



Suturing Vs. Stapler and wound infection in Cesarean section; A systematic review

Mohamed Abdelsattar and Mohannad Abousaadah

Department of Obstetrics & Gynecology, Ohud general hospital, MOH-KSA

Corresponding author: mohammadabdelsattar76@gmail.com

Abstract

Background:

Cesarean section is a very common operation carried out to save maternal and fetal lives. Similar to any surgery, a cesarean procedure carries some complications, including wound infection. The method of closing the wound and the used material can contribute to the development of wound infection. The most common methods for the closure of cesarean wounds are staples and subcuticular sutures.

Aim:

To compare the occurrence of wound infection following suturing and stapling for wound closure in cesarean section.

Methods:

The search process was adopted through scientific databases and using related terms. The eligible articles were those written in English, reported original findings, focused on cesarean procedure, compared staples and suturing, and reported wound infection rates.

Results:

Twelve studies with 5003 women who underwent cesarean delivery were included based on the determined criteria. Similar rates of wound infection between both methods were reported in three studies, whereas the remaining nine studies reported higher rates of infection for the stapling technique.

Conclusion:

Stapler was associated with higher rates of wound infection after cesarean section compared to suturing. However, the risk estimation couldn't be determined due to the lack of reported risk in the included studies.

Keywords: CS, Wound closure, Suturing, Stapler.

Introduction

Cesarean section (CS) is a very common procedure for childbirth globally [1] in order to save the lives of mothers and their fetuses [2]. Despite the recommendation regarding the rate of CS not to exceed 15%, several countries reported much higher rates of CS [3]. The rate of CS, including primary and repeated CS has risen dramatically over the last decades [2]. The increased rate of CS is associated with increasing rates of complications [4]. Wound complications are a main source of morbidity following CS and are associated with increased hospital stay and readmission rate [3, 5]. Almost 5% of women who perform CS experience wound complications such as infection, hematoma, and seroma [6]. Others reported that wound complications occur among 2.5-16% of CS cases [7].

There are various factors that contribute to wound complications of CS, including wound closure; however, the optimal strategy of wound closure to reduce such complications isn't known [8]. Surgical wound closure refers to closing the dermal flaps to facilitate rapid healing with few complications and achieve satisfying cosmetic outcomes [9]. Additionally, professional personnel have an ongoing debate regarding the most effective strategy for closing the uterus after CS [10]. The selection of method and material for wound closure is affected by the surgery type, length of the incision, and the wound anatomical site [11].

The ideal method of closing a wound should result in minimal postsurgical pain and wound complications, be rapidly accomplished, and produce cosmetic outcomes acceptable to women [12]. The most common methods for the closure of cesarean wounds are staples and subcuticular sutures [4]. Staple is a disposable skin stapler with high speed [13]. Suturing is the most frequently used method for incision site closure [11]. There are thousands of available suturing materials which can be synthetic or natural, absorbable or non-absorbable, braided or monofilament [14].

Sutures have the disadvantage of increasing the time of application and having inferior cosmetic outcomes with scars [15]. On the other hand, staplers are superior to suturing due to their disposable nature, reduced time of wound closure, reduced risk of contamination [16], and improved cosmetic outcomes [15].

However, there is a debate regarding skin closure at CS between skin staples and subcuticular suturing [17]. Previous literature compared staples and sutures and reported conflicting findings [18-23]. Additionally, the previously reported analysis that compared between the two methods didn't focus on wound infection and reported wound complications generally or the outcomes of each closing method [5]. So, this systematic review was performed to compare the occurrence of wound infection following suturing and stapling for wound closure in cesarean section.

Method

Search strategy:

According to the guidance of the PRISMA [24], this systematic review was written. The first step involved searching for related studies through the scientific websites PubMed, Web of Science, BASE, and Google Scholar. The search was limited to ten years starting from 2015 till now. The terms used for searching procedure, included "Suturing, Stapling, Stapler, Material, Suture, Techniques, Wound, Infection, Closure, CS, and Comparison." All produced titles were revised thoroughly to avoid missing potential research.

