographic Characteristics of Mothers with Wounds Infection after Caesarean Section**

| Socio-Demographical variables | Groups | No. | % | P-value |
|---|---|---|---|---|
| Age Groups | 15 -19 | 8 | 7.3 | $\chi^2$= 21.455 P=0.001 (HS) |
| | 20 _24 | 20 | 18.2 | |
| | 25 _29 | 32 | 29.1 | |
| | 30 _34 | 21 | 19.1 | |
| | 35 _39 | 20 | 18.2 | |
| | 40_ 45 | 9 | 8.2 | |
| | Mean ± SD | 29.00 ± 6.65 | | |
| Residence | Urban | 21 | 19.1 | $\chi^2$= 30.782 P=0.000 (HS) |
| | Rural | 64 | 58.2 | |
| | outskirts of the city | 25 | 22.7 | |
| Educational Level | Illiterate | 7 | 6.4 | $\chi^2$= 19.055 P=0.000 (HS) |
| | Read and write | 26 | 23.6 | |
| | Primary School | 8 | 7.3 | |
| | Secondary School | 17 | 15.5 | |
| | Intermediate School | 15 | 13.6 | |
| | Institute Graduate | 14 | 12.7 | |
| | College Graduate | 23 | 20.9 | |
| Occupation | House Wife | 89 | 80.9 | $\chi^2$= 186.873 P=0.000 (HS) |
| | Employ | 15 | 13.6 | |
| | Student | 3 | 2.7 | |
| | Free-work | 3 | 2.7 | |
| Monthly Income | Enough | 53 | 48.2 | $\chi^2$= 24.018 P=0.000 (HS) |
| | Barely enough | 44 | 40 | |
| | Not Enough | 13 | 11.8 | |

HS: Highly Sig. at P<0.01; Testing based on One-Sample Chi-Square test, and Binomial test.

Table (1) shows that the survey sample contains the largest proportion (29.1%) of people in the same age group (25 – 29) years, with mean and standard deviation 29 and 6.65 respectively, then followed by "Residence", which showed that vast majority of the studied women are rural residents, and they are accounted 64 (58.2%). Most women had low educated level, since more than third of studied women are illiterate or just read and write, and accounted 33 (30.0%). With respect to the women's occupational status, the majority of the sample are "Housewives", and they account for 89 (80.9%), of the total sample. Finally, "Monthly Income" showed that most of studied women has recorded Enough, and Barely enough income (48.2% and 40.0% respectively).

**Table (2): Distribution of "Reproductive variables" for Mothers with Wounds Infection After Caesarean Section**

| Reproductive variables | Groups | No. | % | C.S. P-value |
|---|---|---|---|---|
| **Gravida** | One | 31 | 28.2 | $\chi^2$= 10.273 P=0.036 (S) |
| | Two | 24 | 21.8 | |
| | Three | 17 | 15.5 | |
| | Four | 12 | 10.9 | |
| | More than four | 26 | 23.6 | |
| **Parity** | One | 35 | 31.8 | $\chi^2$= 17.909 P=0.001 (HS) |
| | Two | 26 | 23.6 | |
| | Three | 24 | 21.8 | |
| | Four | 9 | 8.2 | |
| | More than four | 16 | 14.5 | |
| **Pervious history of Delivery** | Cesarean section | 100 | 90.9 | P=0.000 (HS) |
| | Normal Delivery | 10 | 9.1 | |
| **Number of dead births** | Non | 102 | 92.7 | P=0.000 (HS) |
| | Yes | 8 | 7.3 | |
| **Number of abortions** | Non | 81 | 73.6 | $\chi^2$= 147.527 P=0.000 (HS) |
| | Once | 22 | 20 | |
| | Twice | 6 | 5.5 | |
| | Triple | 1 | 0.9 | |
| **Number of living birth** | One | 35 | 31.8 | $\chi^2$= 18.455 P=0.001 (HS) |
| | Two | 27 | 24.5 | |
| | Three | 24 | 21.8 | |
| | Four | 10 | 9.1 | |
| | More than four | 14 | 12.7 | |
| **Vaginal examinations** | without checking | 33 | 30 | $\chi^2$= 3.618 P=0.164 (NS) |
| | less than 5 times | 46 | 41.8 | |
| | more than 5 times | 31 | 28.2 | |
| **Membrane rupture before C/S** | The membrane was ruptured early | 37 | 33.6 | P=0.000 (HS) |
| | Without membrane rupture | 73 | 66.4 | |
| **Wound infection appeared after C/S** | First 48 hours | 5 | 4.5 | $\chi^2$= 79.327 P=0.000 (HS) |
| | After 3 days after birth | 26 | 23.6 | |
| | More than that | 79 | 71.8 | |

HS: Highly Sig. at P<0.01; Testing based on One-Sample Chi-Square test, and Binomial test.

