Arab American University – Palestine Faculty of Graduate Studies

Surgical Site Infection in Cesarean Section Childbirth at Al-Istishri Arab Hospital in Ramallah

by

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This thesis was submitted in partial fulfillment of the requirements for the Master's degree in

Health Informatics

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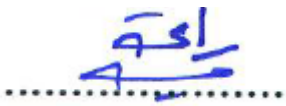
1. Supervisor: Dr. Rami Hadrob	
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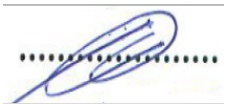
3. Internal Examiner: Dr. Yousef. Mimi	
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Dedication

I would like to dedicate this thesis to:

The Sake of Allah,

My Homeland Palestine.

My wonderful affectionate father,

My dear husband Wael who supported me and gave me hope.

My wonderful children. Jawa, Hussien, Zena, and Mohammad.

My Supervisors; Dr. Rami Hodrob, Prof. Mohammed Awad.

The Arab American University – Palestine

My supportive manager and friend Eba'a Al-Barghthi.

Declaration

This thesis was submitted in partial fulfillment of the requirement for the Master's degree in Health Informatics.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Riham Jamal Ali Hanon

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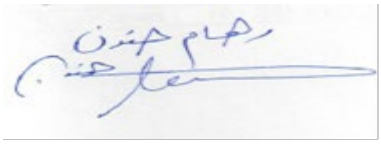

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Abstract

Introduction: Surgical site infection (SSI) is the infection that occurs after a specific period of time of the surgery, and it can involve outer skin layers (superficial), the internal organs, or implanted material. In caesarean section (CS), SSI is an important phenomenon to care for, and is associated with multiple risk factors and consequences. This study aims to investigate for the prevalence of superficial SSI among mothers who underwent CS, as well as the corresponding factors, most common signs and symptoms and preventive measures among Palestinian mothers.

Methodology: A retrospective cross-sectional design was used, and a structured electronic questionnaire that was developed by infection control department at Al-Istishari Arab Hospital (IAH), by gathering data about mothers' demographic data, medical and obstetric history, SSI and its signs and symptoms, and preventive measurements from a randomized sample of 198 CS cases in 2019 records.

Main results: 58.6% of CS are elective, with mean age of mothers of 29.08 years old, and a gravidity mean of 2.63 times and parity of 1.22 times. Prevalence of SSI among CS cases in IAH is 15.7% in 2019, with signs of fever (4%) localized pain (10.1%), swelling (6.1%) and heat (2.5%), open wound (6.6%) and wound discharges (11.6%), and is less than other hospitals and the global rate. SSI prevalence was not significantly associated with CS type (p-value = 0.949) or any of the demographic data, while it was significantly correlated with wound care after operation (p-value < 0.001).

Conclusion: While SSI prevalence is less than other hospitals, more preventive measures can be used to decrease it more, like the use of chlorhexidine solution for dressing rather than iodine, as well as the compliance with recommended protocols of prophylactic antibiotics prescription. Moreover, more studies are recommended to be conducted in other hospitals and for the investigation of further risk factors associated with SSI.

Table of Contents

List of Figure:

List of Table

List of Abbreviations

CDC	The Center for Disease Control and Prevention.
CS/C	Cesarean Section Child birth
DHQP	The Division of Healthcare Quality Promotion.
ECDC	The European Centre for Disease Prevention and Control
HCAI	Health Care-Associated Infection.
HCP	Health Care Provider.
HIS	Health Information System.
IAH	Istishari Arab Hospital
ICPS	The international classification for patient safety
IV	Independent Variable
JCI	Joint Commission International
MDRO	Multi Drug Resistance Organism.
MOH	Ministry of Health
NHSN	National Health Safety Network
NVD	Normal Vaginal Child birth
PCBS	Palestinian Central Bureau of Statistic
SPSS	Statistical Package for the Social Science
SSI	Surgical Site Infection
WHO	World Health Organization

Chapter One: Introduction

Definitions

Vaginal Child birth

Expulsion of a child, placenta, and membranes through the birth canal.

Cesarean Child birth

A surgical procedure involving incision of the walls of the abdomen and uterus, for Child birth of offspring.

Surgical Site Infection:

Infection occurs after surgery in any part of the body where the surgery took place 30 days after the operation. Some of the common symptoms are: drainage of cloudy fluid from the surgical wound, pain and tenderness, localized swelling, redness, and raised body temperature.

Quality:

Carrying out interventions correctly according to pre-established standards and procedures, to satisfy the customers of the health system and maximize results without generating health risks or unnecessary costs.

National Health Safety Network.

Internet-based surveillance system that expands and integrates patient and healthcare personnel safety surveillance systems managed by the division of healthcare quality promotion at the centers for disease control and prevention.

Patient Safety:

It is a concept with multidimensional, in the health service context, as the output of values, attitudes, perceptions, competencies, and standards of individual and group behavior, the administration's commitment is determined, style and proficiency in managing patient safety. (Sullivan et al.2020).

Healthcare-Associated Infections:

It is an infection that patient get while receiving treatment for medical or surgical conditions. Modern healthcare employs many types of invasive devices and procedures to treat patients and to help them recover. Infections can be associated with the devices used in medical procedures, such as catheters or ventilators.

1.1 Background

Recently, the attention has increased to measure the quality of services as part of quality assurance programs. In maternal health care, we have many subjects that affect and improve maternal health. Normally the pregnancy ended by Childbirth either normal vaginal birth or by an operation called Cesarean Section birth (Mohammad Mosadeghrad, 2013). Cesarean Section (CS) is the most common surgical procedure performed in obstetrics, which involving incision of the walls of the abdomen and uterus for the Child birth of offspring, which is considered the only solution when the normal child birth becomes impossible or difficult, in order to save the life of the mother, the baby, or both.

The World Health Organization recommends an average of no more than 10% -15% of births by CS, for optimal maternal and neonatal outcomes (Mohammad Mosadeghrad, 2013). The Palestinian ratio of CS is 20.3%; West Bank is 22.7%, and Gaza 17.4%. A cesarean section, like other types of operation some time, is followed by complications such as injury to the patient's bladder or intestines, amniotic fluid embolism; "*amniotic fluid or fetal material enters the maternal bloodstream*", inflammation of the uterus, bleeding, and Infection at the operation site (Visconti et al., 2020). There are two types of CS; first is planned, or elective, which is selected when the decision of CS is taken during antenatal care, e.g., Breech presentation. Second type is called urgent CS, which is selected when the decision taken by an obstetrician after a sudden incident during labor process like fetal distress, Abruption placenta, in situations when the mother is in need to be in operating room as soon as possible (Mylonas & Friese, 2015).

Nosocomial Infection, Hospital-Acquired Infection, or Health Care-Associated Infection (HCAI) Refers to infection that is acquired during the process of care and not manifested at the time of admission to a hospital or other healthcare facility (Eskander, 2013). Surgical site infections (SSI) are the most common type of the nosocomial infections and a leading cause of morbidity and death. In addition, it increases the overall cost of care that results from readmission and management of such complications. (Farret et al., 2015).

Surgical Site Infection (SSI) is an infection that occurs after surgery in part, where the surgery took place 30 days after the operation. (Farret et al., 2015). The SSI is divided into superficial infections; involving the skin only, and deep SSI are more serious; involve tissues under the skin, organs, or implanted material. (Control et al.). It acquires 20% to 25% of all healthcare-associated infections, with higher rate appears in a developing country, and has been documented as a significant problem that is affecting the quality of health care and has a serious impact on patient safety. (Cole, 2007).

In 2014 the total operation that was done is 14.2 million around 110.800 was diagnosed with SSI the rate decreased 5% in the next year and 7% by 2018 after observation and applying special precaution.(CDC, 2019) that approve the effect and importance of the pre-operative intervention on SSI ratio.

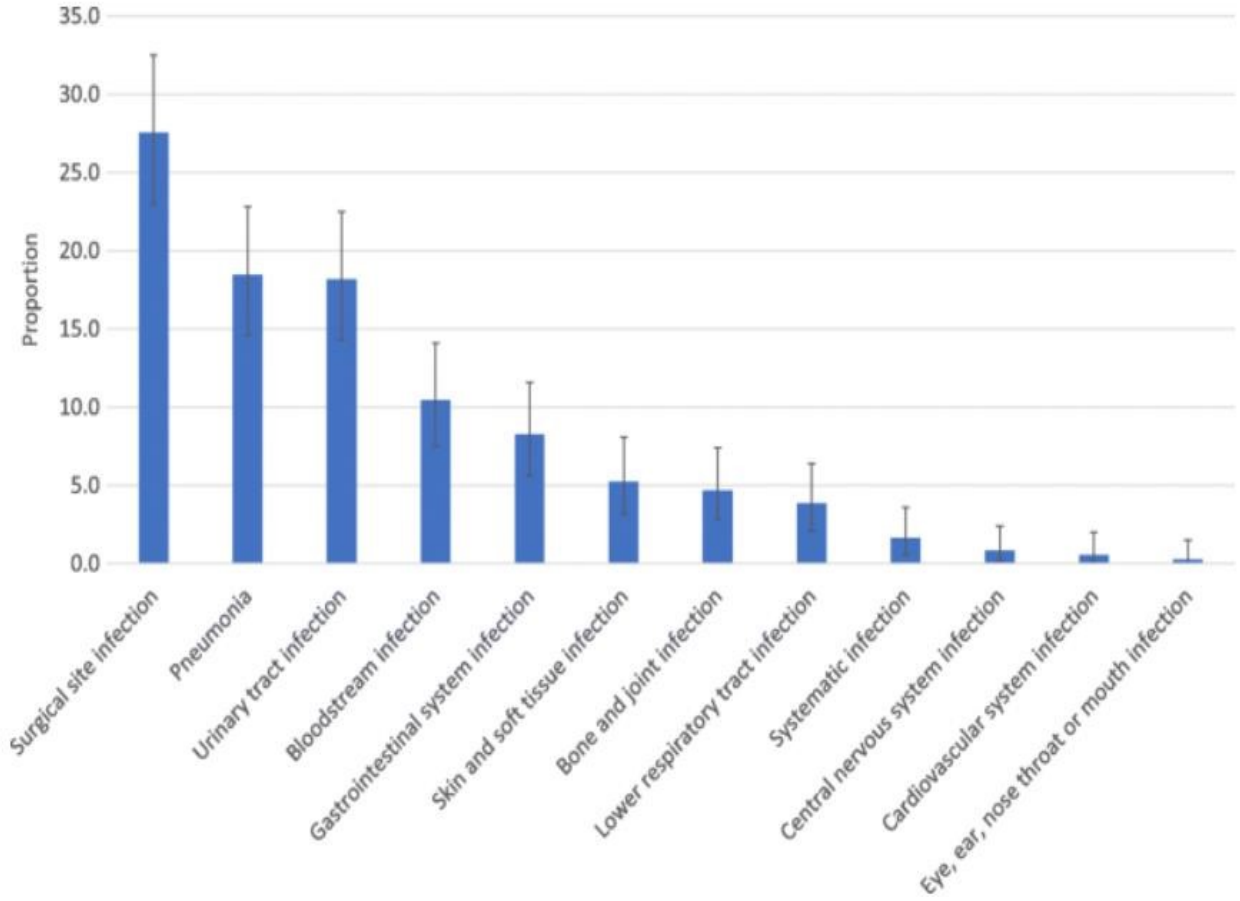

Figure 1 The prevalence of healthcare-associated infections among adult (Russo et al., 2019)

The CS Child birth has a higher risk for post-partum infection about 5-20 times compared to vaginal Child birth (Alfouzan et al., 2019). Many researchers have tried to set guidelines and recommendations for the prevention of surgical site infection. These recommendations and guidelines included avoidance of pre-operative hair removal, advice for pre-operative showering, hand hygiene, appropriate and timely administration of antibiotics, pre-and post-operative glucose control, wound management, and nutritional assessment. The implementation of these guidelines can prevent SSI in patients, and promote their health. (Bullock et al., 1988).