Eligibility criteria:

The obtained studies were then checked to exclude articles reporting suturing and/or stapling regarding other procedures. Also, articles reporting one type of closure technique were excluded. Duplicate articles were excluded to avoid duplication of data. The abstracts of the articles were revised, then studies that didn't report study design were excluded. However, all study designs were eligible. The articles that

compared between the two closure methods and didn't report the wound infection for both techniques were excluded. Therefore, eligible

articles were those written in English, based on original data, available for full-text. The scheme of selection criteria is shown in Figure 1.

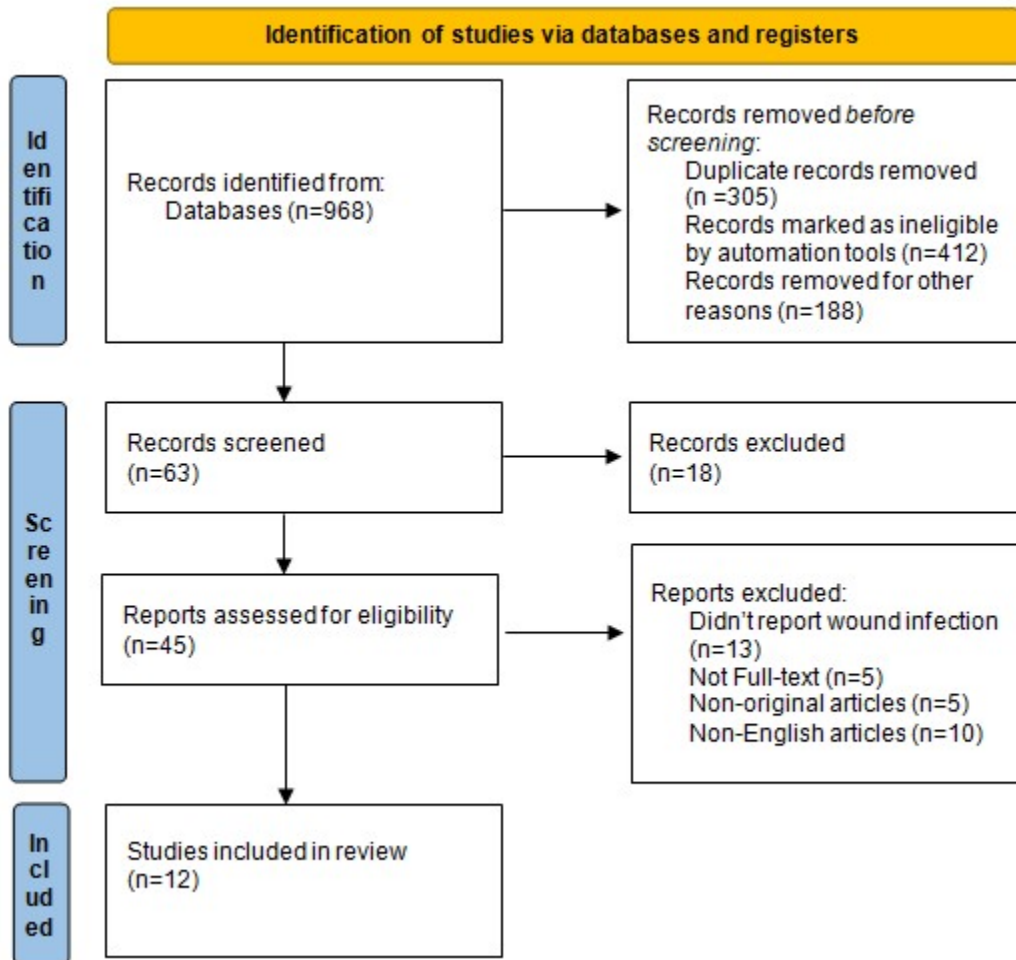


Fig 1: Scheme of selection criteria

Data review and analysis:

A preview was performed for all included articles with a more precise review of the abstract to determine the data of interest for extraction. The data was then extracted by precise reviewing of the full articles and extraction of data using an Excel sheet. The extracted data was then summarized in one table under major titles.

Results

Twelve articles fulfilled the particular criteria [25-36] (Table 1) and were included in this review. The studies were published between 2016 and 2023. The study designs included comparative

[25], prospective observational [26], prospective comparative [27, 28, 35], trials [29-33], and retrospective [35, 36]. Two studies compared three techniques of closure, mattress, subcuticular suture, and stapler [25, 30]. The remaining studies compared between sutures which were applied using different types of sutures and staplers. Suturing was performed using absorbable subcuticular [26], delayed absorbable [27], prolene suture [28, 33], subcuticular [31, 36], undyed [32], subcuticular of poliglecaprone or polyglactin [34], non-absorbable silk [35], but one study didn't state the suture type [29]. Stapler was specified in one study as absorbable subcuticular [32].

