

# Prevention of Infections in Cesarean Surgery Wounds: Systematic Review

Gladis Fernanda Guamán-Joyasaca<sup>1</sup>, Isabel Cristina Mesa-Cano<sup>1,2</sup>,  
Andrés Alexis Ramírez-Coronel<sup>1,2,3</sup>, Elvia Narcisa Godoy Durán<sup>2</sup>

<sup>1</sup>Master's Degree in Postgraduate Care Management of the Catholic University of Cuenca, Ecuador.

<sup>2</sup>Nursing Career of the Catholic University of Cuenca, Ecuador.

<sup>3</sup>Laboratory of Psychometry, Comparative Psychology and Ethology of the Center for Research, Innovation and Technology Transfer (CIITT) of the Catholic University of Cuenca, Ecuador.

\*Correspondence: Mesa Cano Isabel Cristina

Affiliation: Master in Postgraduate Care Management, Universidad Catolica de Cuenca, Ecuador.

**Abstract:-** The main objective was to determine the factors, techniques and methods that influence the prevention of infections in operative wounds by cesarean section. For this, a systematic review was carried out, with the purpose of configuring a theoretical foundation whose scientific basis contributes to nursing practice worldwide. The methodology applied for this systematic review started from a search strategy where the inclusion and exclusion criteria were identified, the specification of the fundamental keywords for the organized exploration of the publications through medical search engines: Pubmed, medigraph, Scielo, Dialnet, Elsevier, with a maximum seniority of 5 years in Spanish and English. As a result, a selection of 30 high-impact articles was obtained. The main variables were related to infections at the surgical site, caesarean sections, post-caesarean wounds, care and prevention of wound infections. The main findings show a multiplicity of risk factors associated with this type of infection that can be prevented through the appropriateness of antibiotic prophylaxis, correct hair removal, maintenance of normothermia, assessment of functional patterns, maintenance of normoglycemia, Performing cultures and haemociliants in the event of clinical suspicion of possible wound infections and active surveillance of post-cesarean section SSI Among the conclusions, it is worth highlighting that the characterization of infections in cesarean section wounds and the identification of associated risk factors allow us to understand the importance of application of prevention techniques and methods that, from nursing practice, can be applied to avoid postoperative complications in cesarean section such as wound infections.

**Keywords:-** Infections in Surgical Wounds, Wounds, Caesarean Section, Prevention, Care.

## I. INTRODUCTION

Surgical procedures are characterized by a high level of risk due to all the factors that converge in it and the various elements that affect the patient in this type of situation before, during and after the intervention. One of these risks is related to surgical infections caused by bacteria that enter through the incision, where not only the patient's life is at risk, but also contributes to the spread of antibiotic resistance (1).

In this particular regard, such is the incidence of surgical infections in the world that the World Health Organization has established a series of suggestions to prevent this type of infections in the postoperative process. These recommendations not only seek to reduce the prevalence of this type of complications associated with health care in the world, since pilot studies have recorded a reduction of up to 39% in this type of infections after applying these recommendations, but they have also been proposed to deal with antibiotic resistance, which constitutes an alarming situation for medicine due to the risk represented by the lack of efficacy of antibiotics to treat and prevent infections (2).

In this context, cesarean section is one of the surgical procedures with a high risk of postoperative surgical site infections (SSIs) in the short term, because although pregnant women who opt for a cesarean section (by their own choice or by medical suggestion), are exposed to various risks at any stage (before, during or after), it is a surgical procedure whose purpose is to achieve the birth of a live fetus through an incision in the hypogastrium, which allows access to the uterus.

However, despite being a routine procedure, this action has significant numbers of deaths due to complications occurring in this type of practice. In 2015, the World Health Organization (WHO) reported the death of 1500 women per day due to complications of pregnancy, childbirth or puerperium worldwide, including postpartum infections, which are part of this list, since sepsis resulting from this

type of complications has a prevalence of approximately 16% in women between 15 and 49 years old (1).

Likewise, several studies, including one conducted by international organizations such as the World Health Organization, have shown that maternal mortality varies significantly between countries and economic levels, and thus has an unequal global distribution that reflects social inequalities and the difference between rich and poor, between developed and developing countries. 3 For this reason, maternal mortality is included in the Sustainable Development Goals for the fulfillment of the 2030 Agenda, specifically in Goal 3, "Ensure healthy lives and promote well-being for all at all ages" and in relation to this goal, Target 3.1, which seeks to "reduce the global maternal mortality ratio to less than 70% of live births" (4).

Cesarean section is a procedure that is clinically indicated in specific situations that represent a risk for the child and the mother; among the most common indications for cesarean section are: previous cesarean section, dystocia or lack of progression of labor, breech presentation and non-reassuring fetal status (5).

However, international authorities warn that in many cases cesarean section is an unnecessary procedure that can generate a risk that can not only affect the health of the woman but also that of the newborn in the short and medium term since, according to the WHO, cesarean sections can cause significant complications and even death, especially when they are performed in places that lack the optimal conditions for this type of procedure to be safe (6).