The actuality of patient care needs to be measured in all aspects of care. Health utilities consider a major aspect of health quality. The researcher tries to find and measure the patient level of care and decision modeling studies. (Witter, 2014). The common subject for studying SSI in CS showed in literature is a risk factor, which makes a policymaker focus on a preventive measurement, to decrease SSI, and to improve interventions, that lowering SSI ratio.

This study concentrates on the prevalence of superficial surgical site infection (SSI) post cesarean section by analyzing secondary data that were collected by the infection control department in Al-Istishari Arab Hospital (IAH). The study investigates for the most common risk factors appear in IAH that increases superficial SSI to be involved in the policy. These data are available in the infection control department for cesarean section and other general surgeries; also, there is a general data for another type of nosocomial infection. Because of that, a good chance to study the effect of the preoperative intervention and update on the policy according to the result depends on the evidence-based practice.

A large hospital like the IAH; which considers a referral hospital because it contains a sensitive and complex departments as adult intensive care unit (ICU), Pediatric ICU, and Neonatal intensive care unit (NICU).

The pregnant with a high-risk condition referred to the IAH for additional intensive care and the pregnancy terminated as soon as possible by CS to minimize the fatal risk that affect mother or fetus. In obstetrics, the CS is needed when the normal vaginal child birth is not possible because of maternal or fetal causes.

The caring process or plan starts from the cesarean Child birth decision, primary lab test, preventive measure, e.g. antibiotic type, dose, and time. Follow for mother after discharge to know the effect of the plan. The preventive measure supports all type of operation; the different appears in abnormal result of lab test, any infection treated before surgery.

1.1.1 Cesarean Section work flow in IAH

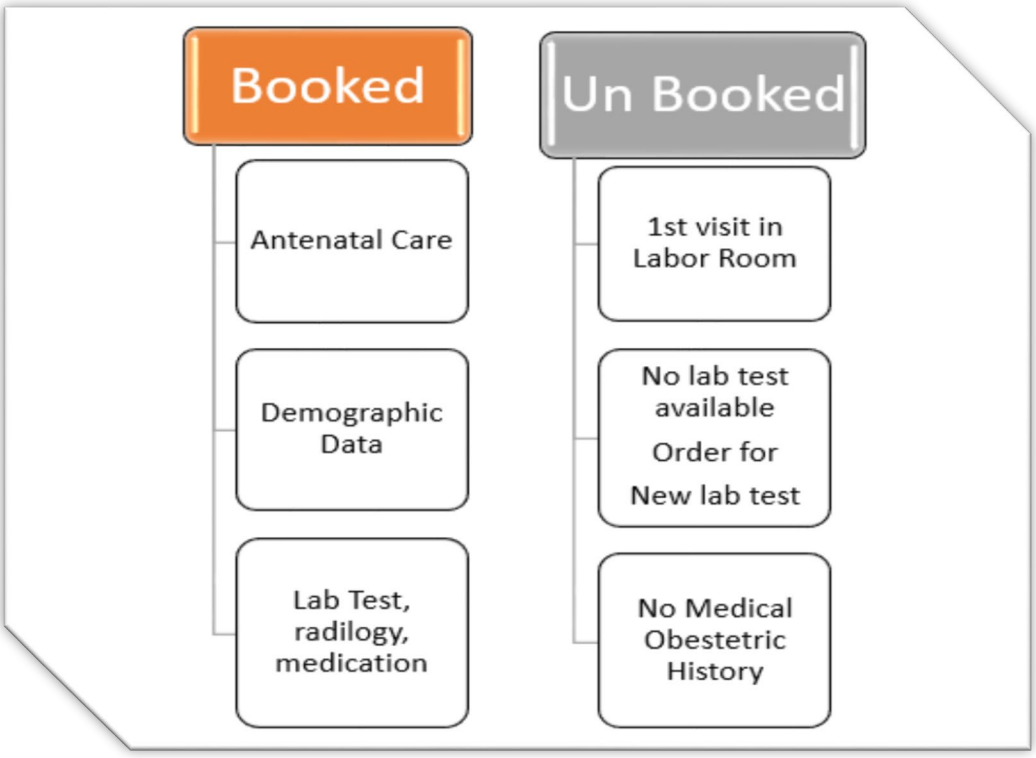

Figure 2 Cesarean Section work flow in IAH

1.2 Problem Statement

The process of care and procedures that involved in the operation can endanger the life of patients significantly (Abdulraheem et al., 2012). Many studies have documented that the surgical site infection can occur in cesarean section (CS), but there is no enough research or information about the risk factor such as type of operation according urgency or other factor. (Costello et al., 2010).

There is no enough research in Palestine about Surgical Site Infection after the Cesarean section (CS) which appears during the search on more than one electronic library with trying different names, synonyms, different relations or factors, while in other high-income countries, topics related to SSI following CS are well-covered in several dimensions. The focus in the last ten years in Palestine was on the rate and causes of cesarean section. Also, many researchers who discussed the quality of care and patient safety tried to find out the causes, risk, and preventive interventions to decrease the SSI ratio in general surgery and in CS child birth (Farret et al., 2015).

During the hospital care the patient may develop a Hospital-acquired infection, and the recipient hospital must take that on the consideration and takes an extra lab test like nasal, rectally swab, and a high vaginal swab. But the initial result of those tests appears after 24 hours. and sensitivity within three days. Because of that the preventive measure that taken before and during operation can decrease the risk of SSI, then may add or change plan according to the culture result (Mellinghoff, Otto & Cornely, 2019).

1.3 Significance of the Study

This study provides the medical field in Palestine with an up-to-date data about the incidence of superficial SSI among mothers who underwent CS in the setting of IAH. This data can be used as a basis for further interventions to be performed in order to decrease SSI incidence among the targeted population, as well as a data to compare other studies that may be conducted in the future or in other settings in Palestine, which will help in establishing integrative evidence-based guidelines to achieve the optimal preventive measures to decrease SSI incidence.

The study concentrates on the superficial SSI that meet specific criteria according patient safety guideline;[1] the first one is the date of the event must be within 30 days after operation including the day of operation, second point the area of infection involving only skin and subcutaneous tissue of incision, and at least one of the following sign: a) Purulent drainage, b) Organism identified by wound swab culture, c) Reopened by the surgeon, and d) Diagnosis superficial SSI by the physician after examination. In addition, the Superficial SSI is divided into two types: first is primary when the patient has one incision like in CS, and the second one is secondary when the patient has two incisions like CABG.

The health information system includes inpatient stay and the follow-up included just if the patient returns to the IAH outpatient clinic, but most of the time follow up done in the patient residency.

[1] Patient safety 2020

The way to detect the superficial infection post CS is a questionnaire that is applied via telephone call after discharge within 30 days which the maximum period for SSI post CS.

Healthcare-associated infections are major healthcare problems for people worldwide. Millions of people are affected each year. Prevention can assist patients in their recovery and reduce the complications associated with infections by the utilization of adequate knowledge and practices. (Russo et al., 2019).

There are several benefits from decreasing the incidence of SSI among mothers who undergo CS. For example, it improves maternal health and decrease maternal morbidity. Cost-effectiveness is another aspect that may be achieved, by the decreased length of stay (LOS) of patients and prevention of readmission. Eventually, patient's satisfaction increases because of effective care plan for the hospital (Steiner & Strand, 2017). Also, that will be applicable by producing a policy and intervention bundle that applied for all pregnant women that underwent a cesarean section and more likely to be affected by a wound infection (Darouiche et al., 2010).

1.4 Aim of the Study

The main and general objective is to investigate for the SSI among mothers undergoing CS in IAH hospital, highlight the most common risk factors, and make a comparison with the evidence-based literature. According to the findings, hospital policy and preoperative preventive measure will be updated to minimize the SSI after CS. This is mainly related to that current guideline regarding post-CS SSI need to be discussed.

1.5 Specific Objectives of the Study

The study tried to achieve the following objectives:

1. Determine the Surgical Site Infection incidence in the planned and urgent cesarean section at Istishri Arab Hospital in 2019.
2. Study main available factors that can be affect superficial SSI ratio such as demographic data, age, obstetrics history, level of education, and chronic disease, according to available data.
3. Investigate for the most common preventive measures against SSI in CS.
4. Investigate the correlation between mothers' demographic and gynecological data and preventive measures with the incidence of SSI.

1.6 Study Hypothesis:

1. There is no relation between the type of cesarean section and the incidence of surgical site infection at a significance level of 0.05.

2. There is no relation between the present of mother's medical condition, pregnancy complication, or referral status of the mother and the incidence of surgical site infection at significance level of 0.05.

3. There is no correlation between preventive measures against SSI followed by mothers and the incidence of SSI at a significance level of 0.05.

Chapter Two: Literature Review

2.1 Introduction.

Surgical site infections (SSI); i.e. wound infections, are considered of the most common causes of healthcare-associated infection. It is also one of the most important complications of surgical intervention and are associated significantly with prolonged patients' hospital stay, and increasing risk of morbidity and mortality. There are certain factors; intrinsic and extrinsic, that are known to be responsible for surgical site infections. Intrinsic factors include advanced age, malnutrition, metabolic diseases, smoking, obesity, hypoxia, immune-suppression, and length of preoperative stay while extrinsic factors consist of an application of skin antiseptics, pre-operative shaving, antibiotic prophylaxis, and pre-operative skin preparation, also inadequate sterilization of instruments, surgical drains, surgical hand scrubs, and dressing techniques. SSI is one of the most common nosocomial infections among surgical patients. In the United State of America; Surgical Site infections account for 14%-16% of all healthcare-associated infections (Famakinwa et al., 2014). Others show that SSI is one of the most common healthcare-associated infections that have a great impact on patient's safety. (Sadia et al., 2017).

Some hospitals have their own policies that guide all health care providers to improve health care services, and researchers test these policies, as well as testing the health care providers' compliance and its reflection on SSI ratio. Moreover, they concentrate on how much this policy is evidence-based and how it's implemented. Moreover, there is a decrease in SSI when following a specific bundle that includes interventions related to preoperative antibiotic, chlorhexidine- alcohol use as antiseptic, bathing before the operation, and others. (Carter, 2017 and Temming, 2017).

Some studies were concerned about the most common factors that may not be related to mother's own factors, and may be related to health care services provided. For example, SSI was noticed to increase in emergency CS because of interventions that were applied during labor such as the number of the vaginal exam, time of membrane rupture, emergency CS and improper use of prophylactic antibiotics. All of these variables affect SSI in general, and health care facilities should take them in consideration when establishing guidelines for proper and time-saving interventions (Farret et al., 2015).