Table 1: The summarized extracted data

Author and Publication year	Study design	Closure technique	Characteristics	Results and main findings
Chaurasia et al 2023 [25]	Comparative	*Interrupted Mattress using ethilon 2.0 suture (A) *Subcuticular suture using ethilon 2.0 suture (B) *Staple (C)	-N=246 *A=83 *B=82 *C=81 -Primary CS with PI	*There were no considerable differences between groups regarding wound infection on day four post-surgery, including healthy, induration, and discharge, and regarding day eight including the same parameters. *Staples and suturing are associated with similar wound complications.
Shrestha et al 2022 [26]	Prospective observational	*Stapler *Absorbable subcuticular suture	-N=353 *Stapler=91 *Suture=262 -CS	*Wound was unhealthy among 1.98%; 71.4% of the stapler and 28.6% of suture groups (P=0.01).
Arpitha et al 2022 [27]	Prospective Comparative	*Stapler *Suturing using 3-0/4-0 delayed-absorbable monoacryl	-N=230 *Stapler=115 *Suture=115 -LSCS both emergency & elective	*Wound infection rate was 2.6% in the stapler and 1.7% in the suture groups, whereas healthy wound was 94.8% in the stapler and 95.7% in the suture (P=0.3).
Jahan et al 2022 [28]	Prospective comparative	*Stapler (I) *Prolene suture (II)	-N=216 *I=108 *II=108 -Emergency & elective	*17.6% of stapler and 7.4% of suture groups experienced wound infection.
Bashir et al 2021 [29]	Randomized control trial	*Stapler (I) *Suture (II)	-N=400 *I=200 *II=200 -Emergency & elective	The rate of wound infection was 11%; 15% of stapler and 7% of suture groups experienced infection.
Nayak et al 2020 [30]	Randomized controlled trial	*Stapler (A) *Subcuticular suturing using monocystal 3-0 (B)	-N=300 *A=100 *B=102 *C=98	*The rate of wound complication was 16.6% and the infection rate was 14.3% and represented 86% of all wound complications. *The rate of infection among group (A) was 27%, (B) was 7.8%, and (C) was 8.2% (P<0.001).

Zafar et al 2020 [31]	Randomized controlled trial	*Mattress suture nylon (C) *Subcuticular suture (A) *Stapler (B)	-Emergency CS -N=500 *A=250 *B=250 -CS	*Wound infection occurred in 7.2% of group A and 14.4% in B (P=0.009).
Madsen et al 2019 [32]	Prospective, randomized, non-blinded, parallel-group trial	*Absorbable subcuticular Stapler *Suture using 3-0 undyed	-N=206 *Stapler=103 *Suture=103 -CS via a low transverse incision	*There were no significant variations between both groups regarding wound complications, including infection; surgical site infection (4.3%) among sutures, (0%) among staplers (P=0.06).
Sajid et al 2019 [33]	Randomized control trial	*Stapler (A) *Suture 2/0 prolene (B)	-N=654 *A=327 *B=327 -Emergency & elective	*Infection was found in 12.2% of staplers and 5.8% of the suture group (P=0.04).
Fox et al 2018 [34]	Retrospective	*Stapler *Suture using subcuticular suture of either 3-0 poliglecaprone or 4-0 polyglactin	-N=551 *Stapler=192 *Suture=359 -Tertiary or higher-order CS.	*Infection occurred among 11.5% of staplers and 4.7% of sutures (P=0.003).
Jahan et al 2017 [35]	Prospective comparative	*Stapler *Suture using nonabsorbable silk 2/0	-N=200 *Stapler=100 *Suture=100 -CS	*Infection occurred in 8% of sutures and 20% of staplers (P=0.01).
Zaki et al 2016 [36]	Retrospective	*Stapler *Subcuticular Suture	-N=1147 *Stapler=540 *Suture=607 -CS for obese women	*Infection rate among staplers was 6.5% and among sutures was 2.6% with an RR of 2.46.