Regarding "Gravida" variable Table (2), results shows that half of the studied women had a one and two cases, and they are accounted 55 (50%), followed by more than four 26 (23.6%), and concerning para variable, one or two cases were the highest percentage of the studied women, and they are accounted 61 (55.4%), most of them had cesarean section, and they are accounted 100 (90.9%), and only 8 (7.3%) had dead births, the percentages was 29 (26.4%) of studied mothers who had abortions, 22 (20%) of them are recorded one abortion. third of studied mothers had one living birth, and they are accounted 35 (31.8%). Most women 46 (41.8%) were less than 5 times vaginal examination, while 33 (30.0%) were without checking of vaginal examination. Relative to

rupture of the membrane during the current birth, third of studied mothers had assigned that their membrane was ruptured early, and they are accounted 37 (33.6%). Finally, for signs of wound infection appeared after birth, most of studied mothers are assigned at more than three days after birth 79 (71.8%).

**Table (3): Summary Statistics of Causes of wound infection after cesarean section**

| Items | Resp. | No. | % | MS | SD | RS% | Ass. |
|---|---|---|---|---|---|---|---|
| (((Causes of Wounds Infection after Caesarean Section ))) | | | | | | | |
| **1. Patients do not wear gaon before C/S** | Yes | 10 | 9.10 | 0.909 | 0.29 | 9.09 | L |
| | No | 100 | 90.9 | | | | |
| **2. Prophylaxis antibiotic not given before C/S** | Yes | 34 | 30.9 | 0.691 | 0.46 | 30.9 | L |
| | No | 76 | 69.1 | | | | |
| **3. Duration of labor before C/S (>24 hours)** | No | 57 | 51.8 | 0.482 | 0.50 | 48.2 | M |
| | Yes | 53 | 48.2 | | | | |
| **4. Membrane rupture before C/S (>12 hours)** | No | 95 | 86.4 | 0.136 | 0.34 | 13.6 | L |
| | Yes | 15 | 13.6 | | | | |
| **5. Chorioamnionitis** | No | 102 | 92.7 | 0.073 | 0.26 | 7.30 | L |
| | Yes | 8 | 7.30 | | | | |
| **6. Operation time (>30 minutes)** | No | 13 | 11.8 | 0.88 | 0.32 | 88.2* | H |
| | Yes | 97 | 88.2 | | | | |
| **7. Malnutrition after C/S** | No | 85 | 77.3 | 0.23 | 0.42 | 22.7 | L |
| | Yes | 25 | 22.7 | | | | |
| **8. Wound dressing change after C/S** | No | 64 | 58.2 | 0.42 | 0.50 | 41.8 | M |
| | Yes | 46 | 41.8 | | | | |
| **9. Wound opened after C/S** | No | 72 | 65.5 | 0.35 | 0.48 | 34.5 | M |
| | Yes | 38 | 34.5 | | | | |
| **10. Bathing women after C/S** | No | 56 | 50.9 | 0.49 | 0.50 | 49.1 | M |
| | Yes | 54 | 49.1 | | | | |
| **11.Fast movement and heavy lifting after C/S** | No | 47 | 42.7 | 0.57 | 0.50 | 57.3 | M |
| | Yes | 63 | 57.3 | | | | |
| **12. Horizontal skin incision** | No | 0 | 0.00 | 1.00 | 0.00 | 100* | H |
| | Yes | 110 | 100 | | | | |
| **13.Vertical skin incision** | No | 110 | 100 | 0.00 | 0.00 | 0.00 | L |
| | Yes | 0 | 0.00 | | | | |
| **14.Continuous stitches.** | No | 0 | 0.00 | 1.00 | 0.00 | 100* | H |
| | Yes | 110 | 100 | | | | |
| **15.Intermittent stitches.** | No | 110 | 100 | 0.00 | 0.00 | 0.00 | L |
| | Yes | 0 | 0.00 | | | | |
| **16. Non absorbable sutures for skin closure** | No | 0 | 0.00 | 1.00 | 0.00 | 100* | H |
| | Yes | 110 | 100 | | | | |
| **17.Absorbable sutures for skin closure** | No | 110 | 100 | 0.00 | 0.00 | 0.00 | L |
| | Yes | 0 | 0.00 | | | | |

Ass.: Assessment of Low (L) (0.00 – 33.33); Moderate (M) (33.34 – 66.66) High (H). (66.67– 100).

