

## The Frequency of Port-Site Infection in Laparoscopic Cholecystectomies – A Retrospective Study

\*Dr.ParthaPratim Mandal<sup>1</sup>, Dr.Pabitra Kumar Goswami<sup>2</sup>,  
Dr.Prasanta Kumar Roy<sup>3</sup>

<sup>1,2,3</sup>(Assistant Professor, Department of General Surgery, Malda Medical College, Malda, West Bengal, India)

Corresponding Author: \*Dr.ParthaPratim Mandal

### Abstract

**Background:** Introduction of laparoscopic surgery was a revolution in the field of surgery. Despite many benefits, the technique is associated with certain complications including port site infection. Port site infection, although less common is annoying both for the surgeon and the patient, and cripple the benefits of minimally invasive surgery. Port site infection not only increases the economic burden, pain and hospital stay of patient but also harm the reputation of the attending surgeon and hospital. Unfortunately, there is a reflection that antibiotics can solve the situation leading to misuse of antibiotics and evolution of multi drug resistant strains of microorganisms.

**Methods:** This observational study carried by the Department of General Surgery at Malda Medical College Hospital, Malda, West Bengal over a period of 3 years (July 2014 to June 2017). The study was carried out in 200 patients who underwent laparoscopic cholecystectomy by our team. Age, gender, operation duration and operative findings were evaluated regarding port site infections.

**Aim:** To study the frequency of port-site infection (PSI) and their magnitude, planning adequate management and to recommend the measures to prevent them in future.

**Results:** In the current study, 200 patients including 122 females (61%) and 78 males (39%) were operated. A total of 19 Patients (9.5%) had port site infection. Infection was seen in 8 male patients (42%) and 11 female patients (58%). Age range was 16-72 years. Most common port involved was epigastric, which developed infection in 7 patients (77.77%), followed by umbilical port which got infected in 5 patient (26.31%), both epigastric and umbilical port infected in 3 patients (33.33%) and last all four ports got infected in 4 patients (22.04). Gall bladder was extracted through epigastric port site in 180 patients (90%) and through umbilical port site in 20 patients (10%). All cases were superficial wound infections and all are under controlled by conservative and surgical management.

**Conclusion:** Laparoscopic cholecystectomy is associated with a low risk of Port Site Infection, which in most cases is only superficial and responds to local measures. Infection is most commonly seen at port site through which gall bladder was extracted

**Keywords:** Laparoscopic cholecystectomy, Port-site infection,

Date of Submission: 26 -08-2017

Date of acceptance: 09-09-2017

### I. Introduction

Skin is a natural barrier against infection<sup>[1]</sup>, so any surgical wound can be a potential source of infection since it will cause a break in the continuity of the epithelium and this can lead to a postoperative infection. The goal of modern wound care has shifted from prevention of infection to timely restoration of the body to its previous state of normal form and function. It is this very goal that has leads to the development of laparoscopic surgery. Laparoscopic surgery has come a long way to be integrated into the mainstream field of surgery. The advantages offered by laparoscopic surgery are vast, like decreased postoperative pain, quicker return to normal activity, and less post-operative complications<sup>[2]</sup>. It is probably because of a smaller incision, faster mobilization, early giving of nutrition, reduction of post-operative and better preservation of immune system function with a limited inflammatory response to tissue injury. It has been observed that metabolic complications due to surgical injury are less in laparoscopic surgery as compared to open surgery. However, laparoscopic surgery is associated with unique complications related to gaining access to the peritoneal cavity. Port site infection is an infrequent complication. Sometimes these infections become protracted and recurrent and pose a dilemma for the surgeon and become distressing for the patients.

Since port site infections have not been given much attention in the medical literature, the objective of this study is to assess the influence and determine the association of laparoscopic surgery and port site infection.

The surgical infection is defined as, “infection which occurs within 30 days of the surgical procedure.” The centre for Disease Control (CDC), USA, classifies surgical site infections into three categories.