CS; Cesarean section, PI; Pfannenstiel incision, LSCS; Lower segment cesarean section, RR; Relative risk.

A total of 5003 women were included; 181 subjects underwent closure using a mattress, 2207 women used stapling and 2615 women used suturing. The population included women who underwent primary CS with Pfannenstiel incision [25], LSCS for emergency and elective CS [27], and CS via low transverse incision [32]. Other studies enrolled women who underwent emergency and elective CS [28, 29, 33], emergency CS [30], tertiary or higher order CS [34], and CS for obese women [36], whereas two studies reported that women underwent CS only [26, 31, 35].

Regarding the findings of the studies involved three closure approaches; one study reported no considerable variations between groups regarding wound infection, with similar wound complications among staplers and suturing groups [25]. Another study reported a wound infection rate of 14.3% and it was the main wound complication reported (86%). Additionally, the rate of infection was significantly higher for the stapler (27%), compared to the mattress (8.2%) and finally suturing (7.8%) ($P < 0.001$) [30].

The rates of wound infection were reported in two studies including 1.98% [26], and 11% [29]. A significantly higher rate of infection among the stapler group was reported in five studies with the significance of $P = 0.01$ [26], $P = 0.009$ [31], $P = 0.04$ [33], $P = 0.003$ [34], and $P = 0.01$ [35]. Other studies didn't report the significance level but reported higher rates of infection among the stapler group compared to the suture one [28, 29, 36]. The relative risk for infection among those who underwent stapling was 2.46 [36].

On the other hand, comparable infection rates between both groups were reported in one [27]. Also, the study reported absorbable staplers reported no significant variation in infection rate ($P = 0.06$) between stapler (0%) and suturing (4.3%) [32].

Discussion

CS is a major obstetric procedure and it may be accompanied by some complications such as

infection [2]. There are various contributors to wound complications in CS, including wound closure [8]. Staples and suturing are the most commonly used methods for closing the cesarean wound [4]. However, the optimal strategy of wound closure to reduce such complications isn't known [8]. The previously published reviews compared staplers and suturing either included heterogeneous studies not focusing on CS [37], or reported general comparison in CS subjects [1X], with no focus on wound infection in CS. Therefore, this review focused on comparing staples and suturing of CS in terms of wound infection.

Stapler is superior to suturing due to the reduced risk of contamination [16]. Also, it was reported that sutures can elevate the probability of surgical site infection due to ischemia related to wound flaps that delay normal healing [38].

However, our findings indicated that staplers were associated with higher rates of wound infection, either high rates of wound infection [28, 29, 36] or significantly higher rates of wound infection [26, 31, 33, 34, 35] compared to suturing, regardless of the suturing material. Only three studies out of twelve reported no significant differences in the rates of wound infection between both closing methods [25, 27, 32].

An earlier analysis included revised databases from 1966 to 2010 included only six studies. It was found that stapling the wound was associated with a twofold increased risk of wound infection or separation compared to subcuticular suturing [4]. Similarly, we found that the relative risk of infection among those who underwent stapling was more than twofold. However, this relative risk was reported in only one study [36].

A previous analysis included ten studies with 3696 women demonstrated that subcutaneous tissue closure reduced the probability of wound infection (OR 0.99). However, there was no data reported regarding women with high BMI [39]. Such findings were similar to ours; additionally, one of the included studies in this review was conducted on obese women and it was found that

stapling was associated with infection with a relative risk of more than twofold [36]. However, there is still inadequate data on the infection rate of each closure method regarding BMI.

Obesity seems to have a direct influence on the rate of wound complication [40]. It was reported that the relative risk of developing wound infection was up to 2.8 when the thickness of the subcutaneous tissue exceeds 3 cm [41].

In a previous meta-analysis of five trials that included 877 women, it was found that wound complication was higher with staples with a pooled odd ratio of 2.11. However, no finding regarding wound infection was reported [5]. In another analysis of 26 trials, there was no focus on wound infection, instead, it was reported that absorbable suture didn't increase the risk of wound complications compared to stapler. Wound complications included the frequency of wound infection, seroma, reclosure, hematoma, and others [3]. In our analysis, there were different materials of sutures were involved; however, all displayed lower infection rates compared to staplers. However, the sole study that used an absorbable stapler displayed no significant variation regarding infection when compared to suturing. Additionally, that study also revealed that despite the non-significant variation in infection rate between both methods, suturing using 3/0 undyed material resulted in a slightly higher infection rate (4.3%) compared to staplers (0%) [32]. Choosing the right suture material and the closure technique has a potential role in the natural healing of the wound and restoring the normal anatomical structure after operation [42].