2.2 Health Care Providers Practice Regarding SSI Prevention:

Nurses, as the most health care provider (HCP) keeps in contact with the patient, need to acquire the proper assessment techniques to capture early signs and symptoms of SSI. In addition to the postoperative care that is applied by HCP to prevent infections, start from preoperative preparation to postoperative care, including proper aseptic or sterile dressing techniques, patient hygiene, self-care, and medication protocol if applicable. Surgical sites had a significant impact on patients, in terms of increased morbidity and mortality; and on hospitals, in terms of higher costs. It can lead to significantly impaired physical and mental capacity, which decreases patients' quality of life, which studies found that they are connected in a significant way (Tanner et al., 2012) .

Certain specific factors are procedure-related, which are modifiable factors, and are responsible for developing SSI. These include inappropriate preoperative shaving, inadequate preoperative showering, inadequate patient skin preparation, poor hand hygiene practices, inappropriate prophylactic antibiotics used, and improper dressing techniques.

Health care providers can play a significant role both in providing quality care and in preventing SSI, and can include interventions related to proper patients teaching regarding the mentioned dimensions (Parvin et al, 2009).

2.3 Health Care Quality

The quality department in IAH activated after one year of opening with one employee then increased to five now, they develop a policy to improve patient care. Later, started the preparation for the Joint Commission accreditation JCI which develops a guideline compose of standers for each category involved in health facility starting from human resources to medical care. Many researchers try to define health quality by reviewing several literatures that discussed the definition from four sides; effective, safe, the culture of excellence, and desired outcome, and so, they define health quality as "*the assessment and provision of effective and safe care, reflected in a culture of excellence, resulting in the attainment of optimal or desired health".*

The main goal is to improve health care, promote health with consistency, and save public trust. (Allen-Duck et al., 2017). When the medical error increased to be the third leading cause of death in the United States, in addition to the healthcare-associated infection is the major cause of morbidity and mortality globally.

The health care quality becomes the solution for the health utility to get the trustfulness of the patient and their family. The quality indicator consists of structure, process, and outcome. So it's a way to build a system. Health informatics is a new aspect of health science that plays a significant role that makes hospital data data that are more beneficial more systemic.

The team of infection control in IAH start working on SSI after Cesarean section as a pilot then after one year takes SSI for all type of surgeries that done in IAH, the data available, the analysis was done by Infection control officer whose responsible about the data and has SPSS training and official certificate.

2.4 Nursing Knowledge and Wound Care Management.

Also, the effect of experience and knowledge varied according to the workplace; for example, the nurse who works in an advanced wound care center are more skillful than others who work in the home care center. But according to the literature, the experience doesn't increase the knowledge of nurses, but continuous education and policy updates can improve their knowledge in wound care. Wound care is the multidisciplinary approach and collaboration between the physicians and the nurses with the continued education. (Zarchi et al., 2014). The IAH applying a continuous education program that concentrates on three standers mainly the nursing care process, patient safety, and infection control. On the other hand, those a major aspect of a JCI accreditation that the hospital prepares for.

2.5 Conceptual Framework.

The patient safety and minimizing medical errors are the health care researcher's priority. On the other hand, there is a lack of standardization of the concept of patient safety definition at global level causes in ability to prepare big data and make a comparison between different disciplines. Also, there is a delay in improvement of health care system (McElroy, 2016)

Moreover, detection of safety vulnerabilities helps in prepare guidelines to improve patient safety. The international classification for patient safety (ICPS) "*is standardized set of concepts and terms organized to a conceptual framework to enable consistence in dealing with events related to patient safety"* applied by the World Health Organization (WHO). The conceptual framework of the ICPS is provided in the following figure. The conceptual framework for the International Classification of Patient Safety according to WHO module

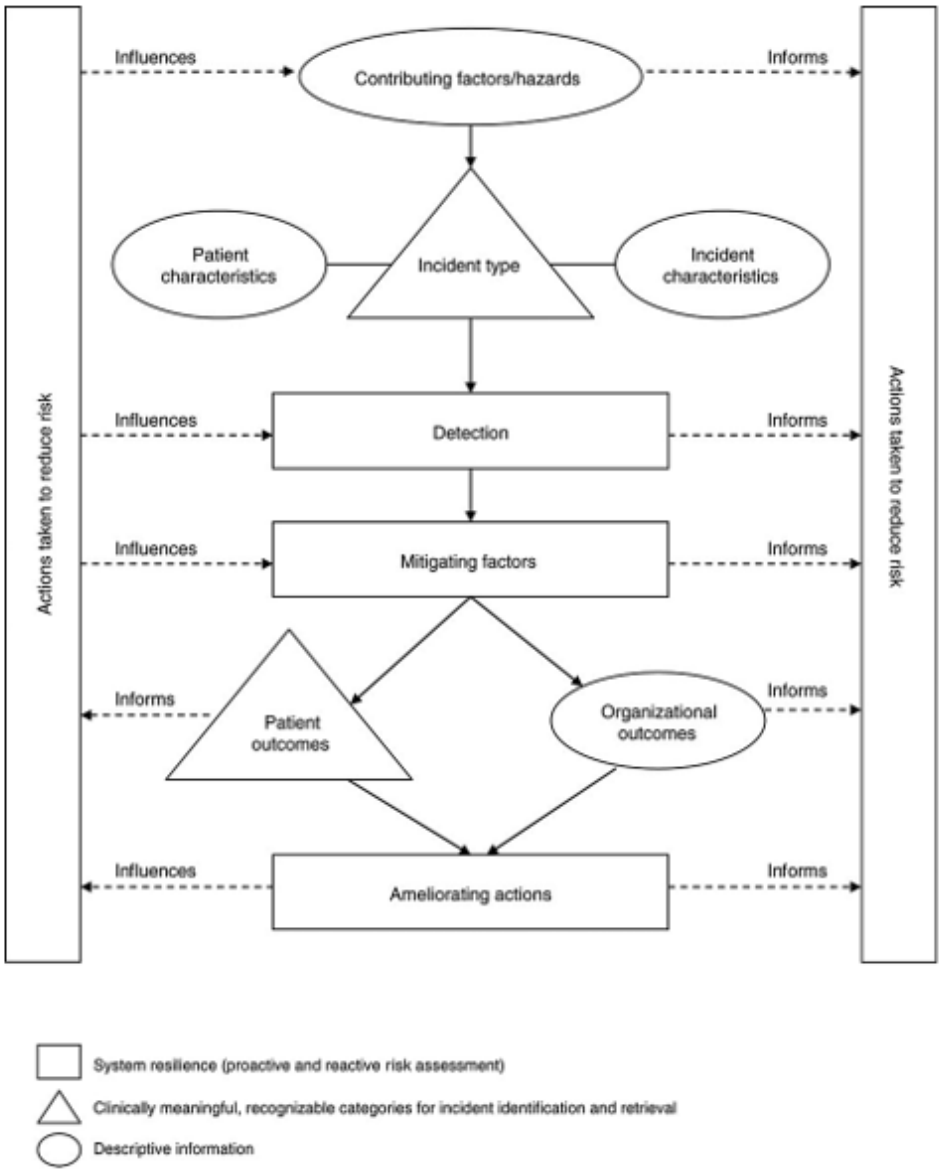

Figure 3 The conceptual framework for the International Classification of Patient Safety WHO. (McElroy, 2016)

The second aspect that needs to be clarified in patient safety is incidence reporting that pick cases, risk factors, and error. Incidence reporting is a controversial method, because it needs from the nurse to have and improved self-esteem, as high percentage of nurses have the thought that incidence reporting is not beneficial for them or their reputation among colleagues. WHO also provided the medical field with the criteria of incidence reporting, focusing on incidence type and contributing factors, as shown in Figure 2 bellow.

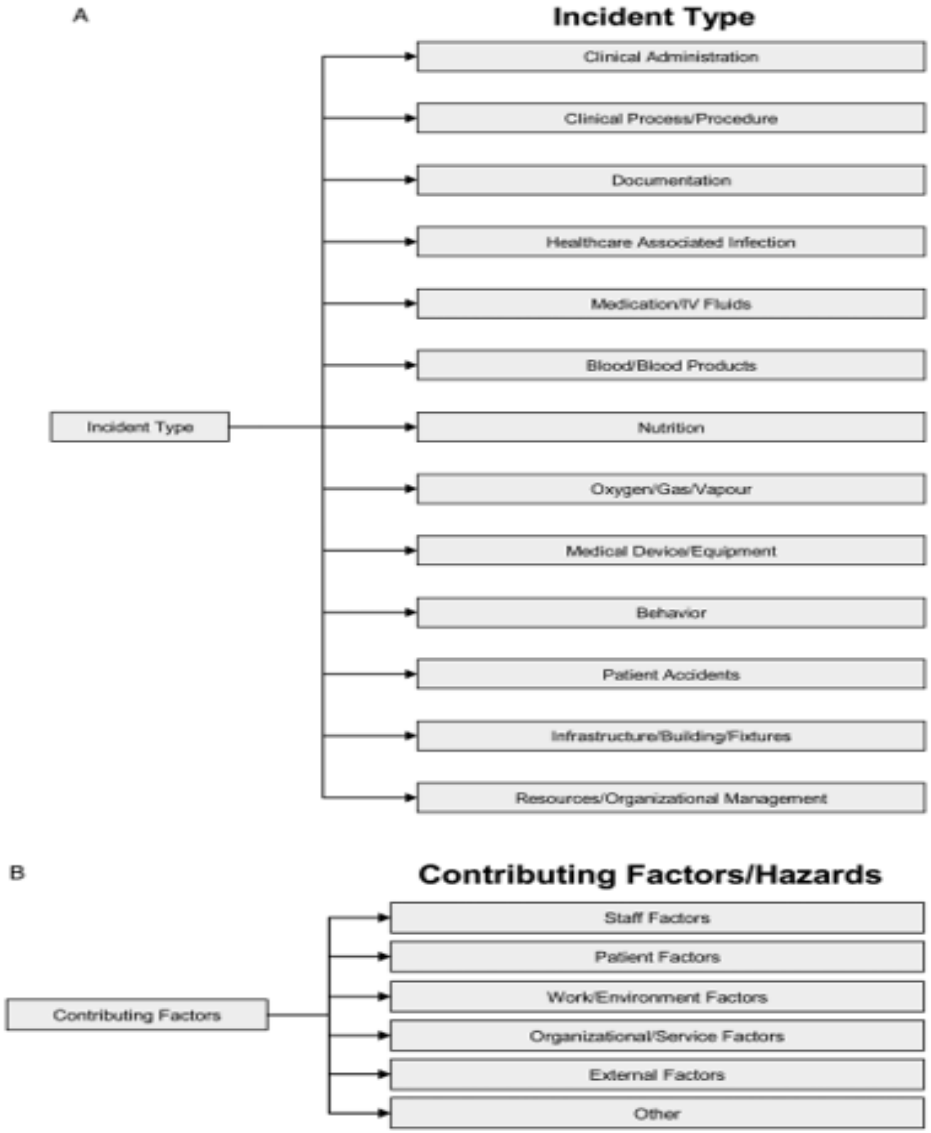

Figure 4 (a) Incident type primary classifications and (b) contributing factor primary classifications (McElroy, 2016)

The CDC mentions that the Surgical Site Infection defines three levels according to the part that involved: ***'Superficial incision***, the infection involves in the skin and subcutaneous tissue. The infections appear by localized signs such as redness, pain, heat, or swelling at the site of the incision or by the drainage of pus.' This type can be examined by asking questions with no need for direct examination. The second type is a ***'Deep incision***, which affects the fascial and muscle layers (Khairy et al., 2011)

The diagnosis of such type of infection by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation. Organ infection is not included within the scope of this guideline.' [2]

Wound class: An assessment of the degree of contamination of a surgical wound at the time of the operation. A person involved in the surgical procedure (for example, surgeon, circulating nurse, etc) should assign wound class.. The wound class must applied according to the wound class schema that is adopted within each organization. The four wound classifications available include Clean, Clean-Contaminated, Contaminated, and Dirty/Infected.