Thus, the high incidence rate of cesarean sections in the world is considered a public health problem that stems from specific situations such as inadequate assessment of obstetric risk, low rate of prenatal control, preferences (of the physician and the pregnant woman), erroneous assessment of fetal risk, among others (4).

Consequently, surgical wound infections are frequently one of the major complications of cesarean sections which, although they can result in a serious clinical condition, can be prevented if the risk factors associated with this type of situation are addressed. That is why the American College of Obstetrics and Gynecology recommends that the care taken as part of the postoperative recovery process should be continuous until the wound is free of any risk of infection (7).

For this reason, the present research is carried out with the purpose of determining which are the ideal actions to prevent infections in cesarean section operative wounds, which is possible by identifying the risk factors associated with this type of post-surgical complications.

### **Surgical Site Infection (SSI)**

This is one of the most frequent complications of surgery that derives in a series of clinical problems that have important economic repercussions not only for individuals but also for health systems. This is a type of infection

directly related to operative procedures that occurs in the surgical incision or in its immediate environment during the postoperative surveillance period and includes two main categories: superficial incisional, deep incisional and organ-space or organ-cavitary (8).

Currently, SSI is the third most frequent nosocomial infection and the first complication in surgical patients; 9 among its risk factors, the following stand out:

- The amount of bacterial inoculum. That is, the nature of the pathogen causing the infection and its virulence.
- Insertion of implantable prostheses.
- Duration of surgery.
- Comorbidities.
- Wound type and wound disinfection process.
- Systemic factors (age, sex, transfusions, malnutrition, obesity, diabetes, smoking, anemia, cancer, HIV, among others).
- Wound care (absence of antiseptic washing, inadequate antibiotic dressing).

### **Superficial incisional infection of the surgical site**

This type of infection occurs when the skin and subcutaneous plenum are affected during the first 30 days after surgery and is evidenced by:

- Oozing of pus from the superficial incision.
- Deliberate opening of the incision by the surgeon.
- Spontaneous pain, pain on pressure, localized edema, erythema or heat, localized swelling.

### **Deep incisional infection of the surgical site**

This type of infection occurs at the surgical site and affects the deep soft tissues of the incision 30 days after the operation and is evident when it manifests itself (10):

- Purulent drainage from the deep wound area.
- Spontaneous wound opening.
- Symptoms such as fever higher than 38°, localized pain, hypersensitivity to touch or pressure.
- Abscess.

### **Etiology and pathogenesis of surgical site infection.**

When reference is made to surgical site infections (SSIs), it is necessary to understand the pathogens involved and their origin from the host microbiota present in the skin, mucosa or highly colonized viscera, since the aim is to understand the interaction between these pathogens and the host that give rise to this type of infections in order to know how to deal with them. From a histopathological point of view, it is estimated that about 10,000 microorganisms/g of tissue are necessary for a SSI to occur. Consequently, the virulence of the microorganism responsible for the infection is an intrinsic characteristic of the same, since some can secrete toxins favorable for the release of cytokines which provokes an inflammatory response, while others can inhibit the movement of macrophages, which decreases the effectiveness of the immune response (11).

Thus, the nature of the microorganisms involved in this type of infection depends not only on their anatomical location but also on the type of surgical wound performed and the resulting wound (clean, clean-contaminated or

dirty). 10 From the epidemiological point of view, it is important to emphasize that the vast majority of infections are acquired at the time of surgery, however, there are specific cases in which they are acquired in the postoperative recovery process due to the factors indicated above, this occurs because most of the microorganisms that penetrate the wound are transmitted from some area of the patient's body immediately adjacent to the surgical site (12).

### **Infection of a Wound**

To determine the infection of a surgical wound, a classification model created by the Research Council of the National Academy of Sciences of the United States in 1964 is used, which is based on the clinical estimation and bacterial contamination that identifies them as follows (9).

- Clean Wound: It is the one that is performed in elective surgery and that does not place drains or open the mucous membranes, does not show evidence of infection and does not violate the antiseptic technique.
- Clean-contaminated wound: In this case, it includes those that open the mucous membranes without evidence of infection, where there is minimal spillage of intestinal contents in the cavity, where the aseptic technique is minimally violated or a drain is placed through the wound.
- Contaminated wound: This is a surgical wound where any of the following conditions are present: opening of the mucosa with evidence of infection without pus, significant spillage of intestinal contents into the cavity, traumatic wound within 4 hours of the accident.
- Dirty wound: These cases occur when there is evidence of purulent inflammation in the opening of tissues, in traumatic wounds after 4 hours after the accident, wounds with foreign bodies or contaminated with fecal matter or any other infectious agent. Each of these classifications is assessed according to the following parameters which are established as maximum infection rates and are universally accepted and used and recognized as the Altemeier classification to determine the risk of contamination and postoperative infection according to the types of surgical interventions (9).

Although the risk of a wound becoming infected in the postoperative process, there are preventive actions that should and can be applied to avoid more serious complications. Thus, it is necessary to care for the wound thoroughly by performing the following actions (13):

- Protect the wound with sterile dressing within 24 to 48 hours.
- Clean hands and utensils before and after changing the dressing, as well as before any contact with the surgical site.