In an analysis included several studies comparing suturing and staplers regarding surgeries of gynecology, emergency care treatment, general surgeries, as well as head/neck operation, it was found that wound infections were significantly fewer in the staples subjects compared with suturing [37]. Such findings were in contrast to ours and the explanation of that could be attributed to the inclusion of various surgeries in the previous analysis [37], whereas the current analysis focused on CS only. A previous review

included 42 very low to low-quality trials of 11067 reported that due to the lack of high-quality studies, there is no deduction that can be made regarding the superiority of sutures over staplers regarding wound infection and other complications [43].

It was reported that the risk factors of surgical site infection after CS, include host, pregnancy, and procedure factors [44]. However, the studies of this review reported the rate of infection of each closure method, with no multivariate analysis and no investigation of other contributing factors of infection.

Conclusion

This review revealed that a stapler was associated with higher rates of wound infection after CS compared to suturing. However, absorbable stapler seems to be promising as it displayed a slightly lower infection rate compared to suturing, but there is no sufficient data regarding absorbable stapler.

Limitations, strengths, and recommendations:

The limitation of this review is that the included studies didn't report the impact of incision type on infection rate, the impact of suturing material, BMI, and the number of previous CS. Also, the studies didn't determine the relative risk of infection for each closing method. The strength of this analysis is that the focus is on wound infection in CS. From the limitations, we recommend the establishment of further studies that focus on the rate of wound infection with the determination of the risk of infection regarding each method of closure.

References

1. Karamnia Far M, Saremi A, Nateghi MR, Sanaye Naderi M. Comparison of differences in post-cesarean section infection following a three-dose prophylactic antibiotic regimen and no prescription of antibiotics, a randomized