Cesarean Section; consider the most common major surgical procedure performed in obstetrics, which is a surgical procedure involving incision of the walls of the abdomen and uterus for Child birth of offspring'. CDC. Cesarean section is classified according to time of operation, as elective, urgent, or emergency according to standardized criteria by the operative team.

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[2] Centers for Disease Control Prevention

Emergency operative procedure: A procedure that was documented per the facility's protocol to be an Emergency or Urgent procedure. When the surgical procedure done under emergency circumstances. The classification as an urgent operation did not include full surgical preparation. (Laurent et al., 2008).

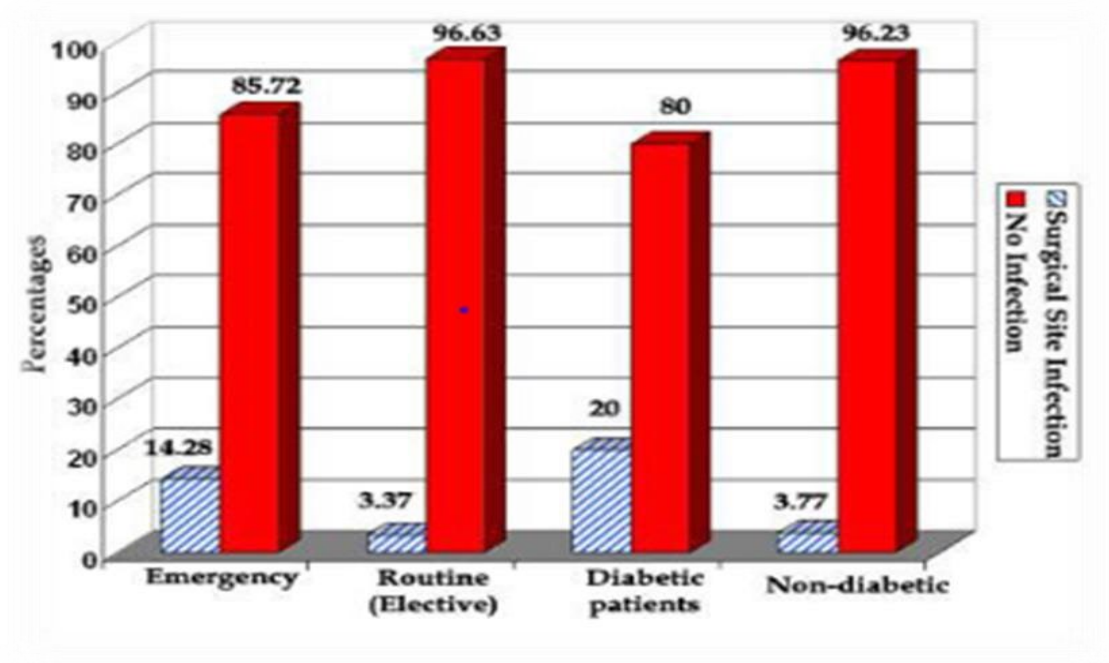


Figure 5 The Prevalence of SSI Among Urgent and Planned Surgery, and Diabetic or Non-Diabetic (Khairy et al., 2011)

2.6 Studies about Surgical Site Infection

A prospective quantitative study was conducted in Kuwait of a sample of 7235 women who underwent CS from the period of January 2014 to December 2016, and aimed to investigate the prevalence of SSI following CS and the most common corresponding factors. The suspected SSI was confirmed in this study by the surgeon and/or by the culture. Main results found that SSI increased from 1.7% in 2014 to 2.95% in 2016, with an overall prevalence of 2.1%. In the infected group, 12.5% of cases had clean surgery class, while 87.5% had clean contaminated class.

Analytical results also showed that there is a significant difference between the infected and control group in terms of prophylactic antibiotics use, and that 74.3% of infected group had the infection for less than 15 days, with 75.7% having a positive culture. Methicillin-resistant Staphylococcus aureus (MRSA) was found in 30.3% of the cultured wounds.

The researchers insisted on the importance of monitoring the incidence of early SSI after CS, both by the nurse and the mother, and teaching is an important approach for early detection, as well as the importance of further studies to be conducted with wider coverage of SSI causes that can be modifiable to establish guidelines of prevention (Alfouzan et al., 2019)

A retrospective analysis in the University of Pittsburgh in 2011 was conducted to identify the risk factor for SSI after the CS that are related to provider, patient, and procedure. The sample included 2739 CS patients, and SSI was identified according to NHSN criteria. Results found that the incidence of SSI after CS is 6.5%, and using analytical testing, risk factors were identified. For example, for patient-related factors, tobacco use increased the risk of having SSI by 2.03 times, while gestational DM increased it by 1.4 times, and chorioamnionitis increased by 3.14 times. For provider-related factors, resident teaching decreased the incidence of SSI by 2.51 times. Others were related to procedures, but what was significant is that extension repair intraoperatively increased the risk by 1.37 times, and each 10 minutes increased in operative time increased the risk by 1% (Shree et al., 2016).

Another study was conducted using retrospective design, and it was done in the low-to-middle income country of Ethiopia, on a sample of 206 caesarean section mothers, in order to investigate the determinants of SSI among these mothers. Results were distributed according to mothers' gynecological and operation-related determinants, and used odds ratio (OR) to measure probability to develop SSI compared to reference groups. For mothers' operation-related determinants, prime mothers have 1.85 times more of probability to have SSI following CS compared to multipara, while grand multipara have 5.8 times the possibility.

Moreover, mothers who developed premature rupture of membrane (PROM) have 8.1 times the probability of risk, as well as mothers with prolonged labor (6.59 times more), mothers with chorioamnionitis (22.25 times more) and mothers who had more blood less. On the other hand, mother's age, emergency CS, operation duration and physician's skills have no significant relationship with SSI after CS (Wendmagegn, Abera, Tsehaye, Gebresslasie & Tella, 2018).

Studies were also concerned about the effect of evidence-based practices regarding wound infections on the incidence of CS surgery complications, including SSI. A great example is the secondary analysis design was conducted by Temming et al. (2017) to investigate the effect of multiple preventive measures on the incidence of SSI after CS surgery among 1082 mothers who were followed-up, where 32.3% of them received all of the targeted preventive measures.

Evidence-based elements regarding wound complications and SSI prevention were pre-skin incision antibiotics administration, skin antisepsis using chlorhexidine solution, subcutaneous closure of the skin and using suture for subcuticular skin closure, and data were collected from 2011 to 2015. Results showed that there was a significant decrease in wound complications in the group who used evidence-based preventive measures (20.3%) compared to the group who didn't use all of them (28.1%). where the impact was highly driven by SSI reduction. Moreover, unscheduled CS was the most significant risk factor for wound complications incidence (27.5% vs 16.1%). Lastly, all of mothers-related factors, like obesity, Diabetic, chorioamnionitis, smoking, skin incision type and surgical experience were not significantly correlated with wound complications, including SSI.

These results were similar to the study that was conducted in Brazil, especially for prophylactic antibiotics use, but were concerned more about the proper timing of its administration, where proper timing is significantly correlated with a decrease in SSI incidence (p-value = 0.049), using the univariate analysis (Farret et al., 2015).

A systemic review and meta-analysis were applied to estimate if the use of three interventions together can reduce the SSI incidence, applied on the Evidence-based Bundles and Cesarean Child birth Surgical Site Infections, which presented the significant morbidity associated with SSI after CS that include prolonging the length of stay, readmission cost, and emotional stress. The interventions that were reviewed in the study are: use antibiotic prophylaxis, antiseptic use of chlorhexidine-alcohol in skin preparation, removal of placental by control cord traction, subcutaneous closure, and use of sutures, not staples.

The findings are surgical bundles with at least 3 of the mentioned interventions reduced the risk of surgical site infection by 67%, with an even greater reduction for superficial or deep surgical site infection (81% reduction). (Carter, 2018). Surgical site infection and associated factors among women who underwent cesarean Child birth in Debretabor General Hospital, Northwest Ethiopia: a hospital-based cross-sectional study. Is another important and recent study high light the SSI after the Cesarean section.

The main objective was to recognize the proportion of SSI in CS and associated factors. Cross-sectional study design was used for data collection by pretest semi-structured Questionnaire with post follow up phone call analyzed using SPSS, pregnant with complication related pregnancy like pregnancy-induced hypertension PIH, chorioamnionitis, mid-line incision, and postoperative hemoglobin less than 11.0 g/dl more likely to develop SSI. So, a significant decrease in SSI when those independent variables were controlled. (Molla et al., 2019).

In an academic institution in US, a retrospective cohort study was conducted to investigate the rate of SSI after CS and to determine its predictive risk factors. The researchers used the definition of CDC for SSI, and included 2419 mothers in their study. The rate of SSI was 5.5%, mostly accompanied with cellulitis in 4.9% of the cases, deep incisional infection in 0.6% of the cases and intra-abdominal infection 0.3% of the cases. For mothers-related factors, higher BMI, having asthma and smoking were associated with higher incidence of SSI, while for surgical factors, general anesthesia and preterm labor were associated with SSI in a predictive way (Moulton et al., 2018).

Many interventions included in a preoperative preparation as bathing, antiseptic type, prophylactic antibiotic, or post-operative antibiotic regimen, On the other hand, high risk women include prolong labor, prolong rupture membrane, and ended with an urgent cesarean section need more attention. Very few steps can prevent SSI incidence like daily bathing, wound drying, encourage movement, and a healthy diet that improves healing. (Carter, 2017).

A prospective study of the surgical site infection was applied from Jan. 2014 to Dec. 2016 using a specific methodology of the American nosocomial infection surveillance system. The study takes into consideration the surgeon confirmation, and/or culture positive, and the objective of the study was to determine the prevalence of SSI and identify the risk factors. The number of CS in the study was 7235 women who underwent cesarean section which representable a sample. Age of patient; SSI rate increased is in a patient that more than 30 years old, the receiving of a prophylactic antibiotic decrease rate of incidence.

The final result shows that emergency CS and inappropriate antibiotic prophylaxis are a risk for SSI. Also, to positive culture multidrug-resistant, MDR bacteria increase the risk of SSI rate. (Alfouzan, 2019).

As the IAH is a referral hospital and the patient comes from many district to seek special and advance care, and the follow up visit can be done the home town of the patient and the special country situation because of Israeli occupation. the available tool used for tracking there is a study conducted in 2017 “a Reliability and validity of using telephone calls for post discharge surveillance of surgical site infection following cesarean section at a tertiary hospital in Tanzania”.