### **Cesarean sections**

Cesarean section is a surgical intervention that is part of the delivery process and is generally performed as an alternative when there are specific risk situations for both the mother and the baby. In this sense, it is an obstetric procedure that is fundamental in medical practice to avoid and reduce harm to the newborn and the mother.

In this sense, they can be classified as: first class cesarean section (when this intervention is performed for the first time); elective cesarean section (in order to avoid risks and suffering for the mother and child); iterative cesarean section (when there is a history of 2 or more cesarean sections) programmed cesarean section (indicated according to specific factors indicated in the prenatal control) and, finally, emergency cesarean section (when the need arises as a result of unforeseen complications).

### **Cesarean section operative wound infections**

When a pregnant woman undergoes a cesarean section, she runs the risk of suffering complications in any of the phases of the process (preoperative, operative and postoperative). In the case of the latter, puerperal infection is one of the main complications of the obstetric patient whose incidence continues to be high in the world in spite of important advances in contemporary Obstetrics. This situation is due to the fact that this type of complication is conditioned by multiple factors.

In this context, septic post-cesarean section surgical wound is a hospital-acquired infection that is considered an important health problem whose incidence is directly related to the quality of the care provided. As has already been noted, there are multiple complications and the risk of postoperative infection that a woman who has undergone cesarean section may suffer because it is not only the short-term care she receives for recovery from this intervention, but also the adherence that the patient is able to have once she leaves the health care center (14).

It is important to understand that cesarean wound infections share the characteristics of wound infections in general, since among the microorganisms most commonly identified as causing surgical wound infection are: *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus aureus* and *Escherichia coli* which are found inside the organism as the main contaminating agent of the operative wound and the surgical site which also depends on the type of surgery that has been performed; but the external flora present in the surgical environment, instruments, personnel, among other environmental factors that significantly affect the appearance of this type of complications can also participate (15).

Consequently, operative wound infection is one of the most frequent complications related to cesarean sections, where an overall rate of 3.6% has been determined, a figure that rises in cases of emergency cesarean sections with a rate of 11.7%. There are several risk factors that affect the manifestation of this type of infection, however, several studies warn that the techniques used by gynecologists for this procedure have a significant impact on its appearance (16).

### **Post cesarean wound care**

Due to the high rate of cesarean sections performed in the world, it is necessary to recognize the care required for the surgical wound after this procedure, since an alteration in the healing process can generate undesirable

complications such as an infection that can have side effects with important repercussions on the mother's health. It is important to understand that during the gestation process there are significant transformations in the structure of the skin due to mechanical and hormonal changes, one of them is the tension to which the skin is subjected due to the increase in abdominal volume, which affects wound closure (17).

In this sense, it is convenient to explore the processes and techniques of post-cesarean surgical wound healing in order to prevent surgical site infections; among these techniques are: drains, pressure therapy, silver impregnated gauze, pulsed electromagnetic field devices (PEMF), silicone dressing (18).

### **Negative pressure therapy**

This is a dynamic and non-invasive healing technique that consists of applying a pressure lower than atmospheric pressure to the wound in a controlled manner. It is based on the placement of special dressings that act as padding (it can be antimicrobial gauze) and that must be adjusted to the surface and to the wound. This technique acts in such a way as to stimulate the outflow of fluids by virtue of decreasing tissue edema and thereby promoting a progressive increase in local blood circulation (17)

This technique is widely used in post-cesarean wound healing processes because it keeps the wound isolated from external contamination, reduces the bacterial load and thus controls and prevents infection. However, for it to be effective, some basic requirements must be met, which are (19):

Diagnostic adequate.

- Clean wounds without contaminating residues.
- Adequate blood supply.
- Use of compressive garments.
- Adequate glycemetic control.
- Wound control through drainage.

### **Silver-impregnated gauze**

Its purpose is to provide antimicrobial protection against possible bacteria introduced in the operating room and it is a dressing containing polymeric substrate that should be checked 2 and 7 days after surgery.

### **Pulsed electromagnetic field devices (PEMFs)**

It is used to promote healing and is applied to the surgical wound once it is closed so that a timed low-voltage therapeutic radiofrequency field acts on the wound.

### **Silicone dressing**

It acts in conjunction with occlusion to increase the temperature that affects the increase of fibroblast and collagen activity; generally, it is indicated in people who present a deficient healing process.

### **Prevention of postoperative cesarean wound infections**

This type of infections that occur in the cesarean section wound after surgery can be avoided through the care

provided by adequate antibiotic treatment, surgical drainage and metabolic and hemodynamic support of the patient, especially when risk factors or clinical suspicions are detected beforehand where this type of infection can develop (20).

From the preventive point of view, there are several significant actions that the nurse can perform to avoid infection in the postoperative cesarean wound; among them, the assessments that can be performed so that the patient can continue the care routine once she is discharged from the health care center.

The nursing process makes it possible to systematize the interventions for the care of post cesarean section women in order to support the discipline in a work method.<sup>21</sup> In the specific case of post cesarean section women, such care is prolonged for more than eight days in order to recover their normal activity; when favorable conditions are present and the woman has an adequate recovery, the surgical procedure should not present major risks for the mothers.