- clinical trial. *Sarem Journal of Medical research*. 2020;5(1):42-7.
- Zuarez-Easton S, Zafran N, Garmi G, Salim R. Postcesarean wound infection: prevalence, impact, prevention, and management challenges. *International journal of women's health*. 2017 Feb 17;81-8.
 - Huang Y, Yin X, Wei J, Li S. Comparison of the effect of skin closure materials on skin closure during cesarean delivery. *Plos one*. 2022 Jun 30;17(6):e0270337.
 - Tuuli MG, Rampersad RM, Carbone JF, Stamilio D, Macones GA, Odibo AO. Staples compared with subcuticular suture for skin closure after cesarean delivery: a systematic review and meta-analysis. *Obstetrics & Gynecology*. 2011 Mar 1;117(3):682-90.
 - Clay FS, Walsh CA, Walsh SR. Staples vs subcuticular sutures for skin closure at cesarean delivery: a metaanalysis of randomized controlled trials. *American journal of obstetrics and gynecology*. 2011 May 1;204(5):378-83.
 - Hager RM, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Oian P, et al. Complications of cesarean deliveries: rates and risk factors. *Am J ObstetGynecol* 2004;190:428–34.
 - Owen J, Andrews WW. Wound complications after cesarean sections. *Clin ObstetGynecol* 1994;37:842–55.
 - Huda F, Gajula B, Singh S, Kumar S, Lokavarapu MJ, Sowmya D. Staples versus sutures for skin closure in standard four port laparoscopic cholecystectomy: a prospective cohort study. *Cureus*. 2021;13(3).
 - Cochetti G, Abraha I, Randolph J, Montedori A, Boni A, Arezzo A, et al. Surgical wound closure by staples or sutures?: Systematic review. *Medicine (Baltimore)*. 2020;99(25):e20573.
 - Antoine C, Young BK. Cesarean section one hundred years 1920–2020: the Good, the Bad and the Ugly. *Journal of Perinatal Medicine*. 2021;49(1):5-16.
 - Kumar R, Hastir A, Goyal S, Walia RS. Sutures versus staplers for skin closure of midline incision in laparotomy patients and their outcome. *Int J Surg Med*. 2017;3(4):211-15.
 - Pearl ML, Rayburn WF. Choosing abdominal incision and closure techniques: a review. *J Reprod Med* 2004;49:662–70.
 - Daykan Y, Sharon-Weiner M, Pasternak Y, et al. Skin closure at cesarean delivery, glue vs subcuticular sutures: a randomized controlled trial. *Am J ObstetGynecol* 2017; 216(4):406.e401–406.e405.
 - Mohit Biswas DA, Jagadamba Sharan D. Comparative study of staplers vs simple interrupted vs sub-cuticular method of skin closure of surgical wounds. *Eur J Mol Clin Med*. 2022;9(3):1926-33.
 - Parameshwara CM, Karthik B. A comparative study between skin staples and skin suture materials in abdominal surgical wound closure. *MedPulse-Int Med J*. 2015;2(12):903-05.
 - AHMED S, PATRA S, MANNA N, HALDER T. Surgipler Skin Stapler versus Trulon Polyamide Suture in Post-surgical Open Abdominal Wound Closure: A Randomised Clinical Trial. *Journal of Clinical & Diagnostic Research*. 2023 Dec 1;17(12).
 - Altman AD, Allen VM, McNeil SA, Dempster J, Pfannenstiel incision closure: a review of current skin closure techniques. *J ObstetGynaecolCan* 2009;31:514-20.
 - Basha SL, Rochon ML, Quinones JN, Coassolo KM, Rust OA, Smulian JC. Randomized controlled trial of wound complication rates of subcuticular suture vs staples for skin closure at cesarean delivery. *Am J ObstetGynecol* 2010; 203:285.e1– 8.
 - Cromi A, Ghezzi F, Gottardi A, Cherubino M, Uccella S, Valdatta L. Cosmetic outcomes of various skin closure methods following cesarean delivery: a randomized trial. *Am J ObstetGynecol* 2010; 203:285.e1– 8.
 - Frishman GN, Schwartz T, Hogan JW. Closure of Pfannenstielskin incisions. Staples vs. subcuticular suture. *J Reprod Med* 1997;42:627–30.
 - Gaertner I, Burkhardt T, Beinder E. Scar appearance of different skin and subcutaneous tissue closure techniques in caesarean section: a randomized study. *Eur J Obstet Gynecol Reprod Biol* 2008;138:29–33.