Results shows that observed response of high assess assigned only 4 (23.52%) items, and responses of assigned a moderate assessment are accounted 5 (29.41%) items, while the leftover items were an assigned low assessment, and are accounted 8 (47.05%).

**Table (4): Relationships between [Mothers 'Socio-Demographical variables, Causes, and Association Factors]**

| Demographical Characteristics and some related variables | Causes Evaluation | | |
|---|---|---|---|
| | C.C. | p value | Sig. |
| Age Groups | 0.293 | 0.067 | NS |
| Residence | 0.092 | 0.627 | NS |
| Educational Level | 0.246 | 0.314 | NS |
| Occupation | 0.089 | 0.831 | NS |
| Monthly Income | 0.135 | 0.358 | NS |

Non Sig. at P>0.05; S: Sig.; C.C.: Contingency Coefficient test.

Results shows in table (4) that weak relationships are a proved with Socio-Demographical Characteristics variables, since no significant relationships were accounted at P>0.05.

**Table (5): Relationships between [Causes, and Association Factors] and Mothers Reproductive Variables**

| Reproductive Variables | Causes Evaluation | | |
|---|---|---|---|
| | C.C. | p value | Sig. |
| Gravida | 0.242 | 0.144 | NS |
| Parity | 0.285 | 0.045 | S |
| Pervious Delivery mode | 0.035 | 0.716 | NS |
| Number of dead births | 0.040 | 0.677 | NS |
| Number of abortions | 0.178 | 0.310 | NS |
| Number of living birth | 0.209 | 0.284 | NS |
| Vaginal examination | 0.169 | 0.198 | NS |
| Membrane rupture before C/S | 0.172 | 0.067 | NS |
| Wound infection appearance after C/S | 0.104 | 0.549 | NS |

(*) HS: Highly Sig. at P<0.01; NS: Non Sig. at P>0.05 ; S : Sig. at P<0.05 ; C.C.: Contingency Coefficient test

Results shows that weak relationships are a proved with (Reproductive Variables), since no significant relationships were accounted at P>0.05, except with "Parity" variable was significant at the causes main domain.

## DISCUSSION

### Discussion Distributions of the Study Sample According to the Socio-Demographic Characteristics:

**Ages of Women:**

Among the total 110 mothers included for the study operated for delivery during the study period in Al-Batol Teaching Hospital in Baqubah city.

The mean (±SD) of the mothers' aged was 29 (±6.65) years, with percentage (84.5%), aged (20-34) of the total study sample, and the highest rang group was (25-29) years.

This finding is consistent with the study conducted in Iraqi at Al-Diwaniayh Maternity and Children Teaching Hospital and Babel teaching hospital for maternity and children showed that the mean (±SD) of the mother's age were 31.76 (±7.29 ) and 29.4(± 7.6). [2][5]

Also, the study was in agreement with retrospective observational study in Ethiopian referral hospital reported increasing risk of SSI in younger women (Mamo et al., 2017).

**Regarding to the** residence the highest percentage of the study sample were residence at rural area (58.2%). Most of studies, including those in Iraq conducted by [2] were recorded inverse results with high percentage in urban resident (70.7%), (64.6%) in Kosovo [33] and (69.5%) in Ethiopia [27]. The researcher attributed these differences in results to the geographical distribution of the population, which varies in different countries.

**Level of education:** Third of studied women in the current study had low educated level with illiterate or just read and write, and accounted (30.0%).

Since most of women are within the level bellow Institute Graduate (66.4%), the researcher expected the prevailing percentage to be housewives (80.9%). This result in agreement with a study carried out by [18] who Illustrated that the highest percentage (79.6%) of study sample were housewives. In addition, [23] reported that (34%) of women are illiterate or just read and write with (58.6%) of the study participants were House wife.

**monthly income:** Concerning ***monthly income***, most of studied women has recorded Enough, and Barely enough income (48.2% and 40.0% respectively).

According to WHO data, one in every three patients undergoing a surgical operation in low- and middle-income countries is at risk of developing surgical site infections (SSIs). [6]

### Discussion Distribution of Study Sample According to Reproductive Variables table 2:

**Gravida and Parity**

The result of study shows that the half of the studied women (50%) had one and two pregnancies with highest percentage of primigravida (28.2%), followed by more than four (23.6%). The parity percentage (55.4%) for one or two and also with highest percentage of primiparity (31.8%). This result is agree with result carried out by [16] who reported

that the majority of the women were multigravida (65.8%), and some Primigravid (34.2%).