In this context, although there is no single method for the care of post cesarean section wounds, there are various nursing techniques and methods that can be used to care for the wound properly and prevent serious complications such as infections. In this regard, several studies refer to the importance of nursing assessment as a preventive action that leads to a good care practice by the patient and her caregivers, for this, nursing specialists can rely on tools such as M. Gordon's Functional Patterns that allow configuring the behavior of certain patients in favor of an adequate post-surgical care that can have a significant impact on the prevention of infections in cesarean section wounds (22).

This type of systematic and premeditated assessment is based on a significant amount of relevant information and data provided by the patient (physical, psychological, social and environmental) that contribute to a treatment plan that adjusts to the reality identified after the assessment. Thus, M. Gordon's Functional Patterns focus on the recognition of 11 areas that affect people's health, ranging from the perception and management of health to the values and beliefs described below.

### **Perception-management of health**

This is the way in which the individual perceives his or her health, well-being and how he or she manages everything related to his or her health, especially important for the maintenance and recovery processes. This is one of the patterns that allow, to a large extent, to evaluate the patient's adherence to treatment and the preventive practices that he/she will carry out in favor of his/her recovery.

### **Metabolic Nutritional**

It is a pattern that allows to evaluate the food and liquid consumption habits in relation to their metabolic needs and to determine if there are problems in their intake and to identify the characteristics of the skin and mucosa. In the case of infection prevention in postoperative cesarean



section wounds, it is important because it allows the identification of associated risks such as dermatological problems or if there are foods contraindicated in the recovery process in the diet.

#### ***Elimination***

In this case, the characteristics of the excretory function are described in order to identify the routines or use of devices, production and control because they can be a source of infectious agents.

#### ***Activity Exercise***

In this particular, this pattern is related to the capabilities for autonomous mobility to recognize the level of autonomy of the individual and the capacity he/she will have to perform his/her activities in a prudent way so that it does not affect the recovery process of the postoperative cesarean wound.

#### ***Sleep-rest***

Describes the patterns of sleep, rest and relaxation throughout the day and the individual uses and habits to achieve them.

#### ***Cognitive-perceptual***

This pattern tests the cognitive abilities related to decision making, memory and language and allows determining the existence or not of pain and the capacity of its visual, auditory, tactile and olfactory functions that allow identifying any type of abnormality in the body, especially in the wound in question.

#### ***Self-perception-self-concept***

In this case it is a pattern that describes the way in which the individual perceives and recognizes himself, which will allow to recognize through his attitudes whether or not he will comply with the treatment according to his desire to recover.

#### ***Role-relationships***

It represents an important pattern because it allows to identify which are the responsibilities that the patient has in her family, because in the case of women when they must comply with postoperative care to avoid wound infections, the role they play in the family is vital because it significantly influences how much rest or not she is willing to keep.

#### ***Sexuality-reproduction***

This is important information because sexual relations are contraindicated in the recovery process of the woman after a cesarean section, since it also avoids the risk of possible infections in the wound. Therefore, if there is a complex pattern in this area, the risk of infection may increase.

#### ***Adaptation-tolerance to stress***

In this case this is a pattern that allows us to identify the patient's capacity and willingness to apply and adhere to the treatment referred to by virtue of his adaptability, ways of handling stress, capacity to control situations, which will

allow us to know whether or not the patient is capable of handling the situation involved in his recovery treatment.

#### ***Values-beliefs***

This is a pattern that allows us to assess the patient's beliefs that guide their decisions and opinions in relation to their health.

## **II. METHODOLOGY**

#### **Type of research**

The present study is a systematic review of cross-sectional type that was carried out from the bibliographic and documentary deepening that began with a search strategy to determine the inclusion and exclusion criteria, as well as the health descriptors specified through the keywords used in the search through the respective databases.

#### ***Inclusion criteria***

- Randomized, descriptive, cross-sectional, clinical studies.
- Studies that are linked to the key words.
- That the main study variables are related to infections in cesarean operative wounds.
- Studies in Spanish and English.
- Must be a maximum of 6 years old (2015-2021).

#### ***Exclusion criteria***

- Descriptive studies or systematic reviews.
- Studies prior to 2015.
- Studies that do not coincide with the research variables.
- Studies in a language other than English or Spanish.

#### ***Bibliographic search***

In this case, the following keywords were initially established: infections, wounds, pregnancy complications, cesarean section, puerperal women with cesarean section, incisional infection, postoperative prevention, postoperative complications, postoperative care. The search was carried out through the following search engines: PubMed, Medigraphic, Scielo, Dialnet, Elsevier.

#### ***Procedure***

The development of the study was carried out in phases. In the first phase, the topic was identified and the scientific question that guided the development of the study was formulated, which allowed establishing the research objectives: What are the applicable nursing techniques and procedures to prevent infections in cesarean section wounds? What risk factors are associated with infections in cesarean section operative wounds? How can infections in cesarean section wounds be prevented?