1. Superficial (skin and subcutaneous tissue).
2. Deep (fascia and muscles.)
3. Organ/Space.

In this context, a port site infection (PSI) is defined as an infection of the skin and subcutaneous tissue at the site of ports created during laparoscopic cholecystectomy which discharges purulent material spontaneously or is opened to drain the same by the surgeon. Organisms have to be isolated from an area of infection, and the surroundings show typical signs of inflammation like pain, redness, swelling, etc. The wound infection rates fell dramatically after the advent of antibiotics. It has been observed that metabolic response to surgery is less after a laparoscopic surgery than open surgery. The fact that laparoscopic surgeries are associated with fewer surgical site infections (SSI's) intuitively makes sense as laparoscopy access ports are short in length and only a fraction of the length of incision used in open laparotomy. The elective laparoscopic approach has a low risk of infection, but many surgeons still use prophylactic antibiotics<sup>[3]</sup>.

For safer surgery on the target organ and to have control on its vascular supply the surgeon has to make an incision large enough to provide the clear view of the target organ as well as its blood supply. The wound sustains additional trauma from retractors, whether metallic or human. The operative wound is cause for morbidity including pain, bleeding, wound infections, nerve entrapment, and herniation<sup>[4]</sup>. The post-operative pain at the wound site precludes the patient from early mobility and deep respiration especially true for upper abdominal incision.

In laparoscopic surgery, the creation of pneumoperitoneum is essential for establishing a working space in which surgeon has to access the target organ and its blood supply. The pneumoperitoneum is created by the insufflation of carbon dioxide gas in the peritoneal cavity and lifting the abdominal wall gently with force being diffuse and evenly distributed resulting in minimal trauma to the abdominal wall<sup>[5,6]</sup>. The patient experiences less pain and other wound-related complications. Even when there is port site infection, it is far less in severity and easily controlled by local means in the majority of cases. Wound disruption and herniation are far less if the Z technique is used during insertion of trocar and cannula and if proper port site closure is employed primarily in 10mm port sites.

The causative organisms are generally those which more prevalent in institute e.g. Staph aureus, E. coli. These types of infections are easily treated with antibiotics which are most commonly prescribed in the Institute. Atypical mycobacteria have been reported at the port site in the literature. They are collectively indicated as M. Fortuitum complex. Primary or secondary anti-tubercular treatment is required in such cases<sup>[7,8]</sup>. Few refractory cases required debridement and excision of sinus tract followed by anti-tubercular or antibacterial treatment<sup>[9]</sup>. This study will evaluate the incidence of superficial port site infections in patients undergoing planned laparoscopic cholecystectomies.

## II. Material And Methods

This prospective study was conducted in the Department of General Surgery at Malda Medical College Hospital, Malda, West Bengal over a period of 3 years (July 2014 to June 2017). Approval from the hospital ethical committee was obtained. All the patients with symptomatic gallstones were admitted through outdoor department, their age range was between 20-72 years.

**Exclusion criteria:** Patients with age < 20 years, acute pancreatitis, choledocholithiasis, skin infections, pregnancy, past history of peritonitis, bleeding disorders and the laparoscopic procedure converted to open were excluded from the study. Procedure was discussed in detail with the patient and written informed consent was obtained. All the patients were admitted to surgical ward a day before surgery. The third generation hospital supply antibiotic (ceftriaxone 1gm) usually given via I.V route. First dose at the time of induction of anaesthesia and rest after the surgery. The patients were monitored for port site infection using standard National Nosocomial Infections Surveillance (NNIS) System definitions given by the Centres for Disease Control and Prevention (CDC).