22. Johnson A, Young D, Reilly J. Caesarean section surgical siteinfection surveillance. *J Hosp Infect* 2006;64:30 –5.
23. Rousseau JA, Girard K, Turcot-Lemay L, Thomas N. A randomized study comparing skin closure in cesarean sections: staples vs subcuticular sutures. *Am J ObstetGynecol* 2009;200:265, e1–4.
24. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.
25. Chaurasia A, Jain K, Ojha V, Sachan N, Singh V. Interrupted mattress versus continuous subcuticular versus stapler: a comparative study on wound closure outcomes in primary caesarean section with Pfannenstiel incision. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2023;12(7):2015-2020.
26. Shrestha R, Pradhan B, Shrestha SD, Malla AP. Does method of closure effect cesarean wound healing? Stapler versus absorbable sub-cuticular closure done in a tertiary hospital, Nepal. *Journal of Patan Academy of Health Sciences*. 2022 Jan 7;9(1):18-24.
27. Arpitha MR, Kumar A, Sreelatha S. Comparative study of wound healing, pain and cosmetic results by staples versus subcuticular skin suture after caesarean delivery. *International Journal of Clinical Obstetrics and Gynaecology* 2022; 6(3): 01-11.
28. Jahan E, Nawaz N, Mahmood S, Shabbir S, Imtiaz R, Gupta U. Comparison Between Skin Staples and Prolene Sutures for Skin Closure in Caesarean Section Patients. *Pakistan Journal of Medical & Health Sciences*. 2022 Jun 16;16(05):594-.
29. BASHIR M, ANJUM S, SHAFIQ S, HANIF A, YASEEN S, MEHWISH W. Compare the Wound Infection Rate between Skin Staples and Sutures for Skin Closure after C-Section. *PJMHS*. 2021; 15(2):363-364.
30. Bhimeswar Nayak G, Saha PK, FIMSA RB, Joshi B, Rohilla M, Gainer S, Sikka P. Wound complication among different skin closure techniques in the emergency cesarean section: a randomized control trial. *ObstetGynecol Sci* 2020;63(1):27-34.
31. Zafar S. Wound Complications: Subcuticular Suture versus Skin Staples for Skin Closure after Caesarean Section. *InMedical Forum Monthly* 2020;31(7):88-91.
32. Madsen AM, Dow ML, Lohse CM, Tessmer-Tuck JA. Absorbable subcuticular staples versus suture for caesarean section closure: a randomised clinical trial. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2019 Mar;126(4):502-10.
33. Sajid M, Noreen H, Sial SS, Tanveer I, Naheed N. Comparison of Wound Infection in Skin Staples Versus Sutures for Skin Closure in Patients Undergoing Caesarean Section. *Journal of The Society of Obstetricians and Gynaecologists of Pakistan*. 2019;9(4):221-5.
34. Fox NS, Melka S, Miller J, Bender S, Silverstein M, Saltzman DH, Rebarber A. Suture compared with staple closure of skin incision for high-order cesarean deliveries. *Obstetrics & Gynecology*. 2018 Mar 1;131(3):523-8.
35. Jahan K, Shrestha R, Adhikari P, Tripathi M, Neupane CP, Gurung RT, Gurung TK, Mally J.A Comparative Study between Staplers and Suture(Silk 2-0) for Skin Closure in Cesarean Sections at Gandaki Medical College Teaching Hospital. *Journal of Gandaki Medical College-Nepal*. 2017; 10(2):1-5.
36. Zaki MN, Truong M, Pyra M, Kominiarek MA, Irwin T. Wound complications in obese women after cesarean: a comparison of staples versus subcuticular suture. *Journal of Perinatology*. 2016 Oct;36(10):819-22.
37. Iavazzo C, Gkegkes ID, Vouloumanou EK, Mamais I, Peppas G, Falagas ME. Sutures versus staples for the management of surgical wounds: a meta-analysis of randomized controlled trials. *The American Surgeon*. 2011 Sep;77(9):1206-21.
38. Merkow RP, Ju MH, Chung JW, Hall BL, Cohen ME, Williams MV, et al. Underlying reasons associated with hospital readmission following surgery in the United States. *JAMA*. 2015;313(5):483-95.

39. Pergialiotis V, Prodromidou A, Perrea DN, Doumouchtsis SK. The impact of subcutaneous tissue suturing at caesarean section on wound complications: a meta-analysis. BJOG: An International Journal of Obstetrics & Gynaecology. 2017 Jun;124(7):1018-25.
40. Conner SN, Verticchio JC, Tuuli MG, Odibo AO, Macones GA, Cahill AG. Maternal obesity and risk of postcesarean wound complications. AmJ Perinatol 2014;31:299–304.
41. Vermillion ST, Lamoutte C, Soper DE, Verdeja A. Wound infection after cesarean: effect of subcutaneous tissue thickness. ObstetGynecol 2000;95:923–6.
42. Shukla A, Phadnis PR, Hosamani PK, Reddy A. A Comparative Study of Wound Closure by Skin Sutures versus Skin Staplers. International Journal of Current Pharmaceutical Review and Research 2023; 15(12); 372-376.
43. Cochetti G, Abraha I, Randolph J, Montedori A, Boni A, Arezzo A, Mazza E, De Vermandois JA, Cirocchi R, Mearini E. Surgical wound closure by staples or sutures?: Systematic review. Medicine. 2020;99(25):e20573.
44. Sowjanya SB, Gadappa S, Sonawane A, Gaikwad R. Risk factors and management of surgical site infection in caesarean section patients at a teaching hospital. The New Indian Journal of OBGYN. 2024.

Access this Article in Online	
	Website: www.ijarbs.com
	Subject: Obstetrics & Gynecology
Quick Response Code	
DOI: 10.22192/ijarbs.2024.11.10.002	

How to cite this article:

Mohamed Abdelsattar and Mohannad Abousaadah (2024). Suturing Vs. Stapler and wound infection in Cesarean section; A systematic review. Int. J. Adv. Res. Biol. Sci. 11(10): 11-20.
DOI: <http://dx.doi.org/10.22192/ijarbs.2024.11.10.002>