An observational cohort study in Dodoma examines the sensitivity and specificity of the telephone call in detecting SSI after hospital discharge, according to the gold standard of clinician review. The result shows that the telephone calls accurate infection detection and accurate in detecting no SSI on the percent of 100% which mean that telephone call is accurate and sensitive as clinical evaluation. So the telephone call is a diagnostic tool for post discharge surveillance of SSI which can be applicable in a low-income setting with high quality of mobile use. (Nguhuni et al., 2017)

The choice of skin antiseptic before cesarean section still is controversial, a meta-analysis was done to assess if chlorhexidine is more effective than iodine in the prevention of SSI. A systemic review was done in PubMed, EMBASE, and Cochrane library, on all publications that compare the skin preparation by using chlorhexidine gluconate and PI preparation in the cesarean section. The result shows that the outcome of CH- based antiseptic compared to PI-based antiseptic doesn't associate with a decrease in the SSI rate. And there is no difference in skin reaction in both groups. The study concludes that no advantage of using the CH-agent in reducing the risk of SSI. (Huang et al., 2018).

Chapter Three: Methodology

3.1 Study Design:

The study was conducted using a retrospective cohort design, in which data from mothers regarding each independent and dependent variable were collected from the previously established database of patients' records. This design has several advantages, including that cohort studies in general allow the researcher to study multiple exposures and outcomes at the same time, while the advantages of retrospective design include time and cost saving, as the researcher is seeking for the desired investigation using an already established database (Euser, Zoccali, Jager & Dekker, 2009).

This study also had a secondary analysis purpose, in which it was conducted on mothers who underwent CS in 2019 as a part of reassessment of SSI data collection tool to monitor risk factors and preventive measures in Istishari Arab Hospital (IAH), which started in 2017, and is continuously developed by the infection control department in the hospital.

3.2 Site and Setting:

The study was conducted in the referral hospital of Istishari Arab Hospital (IAH) in Ramallah City – Palestine. The specific setting was the gynecological and labor department at this hospital, which includes all the targeted population. The use of health information system (HIS) allows the hospital to accurately and safely admit and save all the desired information about inpatients and outpatients in a sufficient and reliable way using up-to-date software and technologies.

IAH is also a reliable setting because of two major factors, which are the availability of high-tech diagnostic tools and specialized personnel, as well as that it has a very good reputation among referral hospitals in the country of Palestine, which was built over several years with the great effort of it founders and colleagues from different specialties.

3.3 Sample Population and Sampling:

The population for this study included all women who underwent CS surgery (regardless to its type) in the targeted hospital in the year 2019. Sampling was done using non-probability purposive sampling, in which all women in the population were selected, as they are considered eligible to be included. The total number of mothers who underwent CS in IAH in 2019 were 200 mothers, so all were included, while 2 women were excluded, resulting in a total sample of 198 mothers.

3.4 Inclusion and Exclusion Criteria:

All mothers in the study population were included in the sample regardless to her age, gravidity, parity, cause of CS or admission date in 2019. On the other hand, women with a missed contact like wrong telephone number from the electronic health record, who refused to share the electronic data outside HIS, or mothers with deep incision infection; that diagnosed by specialist and direct examination done, were excluded.

3.5 Period of the Study:

The data collection process was conducted in the year 2020 and ended in 2021, but data retrieved included all mothers from the year 2019. Moreover, mothers were retrospectively followed-up for one month postoperatively via telephone calling, because the guidelines indicate that SSI is diagnosed in the period of 30 days postoperatively.

3.6 Data Collection Tool:

A specific data sheet (Appendix 1) that was developed by the researcher was used for data collection form database of HIS, and it included variables regarding mothers' demographic and obstetric information, with data related to surgery's type, as well as any SSI-related information regarding the signs and symptoms and preventive measures. Main demographic data of mothers included age and medical history, educational level, while surgery information included its type (urgent or elective) and specific cause. Obstetric information included gravidity, parity, previous births and type of admission. Lastly, information related to SSI included signs and symptoms and main preventive measures.

3.7 Operational Framework

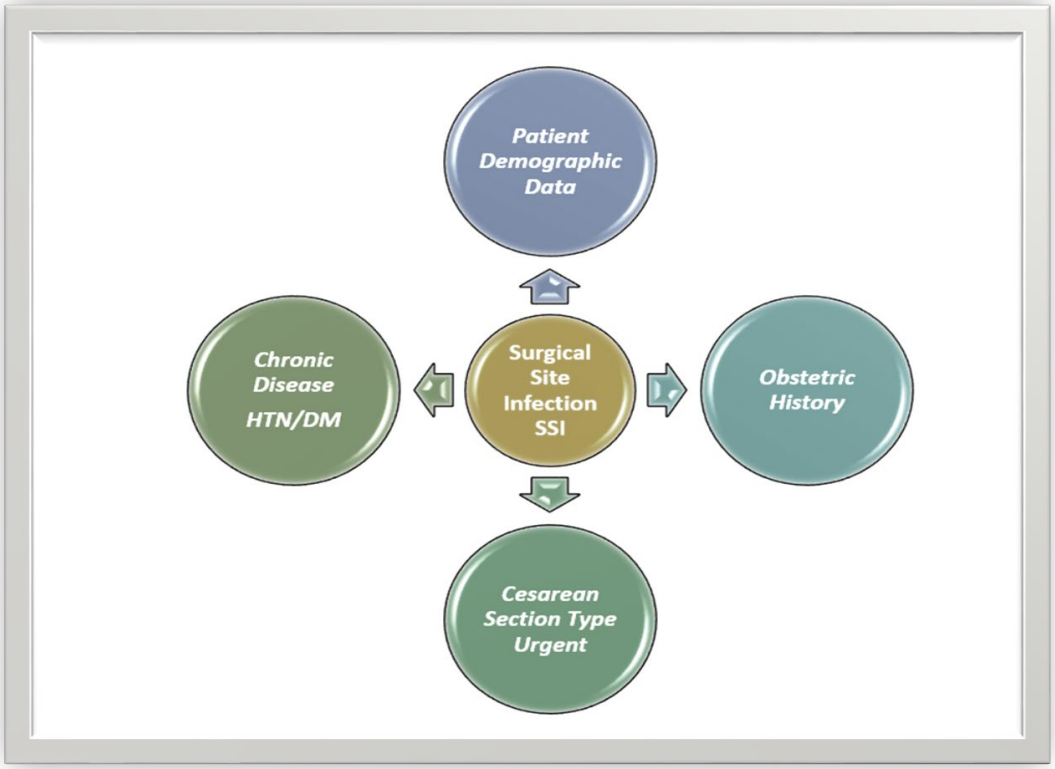


Figure 6 Operational Framework

3.8 Validity and Reliability:

The data sheet was developed and got feedbacks from experts in obstetric field in the hospital and the department of infection control. And as the study is for a secondary analysis purpose, continuous supervision of infection control department is done to verify and develop the used tool for the highest level of reliability and decrease of bias.

3.9 Pilot Testing:

As the study is a secondary analysis, piloting is done to have a feedback from participants to develop tool's data collection and make sure all questions are appropriately chosen to suite participants' educational levels.

3.10 Statistical Analysis:

Using Statistical Package for Social Sciences (SPSS), descriptive statistics are used to analyze demographic, obstetric and SSI-related data, which include frequencies, means and standard deviation. Moreover, SPSS was used used to analyze the relationship between the selected demographic and surgical data (as independent factors) and SSI (as a dependent factor), using the suitable analytical tests.

3.11 Ethical Consideration:

Ethical approval was obtained from IAH before starting use data; for the permission for using the data in the research from the hospital infection department after presents of the university agreement. Moreover, this study involved no more than minimal risk to subjects and involved no procedures for which written consent is normally required outside the research context. Also, the objectives of the data collection were clarified for participants while collecting information, and the mother was informed that this information were used only for infection control and research purpose, and they can withdraw from the interview whenever they want.

The call was done by official hospital telephone that already recorded in the hospital call log, a questionnaire done by trained health care provider and employed in the IAH "two midwives". The questionnaire was filled in google form so, after submitting the data saved in a database, and can't be changed, removed, or destroyed, unless by the admin.

3.12 Limitation of the study

1. The missing cases because of the wrong telephone number that were given at admission for registration, especially in the mothers from other districts.

2. The study investigates for superficial SSI, not deep one; because the deep SSI needs a physical examination for the mother by specialist which need more advanced tool.

3. Possibility of turnover of the midwife that conducted the questionnaire which needs to make training for other by an infection control officer.

4. The level of education and cultural differences can affect understanding of patient for question. To decrease the effect of this point most of the question that related to intervention and infection sign is yes/no, and multiple developments were conducted by piloting, as stated previously.

5. The HIS is different from the health sector or organization to another and not integrating. So, the follow-up visit cannot be recognized systematically.

Chapter Four: Analysis and Results

This chapter reviews both descriptive and analytical results regarding our study sample. Descriptive results include frequencies, means, standard deviations and other descriptive statistics of participants' demographic and obstetric data, while analytical results review the investigation of the relationship between independent and dependent variables, in order to review the correlation between them and test study's hypotheses.

4.1 Descriptive Results

4.1.1 Distribution of mothers' demographic and obstetric data.

1 Distribution of mothers' demographic and obstetric data

Variable	Values	Frequency	Percentage
Age	20 – 24 years old	32	16.2%
	25 – 29 years old	90	45.5%
	30 – 34 years old	45	22.7%
	35 – 39 years old	26	13.1%
	40 years old and older	5	2.5%
Educational level	High school (Tawjihi) or less	43	21.7%
	University degree	155	78.3%
Medical history	Yes	19	9.6%
	No	179	90.4%
Admission type	From house	168	84.8%
	Referred from other hospital	30	15.2%

Gravidity	1 to 3 pregnancies	151	76.3%
	4 to 6 pregnancies	38	19.2%
	More than 6 pregnancies	9	4.5%
Parity	Zero	77	38.9%
	1 to 3 births	105	53.0%
	4 to 6 births	16	8.1%
	More than 6 births	0	0%
Total number of CS	0 to 1 time	166	83.8%
	2 to 3 times	27	13.6%
	More than 3 times	5	2.5%
Complications during current pregnancy	Yes	14	7.1%
	No	184	92.9%
Type of current CS	Urgent	82	41.4%
	Elective	116	58.6%

As shown in Table 4.1.1, about half of the mothers are at age between 25 and 29 years old (45.5%), while around one fourth of mothers (22.7%) are between 30 and 34 years old, which means that the majority of mothers in our sample are between 25 and 34 years old (68.2%). The mean age of mothers in our sample was 29.07 ± 4.93 years old, ranging from 20 to 4 years old. More than three fourths (78.3%) of mothers hold university degree. Majority of mothers (90.4%) reported having no medical history, and 84.8% of the mothers were admitted to the hospital from the house.

Regarding obstetric data, majority of mothers (76.3%) had a number of previous pregnancies (gravidity) between 1 and 3 times, including the current pregnancy, with a mean of 2.63 ± 1.92 pregnancies, while less percentage (53.0%) and the same number of complete births (parity), and more than one third of mothers (38.9%) had no previous complete births (not reaching the viable gestational age), with a mean of 1.22 ± 1.41 births. Lastly, majority of mothers (83.8%) had no or only one previous CS delivery, with a mean of 0.67 ± 1.03 CS. Moreover, majority of women (92.9%) reported having no complications during the current pregnancy, with about half of them (41.4%) preforming the current CS for an urgent purpose.