**Operative technique:** All the patients were operated under General anaesthesia. After painting with Povidone-iodine solution (from the nipple line to the mid-thigh) and draping, a 1.5-cm longitudinal incision was made at the inferior aspect of the umbilicus, then deepened through the subcutaneous fat to the anterior rectus sheath for open umbilical port. A Kocher clamp was used to grasp the reflection of the linea alba onto the umbilicus and elevate it. A 1cm longitudinal incision was made in the Linea Alba with a No. 11 blade. The peritoneum was elevated between two straight clamps and incised so as to afford safe entry into the abdominal cavity. A 10-mm blunt trocar was placed into the abdominal cavity, and pneumoperitoneum created. The laparoscope was white-balanced and advanced into the abdominal cavity. A 1.2-cm incision is made three fingerbreadths below the xiphoid process and deepened into the subcutaneous fat. A 10-mm trocar was

advanced into the abdominal cavity under direct vision in the direction of the gallbladder through the abdominal wall, with care to enter just to the right of the falciform ligament. The table was then adjusted to place the patient in a reverse Trendelenburg position with the right side up to allow the small bowel and colon to fall away from the operative field. The optimal position for lateral 5- mm ports were chosen by the surgeon and the lateral skin incisions were made, and two 5-mm trocars were advanced into the peritoneal cavity under direct vision. Calot's triangle was identified and all the areolar tissue was removed identifying cystic duct and artery clearly. Both the structures were clipped and cut separately. Cholecystectomy was completed using mono polar diathermy with L-hook and haemostasis rechecked and secured. Gall bladder was extracted from epigastric or umbilical port site depending upon surgeon's choice. Pouch for gallbladder was not used in any case. The ports were removed under direct vision. The fascia was closed at the umbilical port by using vicrylno-2/0 (polyglactin 910 manufactured by Ethicon) sutures. All the skin incisions were closed using Ethilonno-2/0 (non absorbable nylon). The drain was removed and patients were discharged on 2<sup>nd</sup> to 3<sup>rd</sup> postoperative day. Port sites were evaluated clinically for infection on day 7<sup>th</sup> to 8<sup>th</sup> after surgery and wound infections were dealt with local washes with Normal Saline and surgical dressings without antibiotic ointment. Stitches were removed after 7 days of surgery usually. All patients were followed for a period of at least 2months.

### III. Aim

To study the incidence of port-site infection (PSI) and their magnitude, planning adequate management and to recommend the measures to prevent them in future in our tertiary health care centre in a rural setup.

### IV. Results

In our study laparoscopic cholecystectomy was performed in 200 patients, which included 122 females (61%) and 78 males (39%). Their age range was between 20- 72years. Out of these 200 patients 19 (9.5%) of patients developed port site infection. The patients who developed wound infections includes 11 females and 8 males (chart 1). 38 persons (19%) out of our study cases were diabetic and 6 persons developed port infections. Most common port site involved was epigastric port, which developed infection in 7 patients (77.77%), followed by umbilical port which got infected in 5 patients (26.31%). Gall bladder was extracted through epigastric port site in 180 patients (90%) and through umbilical port site in 20 patients (10%). both epigastric and umbilical port infected in 3 patients (33.33%) and lastly all four ports got infected in 4 patients (22.04) (chart 2). Out of the 20 patients who developed port site infection, gallbladder was perforated while extraction in 6 cases (30%). Out of these 19 patients who developed wound infection, 3 (15.78%) patients had operative findings of (acute cholecystitis) empyema Gall Balder and 3 patients (15.78%) had thick walled gallbladder. Rest other patients 13 (68.42%) had chronic cholecystitis (chart 3). All gall bladder specimen send for histo-pathological examination and luckily no malignancy detected out of these 200 patients. All cases were superficial wound infections and all are under controlled by conservative and surgical management.