In the second phase, the search strategy was established, which included the inclusion and exclusion criteria, as well as the key words that led to the next phase, which included the primary search for publications that met the established criteria, for which the following were reviewed: title of the article, year of publication, type of study and key words. Subsequently, the fourth phase consisted of a more in-depth review of the articles selected

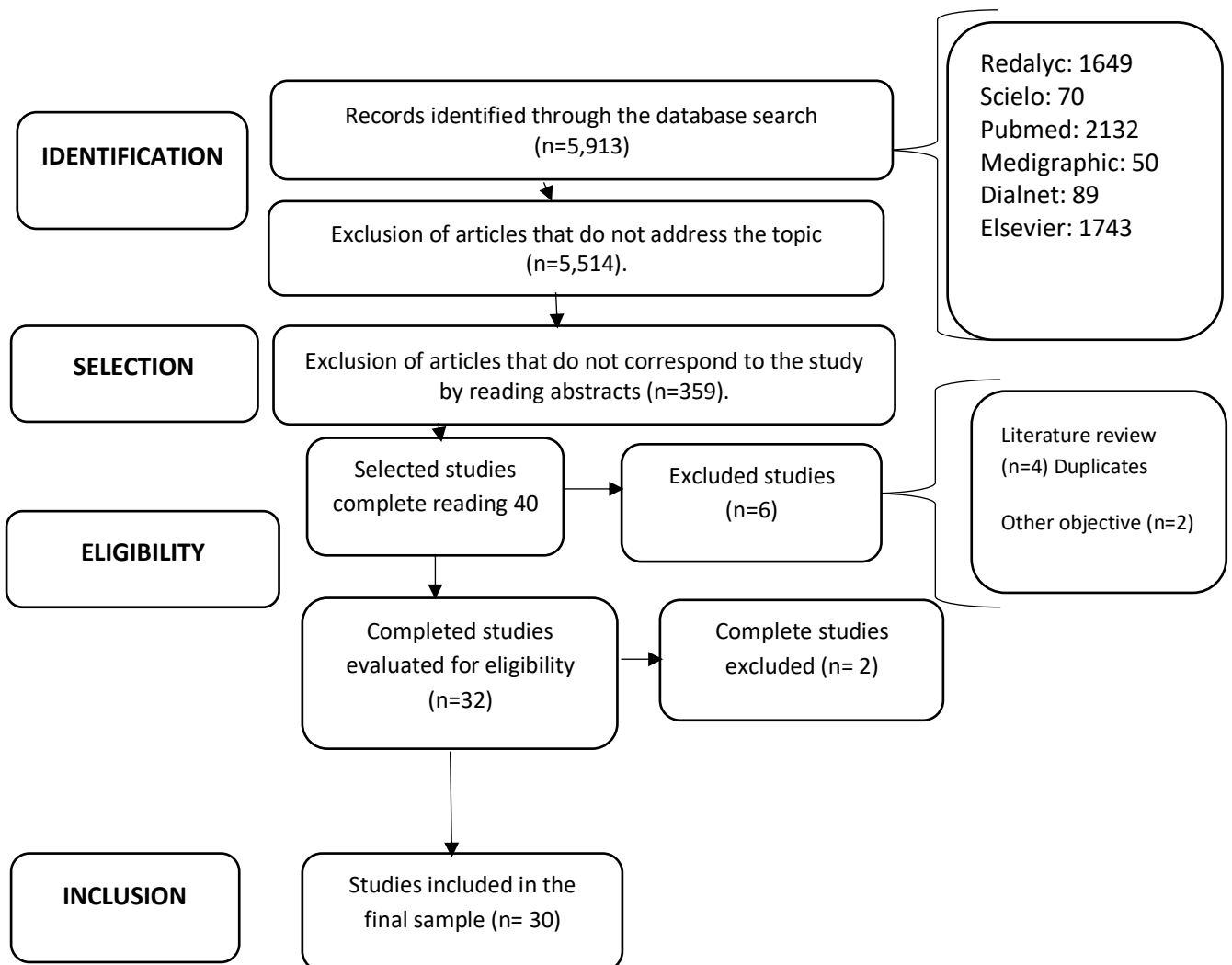
in the previous phase, for which the following were evaluated: the abstract, associated variables, results or findings.

Finally, the relevant information associated with the object of study of the present research was compiled, the results obtained were interpreted and the main dissertations of the subject of study were presented through discussion to finally draw conclusions.

### III. RESULTS

The results of the systematic review of the publications that were consulted according to the search strategies applied are presented below, where a total of 5913 documents were initially found. After applying the inclusion and exclusion criteria, a total of 399 articles remained, of which 40 were used for complete reading as a result of the review of the association of key words and the abstracts. Finally, a total of 30 studies were included in the final sample, which are presented below according to the identification, selection, eligibility and inclusion phases required for this type of systematic review.

**Figure 1** Search strategy. Prepared by: The author.



Among the main results obtained from the systematic review of each of the studies are that infection in the operative wound usually appears only around the 3rd and 10th day after surgery, with symptoms such as persistent fever and pain in spite of adequate antimicrobial treatment, as well as the appearance of incisional erythema, hardening and secretion of the surgical scar (22).