**Pervious Delivery Mode**

Concerning the mode of delivery, the highest percentage of the studies women (90.9%) had previous cesarean section. Consistent with this study, found a significant association SSI versus previous C- section with 7.4 times the risk of developing SSI compared to the group without prior cesarean surgery. [33]

**Types and Numbers of Previous Delivery**

Most of the study sample (92.7%) had no history of dead birth. Meanwhile, three-quarter of the of the mothers without prior abortion, and (31.8%) of mothers have one living child. This finding is consistence with study done by Harzif et al., (2020) who stated that women with secarean sectio SSI was without abortion history.

**Vaginal Examination**

No significant differences were observed between vaginal examination variables, less than half of the study samples (41.8%) underwent <5 times vaginal examination while (30.0%) were without checking. In contrast, a study conducted by [4] who found that the checking of vaginal examination account (53.6%) was less or equal 4 times of the study sample, while (19.6%) were without checking.

**Membrane Rupture Before CS**

Related to the rupture of the membrane during the current birth, third of studied mothers had assigned that their membrane was ruptured early, and they are accounted (33.6%). This result agrees with a study by [21] who reported that (31.40%) of mothers suffering from early Rupture of Membrane

**Wound infection appeared after CS**

Most of studied mothers 79 (71.8%) develop SSI after more than three days. This result in agrees with a study by [24] who revealed that the Postoperative day SSIs detected (1-7) days were (52.7%) after birth.

**Discussion Causes of Wound Infection After Cesarean Section:**

Table (3) shows that observed response of high assess assigned only 4 (23.52%) from the 17 items, moderate 5 (29.41%), while the leftover items were low assessment, and are accounted 8 (47.05%).

In this study the duration of the surgery was more than 30 minutes showed high assessment for the duration of CS and accounted (88.2%), which is consistent with the study done by [9] who reported that the duration of CS was 30–60 min and are accounted (92.7%) of the study sample, and had 4.9-time likelihood to be infected with SSI.

This could be related to the longer operation time, which causes greater tissue injury and increases the number of bacteria introduced into the peritoneal cavity. Anesthesia-related stress, significant tissue trauma, and insufficient antibiotic serum and tissue concentrations in extended surgical procedures are the main explanations for these associations. [25]

Concerning to the ***intra operative condition*** related to horizontal skin incision, continuous stiches and use permanent surgical thread were high assessed with positive response for all the women in the study sample (100%). Similar to our finding, Permanent non absorbable sutures usually generate an inflammatory response that is finally encapsulated by fibrous tissue development. Excessive reactivity causes chronic inflammation, scarring that isn't ideal, and suture extrusion. [12]

Five items, duration of labor before C/S **(**>24 hours), Wound dressing after C/S, Wound opened after C/S, Bathing women after C/S and Fast movement and heavy lifting) were moderate in their assessment.

The length of time of labor before cesarean delivery (more than 24 hours), shows moderate assess and accounted (48.2%). In the line of this study, duration of labor had no association with SSIs. [8][15]

This could be due to the fact that as the length of labor lengthens, the number of vaginal examinations increases, so does the risk of infection. [19]

In respect to the Wound dressing after surgery, Opening the wound after the operation, Bathing women and Fast movement with heavy lifting all moderate assess assigned. In consistence with these results a systemic review have been found no significant evidence about covering wound influence the risk of SSI. [13]

**Discussion the Relationships Among Mothers' Responding and Their Socio-Demographic Data**

Results shows in table (4) that weak relationships are a proved with Socio-Demographical Characteristics variables, since no significant relationships were accounted at P>0.05. This result is consistent with [4][18][17] whose found that Age, parity and previous CS were not significantly associated with wound infection.

**Discussion the relationships Among Mothers' Responding and (Reproductive Variables)**

Results shows that weak relationships are a proved for Reproductive Variables with causes since no significant relationships were accounted at P>0.05, except with "Parity.

Parity variable was significant with the cause's main domain. The highest percentage was Primipara 31.8%, 2-4 para was 53.6% and mor than four was 14.5%. A study conducted by [19] showed that the parity is predictive variable for SSI (Primiparity 50.6%, 2-4 was 37.1% and ≥ 5 12.3%). Parity significantly supporting surgical site infection, and become a risk factors incidence. [1] Inversely, no significant relationship was found between SSI and parity have been recorded by [12]

## CONCLUSION

Most of the studied samples are at (25-29), who have low educational level, housewives, rural residents and with the majority of Enough, and Barely enough income. The reproductive variables that showed highest percentage primigravida/primipara.

No significant difference has been observed between causes and mothers responding to their socio-demographic data Parity from the reproductive variable show a significant relationship with causes domain.

**RECOMMENDATIONS**

Further studies for isolation and culturing bacteria from mothers with cesarean section SSI. Using Absorbable sutures for skin closure to reduced SSI.

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