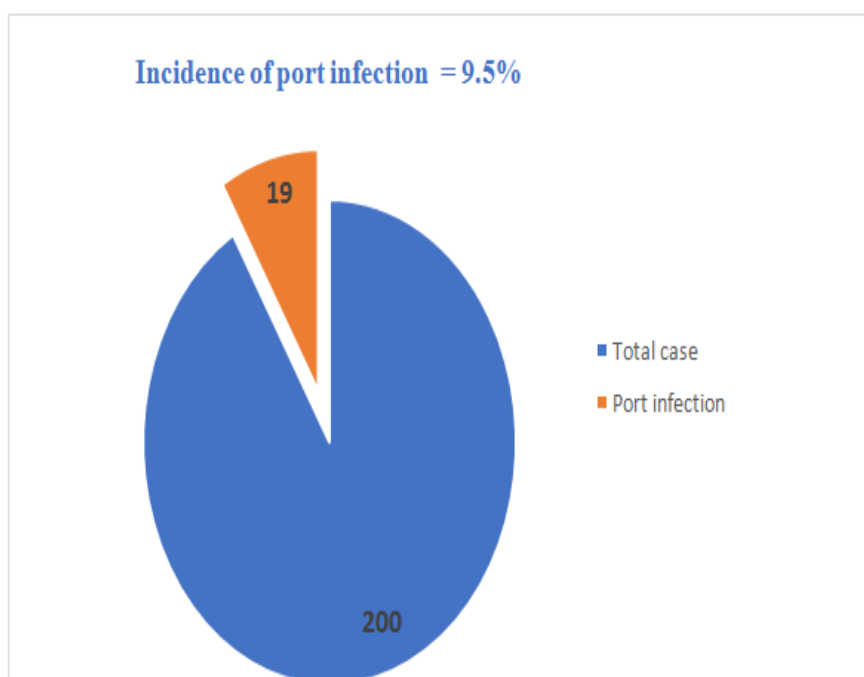


Chart 1

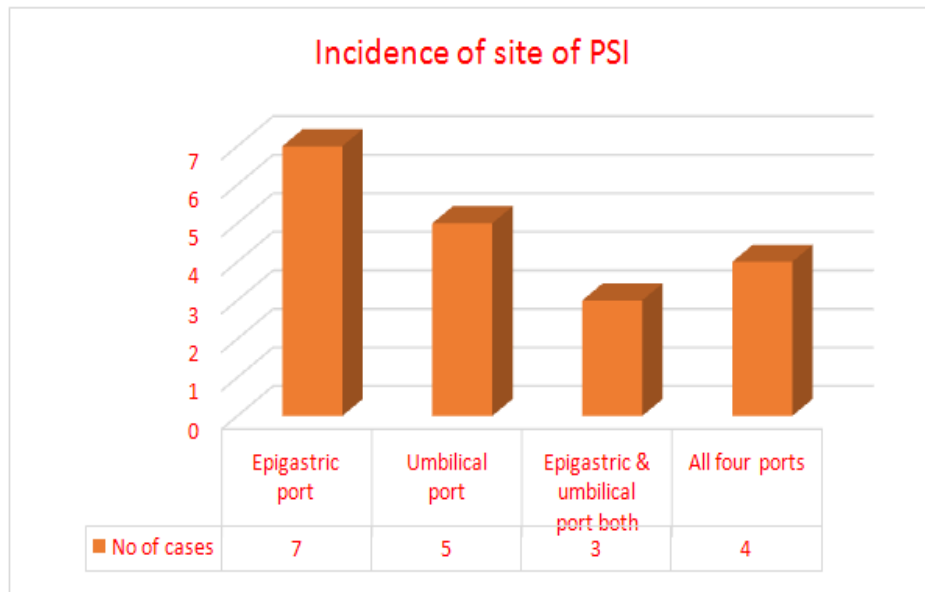


Chart 2

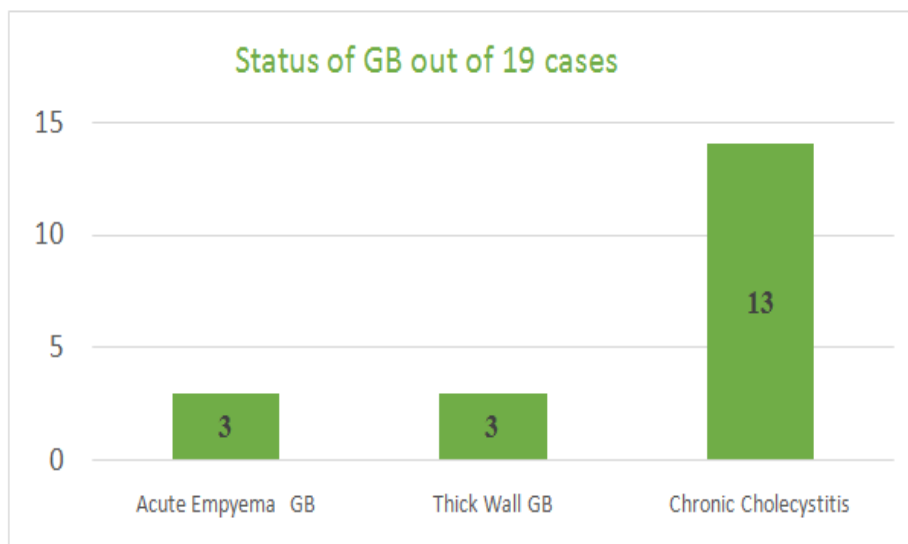


Chart 3



**Pic 1.** Epigastric and Umbilical Port Infection



**Pic 2. Only Umbilical Port Infection**



**Pic 3. All four Ports Infection**

### V. Discussion

No surgical wound is completely immune to infections<sup>[10]</sup>. Despite the advances in the fields of antimicrobial agents, sterilization techniques, surgical techniques, and operating room ventilation, PSIs still prevail<sup>[11]</sup>. Wound infection is the most common complication of almost every open surgery. Same applies to laparoscopic surgery. Although laparoscopic surgeries have less incidence of port site infections<sup>[12]</sup>, still they can produce undesirable effects and increase morbidity. Laparoscopic cholecystectomy is now performed commonly throughout the world and it has been accepted as safe out-patient's procedure<sup>[13]</sup>. The frequency of port site infections observed in our study was 9.5%. A comparative results of various study shown in table below.

#### **Studies showing frequency of port site infection following laparoscopic cholecystectomy**

No.	Ref.	Year of publication	Type of study	Total number of patients	Frequency of infection
1	Karthik et al <sup>[14]</sup>	2013	Prospective	570	10 (1.8%)
2	Mir et al <sup>[15]</sup>	2013	Prospective	675	45 (6.7%)
3	Yanni et al <sup>[16]</sup>	2013	Prospective	100	4 (4%)
4	Taj et al <sup>[17]</sup>	2012	Observational	492	27 (5.48%)
5	Yi et al <sup>[18]</sup>	2012	NA	400	11 (2.75%)