Likewise, among the most common factors that predispose to this type of infection after cesarean section are: the presence of bacteria in surgically devitalized tissues, intramietrial lymphatic vessels exposed to bacterial invasion, moderate blood loss, decreased immune response, low socioeconomic status that exposes them to unhealthy environments or with high exposure to contaminating agents (water, dust, dirt, among others), obesity, anemia, general anesthesia (13).

Specific studies revealed cases where wound infection was present in at least 5 % of the total number of cesarean sections performed, where monomicrobial infections prevailed in 88.7 %, with gram-positive bacteria in 59.4 %. Staphylococcus aureus was the predominant microorganism. In this study, urgent cesarean sections predominated (91.9 %), with clean contaminated wounds (93.5 %) and superficial incisional infections (53.2 %) (12).

As for the variables considered in the studies reviewed to determine the factors that influence the occurrence of infections in post cesarean section wounds, the following stand out: those dependent on the patient, the surgical act, the material resources and the postoperative period, as shown in the following table (23)

**Table 1.** Risk factors associated with cesarean wound infections.

<b>Risk Factors</b>	<b>Description</b>
<b>Dependent on the patient</b>	Immune status
	Baseline diseases (Diabetes Mellitus)
	Tobacco habits
	Nutritional status
	Pre- and post-surgical hospital stay
	Transfusions
<b>Dependent on the surgical procedure</b>	Preoperative shower with antiseptics
	Shaving
	Cleaning
	Antibiotic prophylaxis
	Surgical technique used
<b>Dependent on material resources</b>	Operating rooms (cleaning)
	Use of sanitary garments (masks, gloves, caps, gowns)
<b>Dependent on the postoperative period</b>	Wound care

Finally, the reviewed studies present the following preventive measures to avoid post cesarean wound infections: adequate antibiotic prophylaxis, correct hair removal, maintenance of normothermia, assessment of functional patterns, maintenance of normoglycemia, culture and blood cultures in case of clinical suspicion of possible wound infections, and active surveillance of post cesarean SSIs (24).

**IV. DISCUSSION**

The high rates of cesarean sections practiced in the world make it evident that there are non-clinical factors that influence the decision to undergo this type of procedure, since according to various studies 13 it has been identified that socioeconomic factors, demographic and reproductive characteristics and factors related to health services also influence this type of decision.

Among the findings of the study, it is necessary to highlight the manifest need for specialists to recognize the causes of these infections, which is a premise shared in research that refers to the fact that this type of situation, which represents a public health problem, has not been handled correctly because the consequences and scope of this type of infection are not visualized due to the lack of a reliable database, which is why the mortality associated with SSIs is so high (25).

In this order of ideas, the multiple risk factors that contribute to this type of infection require more studies that demonstrate greater scientific evidence in SSI, in cesarean section procedures that begin at the time of surgery and whose main determinants are the healthcare personnel involved, the pathogen and the patient. This conception is shared with the scientific evidence found in this study, which shows that there are a multitude of factors that can not only alter the host defense mechanisms but can also be intrinsic or extrinsic (26).

Regardless of the route of termination of pregnancy (delivery or cesarean section), all women are at high risk of infectious complications. The success of prenatal care lies in identifying patients with risk factors in a timely manner and thus providing appropriate treatment.

According to other research, women who terminate pregnancy by cesarean section and do not receive antimicrobial prophylaxis have a 5 to 20 times higher risk of infection than those who terminate by delivery (27).

Thus, the multiple findings demonstrate the importance of implementing preventive programs to improve patient safety and reduce health care costs (28).

In this regard, it should be noted that the prevention of this type of complications, as well as the risk factors, is multidimensional and requires the participation of different specialists. In the case of nursing, the prevention of this type of infection starts from the moment the patient leaves the operating room and begins her recovery process, since this reality identified in the present study is shared with the approach of other research and clinical recommendations where it is necessary to apply measures of assessment, identification and evaluation of the patient through the method such as M Gordon's Functional Patterns.22

Finally, it was evident that the presence of modifiable and controllable risk factors in pregnant women conditions the appearance of infections, which demands adequate prenatal control as well as compliance with infection prevention protocols and permanent epidemiological surveillance (29,30,31).

## V. CONCLUSIONS

The characterization of cesarean wound infections and the identification of the associated risk factors allow us to understand the importance of the application of prevention techniques and methods that, from nursing practice, can be applied to avoid postoperative complications in cesarean section, as is the case of wound infections. Thus, the findings show that most of the infections that occur in women who have undergone cesarean section are related to socioeconomic factors, the duration of the surgery, the technique used by the surgeon and the level of vulnerability of the patient.

Likewise, the study shows that in addition to hygiene by health professionals in postoperative care and the techniques they apply for this purpose, such as dressings or negative pressure therapy, are not sufficient to prevent this type of complications. In this order of ideas, it is concluded that, from the nursing practice, the evaluation and assessment made by the professional about the patient's characteristics in relation to the patient's capacity to continue the wound care once he/she leaves the health care center, is significant because it allows to determine the type of treatment required and to guarantee in some way his/her adherence.