4.1.2 Distribution of SSI and related signs and symptoms and preventive measures

2 Distribution of SSI and related signs and symptoms and preventive measures

Variable	Values	Frequency	Percentage
Diagnosed with SSI	Yes	31	15.7%
	No	167	84.3%
The patient had fever	Yes	8	4%
	No	190	96%
The patient had localized pain	Yes	20	10.1%
	No	178	89.9%
The patient had localized swelling	Yes	12	6.1%
	No	186	93.9%
The patient had localized heat	Yes	5	2.5%
	No	193	97.5%

The patient had wound discharge	Yes	23	11.6%
	No	175	88.4%
The patient had open wound	Yes	13	6.6%
	No	185	93.4%
Caring of wound	Nothing	7	3.5%
	Daily bathing	162	81.8%
	Using iodine/alcohol	29	14.6%
Antibiotic prescribed	Yes	27	13.6%
	No	171	86.4%

Table 4.1.2 shows that less than one fifth of the mothers (15.7%) were diagnosed with SSI in our sample. Regarding the related signs and symptoms, only 4% developed fever, 10.1% developed localized pain, 6.1% developed localized swelling, 2.5% reported localized heat, 6.6% had an open wound and 11.6% had discharges from the wound. On the other hand, mothers mostly did daily bathing as the main preventive measure against infection (81.8%), while antibiotics were prescribed for 13.6% of the mothers

4.2 Analytical Results

4.2.1 Relationship between independent variables and development of SSI.

3 Relationship between independent variables and development of SSI

Independent variable	Values	Development of SSI		p-value
		Yes	No	
Educational level	Tawjihi or less	4 (2.0%)	39 (19.7%)	0.195
	University	27 (13.6%)	128 (64.6%)	
Medical history	Yes	4 (2.0%)	15 (7.6%)	0.496
	No	27 (13.6%)	152 (76.8%)	
Admission type	From house	24 (12.1%)	144 (72.7%)	0.209
	Referred	7 (3.5%)	23 (11.6%)	
Gravidity	1 – 3 times	22 (11.1%)	129 (65.2%)	0.573
	4 – 6 times	8 (4.0%)	30 (15.2%)	
	> 6 times	1 (0.5%)	8 (4.0%)	
Previous CS number	0 – 1 time	24 (12.1%)	142 (71.7%)	0.274

	2 – 3 times	5 (2.5%)	22 (11.1%)	
	> 3 times	2 (1.0%)	3 (1.5%)	
Type of current CS	Urgent	13 (6.6%)	69 (34.8%)	0.949
	Elective	18 (9.1%)	98 (49.5%)	
Current CS complications	Yes	1 (0.5%)	30 (15.2%)	0.363
	No	13 (6.6%)	154 (77.8%)	
Wound caring	Nothing	1 (0.5%)	6 (3.0%)	< 0.001
	Daily bathing	16 (8.1%)	146 (73.7%)	
	Iodine/alcohol	14 (7.1%)	15 (7.6%)	

Table 4.2.1 shows the relationship between mothers' demographic, obstetric and SSI related data with the development of SSI. In a brief conclusion, wound caring the only significant variable correlated with the development of SSI (p-value < 0.001), with less SSI among mothers who use daily bathing (73.7% did not develop SSI compared to 8.1% developed SSI) more than who used iodine/alcohol (7.6% did not develop SSI compared to 7.1% developed SSI). On the other hand, all other factors were not significantly correlated with the development of SSI among mothers, as p-value is > 0.05, and there is no significant difference between mothers' development of SSI according to those factors.

Chapter Five: Discussion

This chapter provides a comprehensive discussion of the study's results, by comparing them with the previous literature, as well as providing a holistic critique from the researcher's point of view. It follows the order of the literature review, and cover all independent and dependent variables and the main relationship between most common factors associated with SSI, with a focus on the differences between results of the previous literature from the point of differences in the Palestinian community, norms, culture or laws.

First, the definition of surgical site infection (SSI) is considered to be similar and unified in most of the literature, and is adopted in the medical literature and curricula, in terms of time span (30 days), types (superficial and deep) and the most common signs and symptoms (redness, hotness, swelling, discharge, … etc.). For this reason, there was no problem in selecting the eligible articles to be reviewed according to their specific definition of SSI. In conclusion, the main selection criteria of the reviewed articles include their similarity with the current study's aims and preferring the newer studies over the older ones.

The use of retrospective secondary analysis has several advantages regarding the situation of our study. First, it is more time- and cost-efficient, in which it shortened the time needed for data collection and with no need for prospective follow-up of new cases. Second, we relied on approved data that are archived in the Health Information System in our hospital, which is familiar for the two midwives who collected the data, and their training aimed to eliminate the bias (collection bias).

Lastly, it is a secondary analysis that helps in updating the guidelines of infection control and prevention in the hospital, which originally depends on conducting similar data collection and analysis of the related data by the department of quality.

Regarding the methodological aspects of our study, the study setting of IAH is suitable, as it continuously seeks the most advanced policies to be applied in infection prevention, including updating SSI preventive approaches that depend on conducting similar studies. Moreover, it is a preferred referral hospital that receives a large number of admissions and deliveries.

Also, the well-known Health Information System (HIS) is well-utilized in the hospital and is kept up-to-date to accommodate with hospital's needs in data collection of essential signs and symptoms and prospective follow-up of the cases. The difference in HIS between IAH as a private hospital and the governmental hospitals is that HIS in governmental hospitals lacks the suitable follow-up forms, while patients' files are integrated with their outpatient data. On the other hand, HIS in IAH has a separate follow-up forms and is much more capable of being updated according to the hospital's quality and follow-up needs, because there is a dedicated information technology team for the HIS in our hospital.

The Quality department develops protocols and policy for every procedure that work on, according to evidence-based practice. For all operations that are done in IAH's operation rooms, there is a policy to prevent SSI that includes giving an induction of 2 g antibiotic from third-generation at the time of anesthesia that means covering a broad spectrum of bacteria.

In addition to other 2 g post-operation within 24 hours for the high-risk patient including emergency operation. From the obstetrician's point of view, they continue on an antibiotic for one week after the operation if there is any abnormal lab result, e.g. urinary tract infection.

The health information system in IAH Support a unique Identity for every patient includes a unique systemic ID number of each patient, and national ID number or passport, and a name as mentioned in the national ID card. Every visit to the hospital saved under encounter number according to visit cause and specialty. This is considered an advantage to follow up any patient and continuity of care baseline in any health system.

The effect of antibiotics before surgery is more effective if given 60 minutes before the operation to ensure that tissue and bloodstream are concentrated. (Alfouzan et al., 2019), also, the patient who continues on an antibiotic for one week after CS is 27 cases which 13.6% of the patient as mentioned before, the antibiotic given for causes other than operation. So, the effect on SSI prevention is not clear in this case.

Patient Self-care is a big concern that the literature proves to have a positive effect on preventing SSI, and thus all health care providers concentrate on hygiene, no need to use the disinfectant on the wound as alcohol or iodine, more than enough to wash with soap and water daily and keep it dry because of that 85.4% of patient settle with daily bathing and the present incidence of SSI is 9.8% which the best result that mean, its most effective preventive measure, and 14.6% use the old one which, cleaning with iodine or alcohol with 48% of SSI within this group, just 3.5% use nothing with 14.2% of SSI, and bathing mean nothing for some people.

In conclusion, the relatively higher incidence of SSI in our study compared to other literature may require further management plans in our Quality policies in order to modify guidelines of infection prevention in CS, which may include the use of the standardized solution of chlorhexidine rather than iodine, and the focus on hygiene interventions.

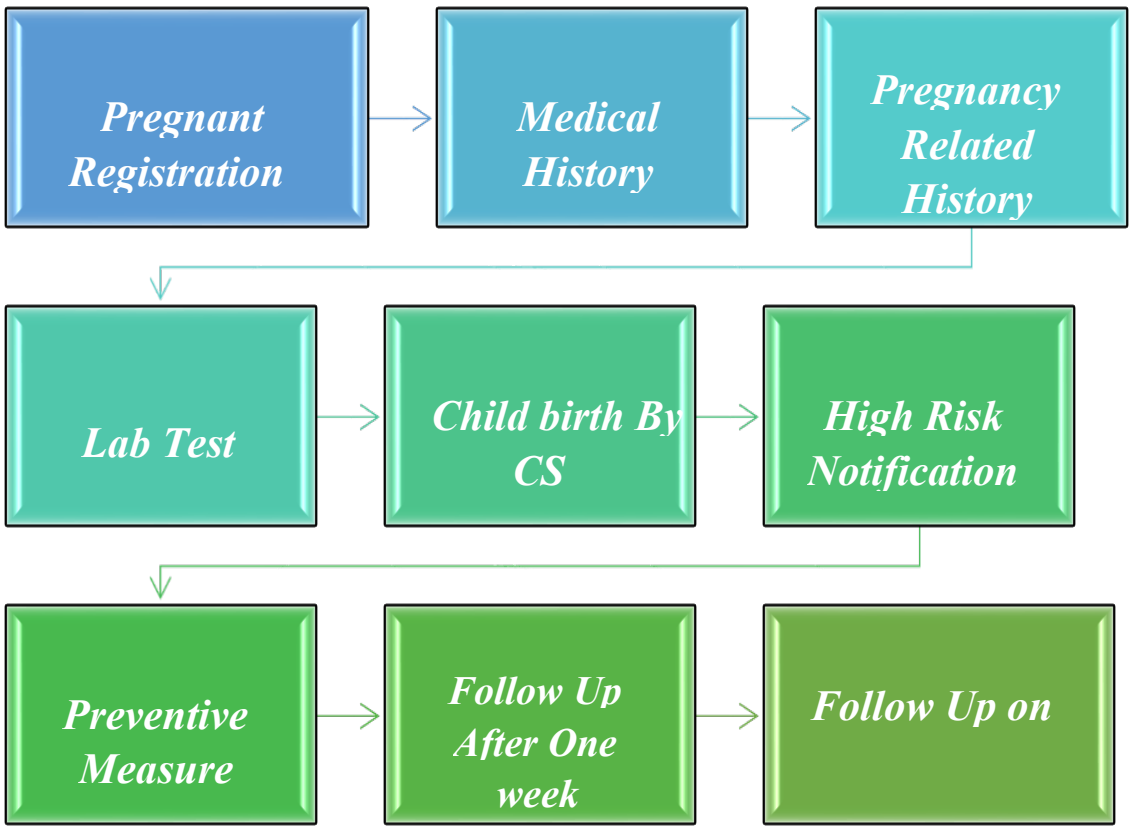
Choosing superficial SSI to be included in the study is made upon several factors, but it's mainly related to that superficial SSI is more common that deep SSI, and thus the inclusion of deep SSI may affect statistical analysis because there will be limited ability to control the homogeneity of the sample according to number of cases in both groups of superficial and deep SSI. On the other hand, the inclusion of both types of CS was possible, because both types are performed in the hospital in an enough number.