6	Triantafyllidis et al <sup>[19]</sup>	2009	Retrospective	1009	14 (1.39%)

7	Chuang et al <sup>[20]</sup>	2004	NA	420	6 (1.4%)
8	Shindholimath et al <sup>[21]</sup>	2003	Prospective	113	7 (6.3%)
9	den Hoed et al <sup>[22]</sup>	1998	Prospective	189	10 (5.3%)

The higher incidence of port site infections in our study may be due to the use of reusable metallic ports. as the cost of disposable ports for every case is not affordable by the patient nor by the hospital. All instruments are re-used frequently after sterilization in CIDEX (CIDEX-OPA Solution, containing 0.55% ortho-phthalaldehyde, is a fast and effective way to high level disinfect a wide range of endoscopes and other semi-critical devices) at least 3 to 4 case per OT-day. In our study, most common port site affected by infection was epigastric port site (77.77%), followed by umbilical port which got infected (26.31%). Similar predominance of epigastric port site infection was noted by Jan et al<sup>10</sup> and Hamzagaolu et al<sup>13</sup>. But studies conducted by Colizza et al<sup>12</sup> and Tocchi et al<sup>14</sup> have shown that PSI is more common at the umbilical port site. Increased incidence of infection affecting epigastric over umbilical port site was due to repeated extraction of gall bladder through epigastric port site. On reviewing the cases with port site infection, acute cholecystitis was the most common operative finding (i.e., 15.78%) followed by thick walled gall bladder (15.78%). Tocchi et al<sup>14</sup> have also reported higher incidence of port site infection in cases of acute cholecystitis.