For this reason, it is advisable to use methods such as M Gordon's functional parameters in this type of scenario as a way to optimize the care required for this type of wound and thus prevent infections in cesarean section wounds.

## ACKNOWLEDGMENT

To the Coordinator and Teachers of the Master's Degree in Care Management of the Catholic University of Cuenca and to the Psychometrics Laboratory, Comparative Psychology and Ethology of the Center for Research, Innovation and Technology Transfer (CIITT).

## SOURCE OF FINANCING

This study is self-financed

## CONFLICT OF INTEREST

There are no personal, professional or other conflicts of interest.

## REFERENCES

- [1]. WHO. Antibiotic resistance. 2021 (cited on 26 February 2021). Available at: <https://www.who.int/es/news-room/fact-sheets/detail/resistencia-a-los-antibi%C3%B3ticos>
- [2]. WHO. WHO recommends 29 ways to stop surgical infections and prevent multidrug-resistant microorganisms. 2016 (cited 26 February 2021). Available at: <https://www.who.int/es/news/item/03-11-2016-who-recommends-29-ways-to-stop-surgical-infections-and-avoid-superbugs>
- [3]. World Health Organization. Maternal, newborn, child and adolescent health. 2015 (cited 26 February 2021). Available at: [https://www.who.int/maternal\\_child\\_adolescent/topics/maternal/maternal\\_perinatal/es/](https://www.who.int/maternal_child_adolescent/topics/maternal/maternal_perinatal/es/)
- [4]. World Health Organization. Sustainable Development Goals Targets. 2015 (cited on 26 February 2021). Available at: <https://www.who.int/topics/sustainable-development-goals/targets/es/>
- [5]. Aguiar da Cruz L, Vieira L, Moura R, De Souza L, Teixeira C. Operative wound infection after cesarean section in a public hospital in Fortaleza. *Global Nursing Journal*. [Internet]. 2013 [Accessed 28 February 2021]; 29: 105-117. Available in: <http://scielo.isciii.es/pdf/eg/v12n29/clinica5.pdf>
- [6]. WHO. WHO statement on caesarean section rates. Geneva: WHO; 2015.
- [7]. Mayo Clinic. Cesarean section. 2020 (cited February 26, 2021). Available at: <https://www.mayoclinic.org/es-es/tests-procedures/c-section/about/pac-20393655>
- [8]. Badia J. Surgical site infection: definition, classification and risk factors. *Clinical Guides of the Spanish Association of Surgeons*. Madrid: Aran; 2016.
- [9]. Rodríguez Z, Fernández O, Ochoa G, Romero L. Some considerations on surgical infections. *Cuban Journal of Surgery*. [Internet]. 2017 [Accessed 28 February 2021]; 56(2): 46-58. Available at: Available at:



- <https://www.medigraphic.com/pdfs/cubcir/rcc-2017/rcc172e.pdf>
- [10]. Franco R. Epidemiologic surveillance of surgical site infection in orthopedics. *OrthotipsAmot*. [Internet]. 2020 [Accessed 28 February 2021]; 16(1):7-15. Available in: <https://www.medigraphic.com/pdfs/orthotips/ot-2020/ot201b.pdf>
- [11]. Sánchez B. Infecciones asociadas a procedimientos quirúrgicos. (Trabajo de Grado). Universidad de la Laguna. España; 2017.
- [12]. Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz R. Centers for Disease Control and Prevention. Guideline for the prevention of surgical site infection. *JAMA Surg*. [Internet]. 2017 [Consultado 28 febrero 2021]; 152 :784-791. Disponible en: <http://dx.doi.org/10.1001/jamasurg.2017.0904>
- [13]. Jiménez, M. Moore, J. Quintero, G. Lerma, C. Nieto, J. Fajardo, R. Guide for the prevention of operative site infection (ISO). Colombian Association of Surgery. (2015). Available at: <https://www.ascolcirugia.org/images/resources/PDF/guiasCirugia/prevencionDeLaISO.pdf>
- [14]. Ramírez Y, Zayas A, Infante S, Ramírez Y, Mesa I, Montoto V. Surgical site infection in postpartum women with cesarean section. *Revista Cubana Obstétrica Ginecológica*. [Internet]. 2016 [Accessed 26 February 2021]; 42(1): 2-14. Available in: [http://scielo.sld.cu/scielo.php?script=sci\\_arttext&pid=S0138-600X2016000100005#:~:text=La%20infecci%C3%B3n%20del%20sitio%20quir%C3%BArgico,30%20%25%20de%20las%20operaciones%20ces%C3%A1reas](http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0138-600X2016000100005#:~:text=La%20infecci%C3%B3n%20del%20sitio%20quir%C3%BArgico,30%20%25%20de%20las%20operaciones%20ces%C3%A1reas)
- [15]. Morales R, Badia JM. Control of the septic focus in surgical infection. By: Badia JM, Guirao X. *Infecciones quirúrgicas. Guías clínicas da associação espanhola de cirujanos*. 2nd ed. Madrid: Arán Ediciones SL; 2016.
- [16]. Puma J, Díaz J, Caparó C. Maternal complications of cesarean section in term pregnant women in the third stage of labor in a general hospital in Lima, Peru. *Rev Med Hered*. [Internet]. 2015 [Accessed 25 February 2021]; (26):17-23. Available in: <http://www.scielo.org.pe/pdf/rmh/v26n1/a04v26n1.pdf>
- [17]. Rodríguez M, Valerdez S. Negative pressure therapy in pregnant patients: A race against time. *Wounds and Healing*. [Internet]. 2018 [Accessed 25 February 2021];1(9):14-18. Available in: <https://revistas.proeditio.com/jonnpr/article/view/3827>
- [18]. Gonzalez E. Care of the surgical wound after cesarean section. *Midwifery Profession*. [Internet]. 2019 [Accessed 26 February 2021];20(2):63-64. Available at: [https://www.researchgate.net/publication/338792698\\_Cuidados\\_de\\_la\\_herida\\_quirurgica\\_tras\\_cesarea](https://www.researchgate.net/publication/338792698_Cuidados_de_la_herida_quirurgica_tras_cesarea)
- [19]. Felemovicius J, Lopez R. Use of negative pressure therapy in the treatment of complex wounds. Report of 4 cases. *Anales Médicos*. [Internet]. 2015 [Accessed 25 February 2021]; 60(2):141-147. Available in: <https://www.medigraphic.com/pdfs/abc/bc-2015/bc152k.pdf>
- [20]. Santalla A, López M, Ruiz M, Fernández J, Gallo J, Montoya F. Surgical wound infection. Prevention and treatment.
- [21]. García C, Flores M, Gómez V, Gordillo A, García C. Nursing process in post cesarean patients: A challenge for the Mexiquense health sector. *Revista Universidad Autónoma del Estado de México*. [Internet]. 2015 [Accessed 25 February 2021]; 29-36. Available in: [http://web.uaemex.mx/revistahorizontes/docs/revistas/Vol5/3\\_PROCESO.pdf](http://web.uaemex.mx/revistahorizontes/docs/revistas/Vol5/3_PROCESO.pdf)
- [22]. NANDA International. *Nursing diagnoses. Definitions and classification 2018-2020*. Barcelona: Elsevier; 2019
- [23]. Vallejo M, et al. Independent risk factors for surgical site infection after cesarean delivery in a rural tertiary care medical center. *J Anesth*. [Internet] 2016 [Accessed 28 February 2021]; 31(1): 120-126. Available in: <https://doi.org/10.1007/s00540-016-2266-2>
- [24]. MSCBS. *Methodology applicable to NE IG standards*. Spain: MSCBS; 2020. Available from:
- [25]. <https://www.mscbs.gob.es/estadEstudios/estadisticas/docs/01Indice.pdf>
- [26]. Vásconez M, Reyes E, García J. Surgical site management as a risk for wound infection in hospitalized patients. *Pol. Con*. [Internet] 2019 [Accessed 25 February 2021]; 4(10): 162-196. DOI: 10.23857/pc.v4i10.1163 Available from: <http://clinicainfectologica2hnc.webs.fcm.unc.edu.ar/files/2018/03/Manejo-de-las-infecciones-de-la-herida-quir%C3%BArgica.pdf>
- [27]. Rael S, López V. Risk factors contributing to surgical site infection. *Metas Enferm*. [Internet] 2016 [Accessed 26 February 2021];19(6):14-20. Available in: <https://www.enfermeria21.com/revistas/metas/articulo/80942/factores-de-riesgo-que-contribuyen-a-la-infeccion-del-sitio-quirurgico/>
- [28]. Martínez C, García J, Cepeda A. Evaluation of post cesarean infection control through the implementation of a preventive program. *Gynecol Obstet Mex*. [Internet] 2019 [Accessed 26 February 2021]; 87(4):228-233. Available in: <https://www.medigraphic.com/pdfs/ginobsmex/gom-2019/gom194c.pdf>
- [29]. Hernández E, Esparza S, Reyes A. Effectiveness of a surgical site infection prevention model in a second level care hospital. *Index Enferm*. [Internet] 2020 [Accessed 28 February 2021]; 29(1). Available in: [http://scielo.isciii.es/scielo.php?script=sci\\_arttext&pid=S1132-12962020000100003](http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1132-12962020000100003)

- [30]. MSCBS. Methodology applicable to NE IG standards. Spain: MSCBS; 2020. Available in:
- [31]. <https://www.mscbs.gob.es/estadEstudios/estadisticas/docs/01Indice.pdf>
- [32]. Campa, Elizabeth M. 2020. Cesarean Wound Care After Hospital Discharge: A Qualitative Study in Rural Haiti. Master's thesis, Harvard Medical School.
- [33]. Alnajjar, M.S., Alashker, D.A. Surgical site infections following caesarean sections at Emirati teaching hospital: Incidence and implicated factors. *Sci Rep.* [Internet] 2020 [Consultado 28 febrero 2021]; 10:18702. Disponible en: <https://doi.org/10.1038/s41598-020-75582-9>