According to the SSI definition, the time of occurrence extends to 30 days which may develop after discharge. Observational cohort study of Nguhuni et al. (2017) titled "*Reliability and validity of using telephone calls post-discharge*…" examined the sensitivity and specificity for a telephone call to detect SSI after discharge and comparison with a gold standard of clinical review. The finding approves that telephone interview is a diagnostic tool for SSI with a moderate sensitivity and high specificity, all cases that were diagnosed as SSI infection by interview were positive, and no SSI case was missed, especially in low income and good mobile connectivity. Moreover, telephone calls to gather the data were used in the Kuwaiti study of Alfouzan et al. (2019) and Ethiopian study of Molla et al. (2019).

The care system depends on patient and family education during hospitalization and after discharge. That means the questionnaire will be more effective if the delivered woman is educated about the sign and symptom that are needed to be noted and this affects the accuracy of data, the result given to the quality department and policymaker.

The HIS contain several parts; outpatient clinics, inpatient department, laboratory and radiology department that integrated together. Other HIS systems in Palestine are different, and integration between systems seems difficult because most of HIS is close source, must contact the owner in every step which is financially expensive and takes time and effort. So, in this phase the concentration will be on phone call for cesarean section women whose didn't take follow up visit in IAH.

Figure 7 CS protocol in IAH policy



Previous literature concluded that SSI is more prevalent in cases of emergency CS, because there is no enough preparation for the patient, in terms of preoperative prophylactic interventions, like antibiotics. On the opposite side, our study revealed no significant difference between urgent and elective CS in the incidence of SSI (p-value = 0.949).

In fact, the percentage of SSI among urgent CS is less than in elective CS (6.6% vs 9.1%, respectively). The difference in results may be caused by the difference in selection criteria between the current study and the previous literature, as there is larger number of elective CS than urgent CS in our study that the previous studies, which leads to more control of the percentage of both types, resulting in more homogeneity.

On the other hand, the mother who complains of labor pain before starting the booking process, the MDRO form filled and the patients consider at risk, then the system gives the notification that mentions before, to start processing from point zero, with the additional lab test because it is defined as urgent CS.

According to Tanner et al. (2012), nurses' role in the prevention of SSI, and infections in general, is essential, and is a part of the continuous nursing education. In IAH, there is a separate team for continuous nursing education, and its role is determined in providing multiple comprehensive training courses and lectures for nurses about the latest updates in nursing skills and science about various aspects of nursing profession, including protocols related to infection prevention, and this was a part of the JCI accreditation, which encourages nurses to take a minimum number of studying hours that are flexible, as well as being highly specialized for different nurses in different departments.

According to Parvin et al. (2009), modifiable factors that affect the incidence of SSI are variant, and these factors should be a focus in the management and prevention of SSI, because they account for the majority of factors, and are preferrable targets when gynecological departments seek proper preventive measures.

Moreover, modifiable factors are essential part of the educational content that is provided for the mother when taking care of her wound. In IAH, nursing education is an important non-neglictable part of the patient's discharge plan, and it is taken in consideration that mothers vary in their educational level, delivery assumptions and how much the external environment affects her attitude toward infection prevention methods for the wound.

In our study, we took in consideation the importance of gathering information about the top modifiable factors that are related to SSI among the Palestinian mothers, and this goes alongside the finding that mother's wound caring had a significant positive effect on the decrease in SSI incidence (p-value < 0.001).

This also goes parallel with the findings of Zarchi et al. (2014), who concluded the important integrative role of interdisciplinary team work between nurses and physicians in providing nurses with the proper patient educaiton techniques, by providing the medical and nursing team with continuous education sessions about wound infection prevention, taking in advantage that IAH receives a variety of cases, from simple to complex, and the most modern tools are available in the hospital and can be utilized to help decrease the incidence of hospital-acquired infections.

In IAH, also, the continuity of the conceptual framework regarding infection prevention and ICPS are applied and all parts are taken in consideration in patient's care plan, including patient and organizational outcomes, incident reporting, ... etc. And this type of secondary analysis studies help in providing and overview of how much medical and nursing teams.

as well as quality management department, are on the track of eliminating SSI to the lowest possible limit, by mainly focusing on applying up-to-date CDC protocols and review their efficacy in our setting. Close monitoring of early signs of SSI is an important role of the nursing team, and should be an integartive part of the nursing education plan for the mother, and this is of the main results of Alfouzan et al. (2019).

The main difference between both studies is the niticeable gap in SSI incidence, which can be related to much larger sample in the previous study, leading to much more possibly included mothers in the study, as well as the reasong of more availability of wound caring tools for mothers at home, caused by differences in socioeconomic status between Palestinian and Kuwaiti mothers. Moreover, the previous study found that SSI increased in its incidence, which was a triggering point for etablishing similar studies to investigate for the best possible methods to prevent SSI, which is a noticeable advantage of the secondary analysis studies.

On the other hand, the differnce between our study and the previous one is that they focused on the positive wound culture bacteria strain type, which palys a major role in identifying specific care plan for the patient that is based on prescribing the most accurate antibiotic according to culture's specificity and sensitivity, while in our study we focused more on nursing-related factors and the factors related to what simple intervetnions the mother can implement to prevent SSI.

Another study of a less incidence of SSI is the study of Shree et al. (2016), which found an incidence of 6.5%, and diference can be realted to difference in setting, as the previous study was conducted in a university-based hospital, which may admit larger number of patients without selective criteria, and icreasing the sample may help in decreasing the possibility of SSI incidence. Moreover, they found a significant correlation between tobacco use and DM increased the incidence of SSI, while in our study, no demographic data was associated with positive increase in SSI. Also, the previous study investigate other factors like intraoperative extension repair and chorioamnionitis, whcih are recommended to be investigated for in future studies in our setting.

There was a similarity between our results and the results of Wendmagegn, Abera, Tsehaye, Gebresslasie & Tella (2018), as there was no significant difference in SSI incidence according the mothers' age, CS emergency level, operation duration or phycician's skills, which can be realted to the relative similarity in study design, as well as that Palestine is also classified as a low-to-middle income country.

On the other hand, the difference between both studies is that parity and history of chorioamnionitis, prolonged labor PROM had a significnat effect on SSI incidence, while our study found no significant difference in them.

It is hard to compare our results with the results of Temming et al. (2017) regarding he effect of integraive preventive bundle for wound infection that contained pre-skin incision antibiotics administration, skin antisepsis using chlorhexidine solution, subcutaneous closure of the skin and using suture for subcuticular skin closure. Although they are repeatedly used measures in IAH, the comparison is hard becuase the previous study included all wound complications in their study, while our study included SSI only.

On the other hand, this study was utilized in that preventive bundles that contain evidence-based tools and interventions with a focus of it timing, as emphasized by Farret et al (2015) in another study regarding antibiotics administration timing, are important to be included in the care plan of skin care, which is highly applied in IAH, which is helped by several factors, including the care of infection control department in implementing evidence-based practice, as well as the hard team work to implement up-to-date policies. The use of bundles in perioperative wound care and SSI prevention was also supported by the study of Carter (2018), who included chlorhexidine skin care, which is implemented more in our setting.

There is a variety in the number of covered factors related to postoperative wound care and the incidence of SSI between our study and the previous studies. For this reason, it is highly recommended that further studies are needed to be conducted in our settings to try to include as much factors as possible, which will help in widening the covered spectrum of related variables of SSI, that will help in establishing more focused guidelines to prevent SSI in our setting. Such varibales include postoeprative hemoglobin readings, as in Molla et al. (2019), anesthesia and BMI factors, as found in Moultan et al. (2018).

Chapter Six: Conclusions and Recommendations

6.1 Conclusions

Hospital-acquired infections in general, and surgical site infections in specific, are among the most common causes of high financial burden in hospitals, as well as their role in increasing the rate of morbidities and mortality among the patients who undergo surgical interventions, and cesarean sections (CS) are no exception.

The related factors and preventive measures are variant, and policy makers in hospitals tend to assess and reevaluate the current guidelines for mothers' preparation and postoperative care to enhance their quality of care and eliminate risks of developing SSI, which plays a significant role in decreasing length of stay, improving outcomes and increase mother's satisfaction level of the provided medical services.

Our current study aimed to investigate the prevalence and most common associated risk factors of superficial SSI after CS, as well as determining the correlation between the risk factors and preventive measures and the development of SSI. Using a secondary analysis of retrospective cohort design in IAH Palestine in the period of 2019, including a total of 198 eligible mothers.

In general, about half of the sample (45.5%) are between 25 and 29 years old, with most (78.3%) having a university degree, free from medial history (90.4%), admitted from house (84.8%). About three quarters (76.3%) had a total gravidity of 1 to 3 pregnancies, and more than half (53%) having the same amount of parity. Majority (83.8%) has one or no previous CS, with 92.9% having no complications of the current pregnancy, and more than half (58.6%) conducting the CS for an elective reason.

Main results of our study found that the prevalence of superficial SSI postoperative of CS is 15.7%, with a significant correlation between type of postoperative preventive measure (hygiene practice) and the decreased prevalence on SSI (p-value < 0.001).

For SSI signs, 4% had fever, 10.1% had localized pain, 6.1% had localized swelling, and 2.5% had localized heat. 11.6% had wound discharges, but 6.6% had open wound, with 81.8% reported doing daily bathing, and 86.4% had antibiotics prescribed postoperatively.

The prevalence of SSI in our setting is significantly higher than other settings as compared with previous literature, and this alarms policy makers and quality department members to modify our policies and guidelines regarding SSI prevention, including the adoption of chlorhexidine solution rather than iodine for wound care, among others. It is also recommended to conduct further studies to investigate SSI in a broader spectrum.

6.3 Recommendation

The start will be with the IAH hospital and maybe make an extended study to the widest extent which gives more effect on improving woman health.

1. The health information system does not integrate with another system in our country, the Governmental health system is donated by an outside vendor for Palestinians as a part of medical support. The private sector bought HIS according to their budget and complicity of care that they provide, and the integration between several HIS system is difficult. Because of that tracking for cesarean section Child birth harder and missing more cases. On another hand-making integration is easier than starts with a new system.
2. The telephone call follows up to make early detection for SSI easier and accessible in Palestine. That means it's a good tool for an SSI infection survey.
3. Update the preventive SSI policy and continue tracking for SSI to examine the efficiency.
4. The research can be applied to a big sample from the government hospital and according to the prevalence can update pre-op preparation in all countries.
5. The outpatient clinic received all babies on the mother and baby care unit so, there a good area to collect data. Adding, a small question for postpartum follows up despite the Child birthplace or area.
6. Future research should include the investigation of further corresponding factors to SSI, including the sensitivity and specificity of MDR found in wound culture, which aids in describing the exact correlation between type of MDR and the prescribed antibiotic and the development of SSI. Also, conducting the study on an integrated system of private and governmental sectors, to overcome the issues of follow-up problems and to include as large sample size as possible

الملخص:

مقدمة: التهاب موضع الجراحة هو الالتهاب الذي يحدث بعد فترة محددة من عملية جراحية حول موضع الجراحة، وقد يتضمن التهابات في طبقات الجلد (سطحي) او الأعضاء الداخلية أو المواد المزروعة. تعتبر هذه الظاهرة مهمة في الولادات القيصرية، حيث أنها تصاحب العديد من عوامل الخطر ويصاحبها مضاعفات عديدة. تهدف هذه الدراسة إلى التعرف على نسبة حدوث التهابات موضع الجراحة عند النساء اللواتي خضعن لعملية الولادة القيصرية على عينة من فلسطين، وكذلك التعرف على أهم العوامل والعلامات والأعراض المصاحبة وطرق الوقاية.