Poor skin hygiene and malnutrition are another most frequent cause of operative wound infection. In our set up, the patients come from very poor socio economic status and most of them are suffering malnutrition and unhealthy skin. We also observe that the surgeries which taken long time, the chance of port infection also increased. The another culprit for PSI is diabetes. The patients suffering from long duration of diabetes and irregular medication, their chance of port infection also very high and invariable their gall bladder was contracted and thick walled and also taken long time for surgery. 38 persons (19%) out of our study cases were diabetic. 6 diabetic patients out of total 19 patients (31.58%) developed port infections in our study.

## VI. Conclusion

With innovation of minimal invasive surgery (MIS) the port site infection (PSI) is a burden in health care system, and still on and off patients do develop port site infection, which not only disturbs the patient, but also agitates the operating surgeons, because it not just increases the duration of recovery but also increase the cost. We feel it can be reduced by adopting strict antiseptic measure, with no compromise on sterilization or by using disposable instruments and almost always tight glycaemic control for diabetic patients.

## Reference

- [1]. Niyonsaba F, Ogawa H. Protective roles of the skin against infection: implication of naturally occurring human antimicrobial agents beta-defensins, cathelicidin LL-37 and lysozyme. *J Dermatol Sci.* 2005; 40(3):157-68.
- [2]. Targarona EM, Balagué C, Knook MM, Trías M. Laparoscopic surgery and surgical infection. *Br J Surg.* 2000;87(5): 536-44.
- [3]. Yamamoto S, Fujita S, Akasu T, Ishiguro S, Kobayashi Y, Moriya Y. Wound infection after elective laparoscopic surgery for colorectal carcinoma. *Surg Endosc.* 2007;21(12):2248-52. Epub 2007 May 19.
- [4]. Hackam DJ, Rotstein OD. Host response to laparoscopic surgery: mechanisms and clinical correlates. *Can J Surg.* 1998;41(2): 103-11.
- [5]. Bonjer HJ, Hazebroek EJ, Kazemier G, Giuffrida MC, Meijer WS, Lange JF. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. *Br J Surg.* 1997;84(5):599-602.
- [6]. Mir IS, Ahmad M, Ahad B. Establishing pneumoperitoneum safely for laparoscopic surgeries. *JK-Practitioner* 2005;12(4):224-2267.
- [7]. WA, AliSI, Shah NA, Khan M, Khan AS. The frequency of the port site infection in laparoscopic cholecystectomies. *J Postgrad Med Inst.* 2008;22(1):66-70.
- [8]. Sethi NK, Aggarwal PK, Duggal L, Sachar VP. Mycobacterium chelonae infection following laparoscopic inguinal herniorrhaphy. *J Assoc Physicians India.* 2003;51:81-2.
- [9]. Bhandarkar DS, Bhagwat S, Punjani R. Port site infection with mycobacterium chelonae following laparoscopic appendectomy. *Indian J Gastroenterol* 2001;20(6):247-48
- [10]. Richards C, Edwards J, Culver D, Emori TG, Tolson J, Gaynes R. Does using a laparoscopic approach to cholecystectomy decrease the risk of surgical site infection? *Ann Surg.* 2003;237:358-362. [PMC free article][PubMed]
- [11]. NupurGupte, Jignesh B. Rathod and Vipul D. Yagnik: A Study of a Prevalence of Port Site Infections in Laparoscopic Surgery in a Tertiary Care Centre in the Rural Set Up: *British Journal of Medicine & Medical Research* 20(10): 1-9, 2017; Article no. BJMMR.33062 ISSN: 2231-0614, NLM ID: 101570965
- [12]. Targarona EM, Balagué C, Knook MM, Trías M. Laparoscopic surgery and surgical infection. *Br J Surg.* 2000;87:536-44. [PubMed]
- [13]. Chok KS, Yuen WK, Lau H, Lee F, Fan ST. Outpatient laparoscopic cholecystectomy in Hong Kong Chinese -- an outcome analysis. *Asian J Surg* 2004;27: 313
- [14]. Redmond HP, Watson RW, Houghton T, Condron C, Watson RG, Bouchier-Hayes D. Immune function in patients undergoing open vs laparoscopic cholecystectomy. *Arch Surg.* 1994;129:1240-1246. [PubMed]
- [15]. Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. *J Minim Access Surg.* 2013;9:59-64. [PMC free article] [PubMed]
- [16]. Mir MA, Malik UY, Wani H, Bali BS. Prevalence, pattern, sensitivity and resistance to antibiotics of different bacteria isolated from port site infection in low risk patients after elective laparoscopic cholecystectomy for symptomatic cholelithiasis at tertiary care hospital of Kashmir. *Int Wound J.* 2013;10:110-113. [PubMed]