المنهجية: تم استخدام تصميم الدراسة المقطعية المرجعية، باستخدام استبيان إلكتروني تم تصميمه من قبل وحدة ضبط العدوى في المستشفى الاستشاري العربي – رام الله، وذلك بجمع البيانات الديموغرافية ومعلومات الحمل والولادة، أعراض التهاب موضع الجراحة وسبل الوقاية منه، على عينة عشوائية مكونة من 198 امرأة من سجلات عام 2019.

أهم النتائج: 58.6% من عمليات القيصرية هي اختيارية، بمعدل عمر الأم 29ز08 عاما، ومعدل أحمال 2.63 مرة ومعدل أحمال مكتملة 1.22 مرة. نسبة حدوث التهاب موضع الجراحة كان 15.7% في عام 2019، بعلامات أهمها الحمى (4%)، ألم موضعي (10.1%)، انتفاخ موضعي (6.1%)، حرارة موضعية (2.5%)، جرح مفتوح (6.6%) وإفرازات من الجرح (11.6%)، وهو معدل أقل من المستشفيات الأخرى والمعدل العالمي. لا يوجد علاقة بين التهاب موضع الجروح والمعلومات الديموغرافية للأم، ولكن توجد علاقة مهمة مع العناية بالجرح بعد العملية (معامل تأثير < 0.001).

الملخص: مع أن معدل التهاب موضع الجراحة أقل من المستشفيات الأخرى والمعدل العالمي، إلا أنه يمكن تطبيق استراتيجيات أخرى لتقليل هذه النسبة، مثل استخدام محلول الكلورهكسيدين بدلا من اليود لتعقيم الجروح، وكذلك اتباع المعايير العالمية في وصف المضادات الحيوية الوقائية للالتهابات. كذلك يفضل عمل دراسات أخرى للتعرف على عوامل أخرى تؤثر على التهابات موضع الجراحة وطرق الوقاية منه، وفي مستشفيات أخرى أيضا.

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Appendix

Appendix (1): Permission Letter for use the Hospital Data.

Arab American University
Faculty of Graduate Studies

الجامعة العربية الأمريكية
كلية الدراسات العليا

التاريخ:13-7-2020

حضرة الدكتور عاطف الريماوي المحترم
المدير التنفيذي للمستشفى الاستشاري العربي\ ضاحية الريحان \ رام الله

الموضوع: تسهيل مهمة بحثية-الحصول على بيانات لأغراض البحث العلمي

تحية طيبة وبعد،
تهديكم كلية الدراسات العليا في الجامعة العربية الامريكية اطيب التحيات وبالإشارة الى الموضوع أعلاه، نرجو من حضرتكم تسهيل مهمة رهام جمال علي حنون والتي هي طالبة في كلية الدراسات العليا في الجامعة العربية الامريكية تخصص ماجستير المعلوماتية الصحية، للحصول على بيانات متعلقة بالعمليات القيصرية في المستشفى (دون المعلومات الشخصية للمرضى) والمرتبطة برسالة الماجستير الخاصة بها حيث تقوم الطالبة باستخدام البيانات المطلوبة الخاصة بوحدة مكافحة العدوى:

Comparative Study: Surgical Site Infection in Planned and Urgent Cesarean Section, at Al - Istishri Arab Hospital

حيث ستجري الباحثة تحليل للبيانات والتوصل لتوصيات هادفة، علما ان البيانات المطلوبة ستستخدم لأغراض البحث العلمي فقط، وقد أعطيت هذه الرسالة بناءً على طلبها.

وتفضلوا بقبول فائق الاحترام والتقدير

عميد كلية الدراسات العليا
د. عبد الرحمن أبو لبدة

كلية الدراسات العليا
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تحول إلى لجنة Ethics Com.
للتوصية و لنظر
في إعطاء الموافقة
20/7/2020

Page 1 of 1
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Appendix (2): IAH infection control measuring tool for SSI.

المستشفى الإستشاري العربي
ISTISHARI ARAB HOSPITAL

أكثر من مجرد مستشفى

Cesarean Section, SSI

1. نوع المقابلة: ----------
2. رقم الهوية: ----------
3. الاسم كامل: ----------
4. العمر: ----------
5. تاريخ القيصرية: ----------
6. نوع القيصرية:
   - Urgent
   - Elective
7. ما هو سبب القيصرية: ----------
8. كم عدد القيصريات السابقة ----------
9. عدد الاحمال: ----------
10. عدد الولادات السابقة: ----------
11. اسم الطبيب: ----------
12. مصدر المعلومات:
    - المريضة نفسها
    - Other :--------

13. نوع الدخول:

- تحويلة طبية من مستشفى اخر
- من البيت

14. عندك أمراض سابقة:
- ضغط
- سكري
- جلطات سابقة
- لا شيء
- Other:

15. المستوى التعليمي:
- جامعي
- توجيهي
- اعدادي
- Other

16. هل اصابك اي مضاعفات في الحمل الحالي :
- نعم
- لا

17. إذا نعم اذكري اسم المرض: ----------

18. هل عانيت من ارتفاع حرارة:

- نعم
- لا

19. إذا كان الجواب نعم هل كان في تحجير بالصدر
- نعم
- لا

20. كم أعلى درجة حرارة وطريقة قياسها؟
- 37>
- 38>
- 39>
- لا قياس
- لا ينـطبق

21. هل الالتهاب يشمل الاتي؟
- قطبة واحدة
- جزء من الجرح

- كل الجرح
- لا ينـطبق

22. هل لاحظت وجود واحدة او أكثر من العلامات التالية؟
- انتفاخ في الجرح
- ألم في الجرح
- سخونة في الجرح
- لا ينـطبق

23. هل لاحظتي وجود افرازات مكان العملية؟
- نعم
- لا

24. لون الافراز :
- دمfresh blood
- دم قديمold blood
- سوائل صفراءserous
- قيحpus
- لا ينطبق

25. هل الجرح مفتوح:
- نعم
- لا

26. هل يوجد عندك احدى العلامات التالية؟
- وجع بطن
- ألم عند اللمس
- افرازات مهبلية ذو رائحة

27. هل راجعتي او زرتي :
- مستشفى
- طبيب
- Other:----------

28. هل تم عمل أحد الإجراءات التالية:

- تنظيف الجرح
- فتح الجرح جزئيا
- إعادة فتح الجرح
- عمل مسحة/زراعة (اين؟)
- Other:----------

29. هل تم وصف مضاد حيوي او اخذتي مضاد حيوي (دواء للالتهاب)؟

- نعم
- لا
- Other: ----------

30. ما هو اسم الدواء المضاد للالتهابات؟

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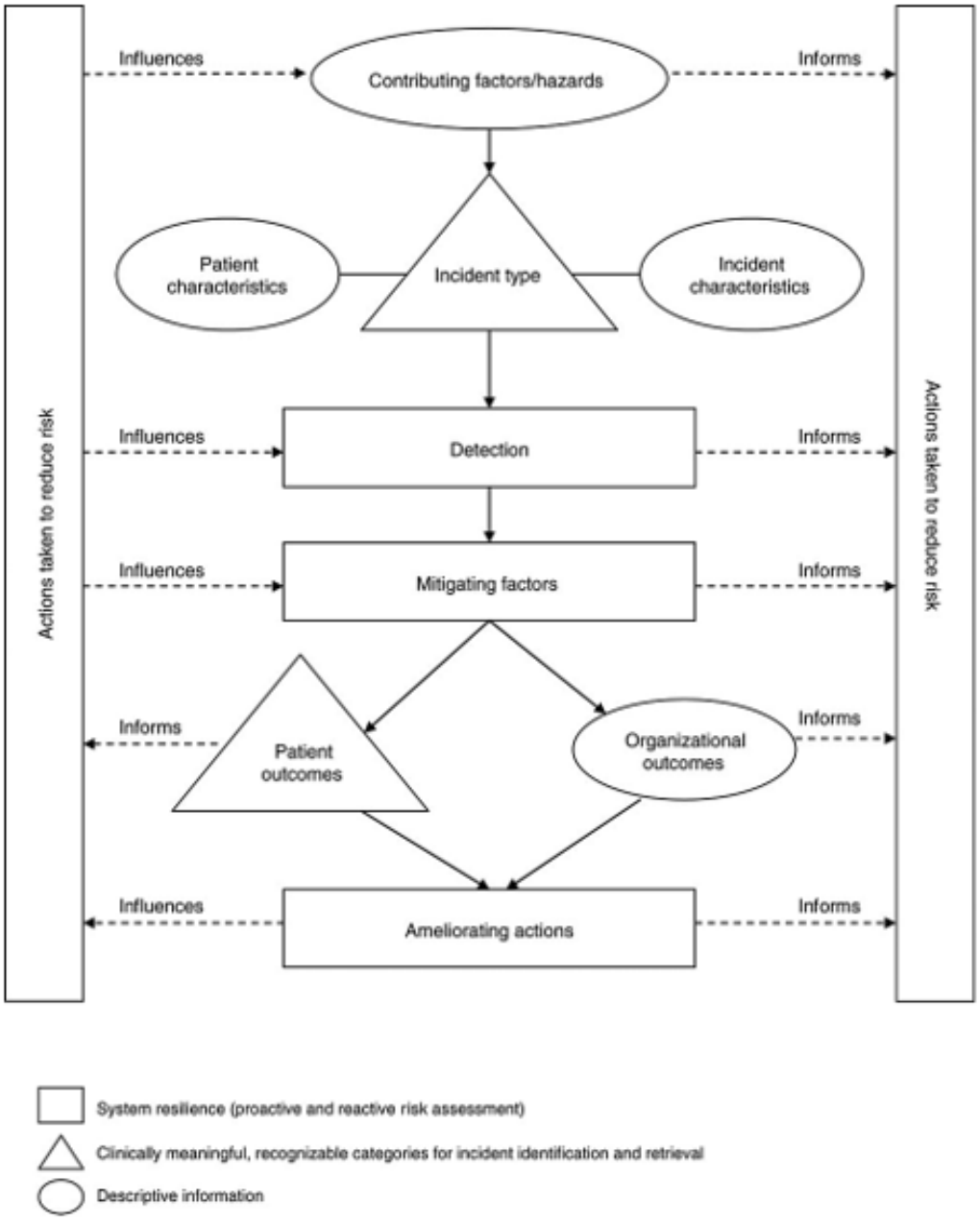
31. كيف كنت تعتنين بالجرح بعد العملية؟

- لا شيء
- حمام يومي مع التجفيف جيدا
- استخدام اليود / كحول/ مواد معقمة

32. التقييم النهائي التهاب بعد النقاش التهاب جراحي؟

- نعم
- لا

Appendix (3) The conceptual framework for the International Classification of Patient Safety WHO. (McElroy, 2016)



Appendix (4) (a) Incident type primary classifications and (b) contributing factor primary classifications (McElroy, 2016)