## *The Frequency of Port-Site Infection in Laparoscopic Cholecystectomies – A Retrospective Study*

- [17]. Yanni F, Mekhail P, Morris-Stiff G. A selective antibiotic prophylaxis policy for laparoscopic cholecystectomy is effective in minimising infective complications. *Ann R Coll Surg Engl.* 2013;95:345–348. [PMC free article][PubMed]
- [18]. Taj MN, Iqbal Y, Akbar Z. Frequency and prevention of laparoscopic port site infection. *J Ayub Med Coll Abbottabad.* 2012;24:197–199. [PubMed]
- [19]. Yi F, Jin WS, Xiang DB, Sun GY, Huaguo D. Complications of laparoscopic cholecystectomy and its prevention: a review and experience of 400 cases. *Hepatogastroenterology.* 2012;59:47–50. [PubMed]
- [20]. Triantafyllidis I, Nikoloudis N, Sapidis N, Chrissidou M, Kalaitidou I, Chrissidis T. Complications of laparoscopic cholecystectomy: our experience in a district general hospital. *SurgLaparoscEndoscPercutan Tech.* 2009;19:449–458. [PubMed]
- [21]. Chuang SC, Lee KT, Chang WT, Wang SN, Kuo KK, Chen JS, Sheen PC. Risk factors for wound infection after cholecystectomy. *J Formos Med Assoc.* 2004;103:607–612. [PubMed]
- [22]. Shindholimath VV, Seenu V, Parshad R, Chaudhry R, Kumar A. Factors influencing wound infection following laparoscopic cholecystectomy. *Trop Gastroenterol.* 2003;24:90–92. [PubMed]
- [23]. den Hoed PT, Boelhouwer RU, Veen HF, Hop WC, Bruining HA. Infections and bacteriological data after laparoscopic and open gallbladder surgery. *J Hosp Infect.* 1998;39:27–37. [PubMed]
- [24]. Jan WA, Ali IS, Shah NA, Ghani A, Khan M, Khan AS: The frequency of port-site infection in laparoscopic cholecystectomies. *JPMI;* 2008; 22(1): 66-70.
- [25]. Colizza S, Rossi S, Picardi B, Carnuccio P, Pollicita S, Rodio F, et al.: Surgical infections after laparoscopic cholecystectomy: Ceftriaxone vs ceftazidime antibiotic prophylaxis. A prospective study. *Chir Ital;* 2004; 56: 397-402.
- [26]. Hamzaoglu I, Baca B, Böler DE, Polat E, Ozer Y: Is umbilical flora responsible for wound infection after laparoscopic surgery? *SurgLaparoscEndoscPercutan Tech;* 2004; 14: 263-267.
- [27]. Tocchi A, Lepre L, Costa G, Liotta G, Mazzoni G, Maggiolini F: The need for antibiotic prophylaxis in elective laparoscopic cholecystectomy: a prospective randomized study. *Arch Surg;* 2000; 135: 67-70.

\*Dr.ParthaPratim Mandal. "The Frequency of Port-Site Infection in Laparoscopic Cholecystectomies – A Retrospective Study." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 16.9 (2017): 23-29.