

## COMPARISON BETWEEN CHLORHEXIDINE GLUCONATE AND POVIDONE IODINE IN PREVENTING SURGICAL SITE INFECTION IN LAPAROSCOPIC CHOLECYSTECTOMY

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### Abstract

**Background and Objectives:** Surgical site infection is one of the major postoperative complication resulting in an increase in both morbidity and mortality of the patient. Preoperative patients body surface preparation is one of the major factors in preventing surgical site infection. In this study we compared povidone iodine usually used disinfectant with chlorhexidine gluconate for surgical site infection

**Methods:** It was a randomized control trial conducted at General Surgery ward Gulab Devi Hospital Lahore from January 2021 to December 2022. A total of 200 patients undergoing laparoscopic cholecystectomy were included in this study through purposive sampling and then divided into two groups using lottery methods. In Group A peroperative patients skin preparation was done with 10% povidone iodine while in Group B 4% chlorhexidine gluconate was used for skin preparation. Patients with empyema gall bladder, gall bladder or gut perforation and laparoscopic procedures converted to open were excluded from this study.

**Results:** In this study mean age of  $45.8 \pm 10.3$  years with range from 25 to 65 years. In Group A mean age was  $45.7 \pm 10.8$  years while in group B it was  $45.8 \pm 9.8$  years. In Group A 12% wound infection was documented while in Group B it was only 4% (P-value 0.03).

**Conclusion:** Chlorhexidine gluconate solution showed less surgical site infection which implies that chlorhexidine gluconate solution can be safely replaced with povidone iodine solution for skin preparation.

**Keywords:** Povidone, Chlorhexidine, Surgical Site Infection

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Surgical Site Infections stand as the prevailing form of infection and represent a notable concern for patients undergoing surgery due to their substantial association with morbidity and mortality rates. Surgical site infections are ranked third most frequently diagnosed infection according to published data of Centers for Disease Control and Prevention (CDC). Infection occurring in wounds due to surgery within 30 days of

operation is labelled as surgical site infection<sup>1</sup>. The development of SSIs (Surgical Site Infections) can be attributed to various risk factors associated with the patient, the environment, and the care provided<sup>2</sup>. Surgical site infections are divided into superficial and deep infections. In superficial infection usually involves skin and subcutaneous tissue and occurs earlier while deep involves fascia, muscles and deep structures and develops late.<sup>3</sup>

The environment of the operating theatre (OT) and surgery ward plays a crucial role in the occurrence of infections.<sup>4</sup> The presence of crowded visitors in common access areas and within wards facilitates the transmission of pathogens through droplets, which are released during talking, sneezing, and coughing by personnel carrying intranasal and facial pathogens.

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These microbes settle on various surfaces such as beds, OT tables, trolleys, and linens, eventually leading to transmission to patients undergoing surgery. The surgical team also contributes to the transmission of microbial agents to the operation wounds.<sup>4</sup> Additionally, the unclean floor of the ward and unclear logistics further increase the risk of surgical site infection.

Surgical site infection can be prevented by use of proper patient scrubbing, use of aseptic technique and use of appropriate antibiotics. Many solution are used for patient skin preparation preoperatively which includes povidone iodine, chlorhexidine gluconate and alcohol solution.<sup>5</sup> Povidone iodine is most frequently used solution for skin preparation. Chlorhexidine solution contains 4% chlorhexidine gluconate. Despite its higher cost compared to povidone iodine, it exhibits a quicker action upon skin application and maintains its effectiveness. Studies have revealed that chlorhexidine remains efficacious for hours after application, surpassing the skin microbial eradication capabilities of Povidone Iodine.<sup>6,7</sup> Povidone iodine is a locally applied antiseptic solution with bactericidal, sporicidal, and fungicidal properties.<sup>8</sup>

The types of pathogens causing infections vary depending on the surgical procedure performed. In clean surgical procedures gastrointestinal, respiratory and gynecological tracts are not involved, usually result in *Staphylococcus aureus* infections, which can come from the exogenous environment or the patient's skin flora. On the other hand, in categories like clean-contaminated and dirty surgeries, mostly polymicrobial growth is present including both aerobic and anaerobic flora which is similar to normal microflora of resected organs. A significant drawback associated with these microbes is their multi-drug resistance.<sup>9</sup>

The objective of this study was to compare incidence of surgical site infection between povidone iodine and chlorhexidine gluconate used for preparation of skin preoperatively. The results of this study will help in reducing incidence of surgical site infection which will result in decrease of morbidity and mortality of patients.

## METHODS

It was a randomized control trial conducted at General Surgery ward Gulab Devi Hospital Lahore from January 2021 to December 2022. It was conducted after approval from institutional review board and patients were included after their consent. A total of 200 patients undergoing laparoscopic cholecystectomy were included in this study through purposive sampling and then divided into two groups using lottery methods. In Group A peroperative patients skin preparation was done with 10% povidone iodine while in Group B 4% chlorhexidine gluconate was used for skin preparation. Patients with empyema gall bladder, gall bladder or gut perforation and laparoscopic procedures converted to open were excluded from this study. Wound infection in both groups was documented on prescribed performa. Data was analyzed in SPSS 24 and variables like age and sex were presented in the form of means and standard deviation while qualitative variables like wound infection was presented in the form of frequency tables. P-Value of less than 0.05 was taken as significant.

## RESULTS

A total of 200 patients undergoing laparoscopic cholecystectomy were included. Out of these 200 patients 30 (15%) were male while 170 (85%) were female. In this study, mean age of  $45.8 \pm 10.3$  years with range from 25 to 65 years. The comparison of mean age and mean weight is shown in Table 1. In all patients laparoscopic cholecystectomy was performed using 04 ports. Out of these four ports two were of 10mm and other two were of 05mm. All ports were closed using non absorbable suture polypropylene 3/0. Out of these 200 patients wound infection was seen in only 16 (08%) of patients. In Group A 12% wound infection was documented while in Group B it was only 4% (P-value 0.03). In these infected, only 10 mm port wounds were infected with 81.2% (13) in umbilical wound and 18.7% (03) in epigastric wound. In these 200 patients 30 (15%) had diabetes mellitus, 22 (11%) had hypertension, 06(03%) had ischemic heart disease, 08(04%) had hepatitis B and 07(3.5%) had hepatitis C infection while 127(63.5%) had no co morbidities. There was

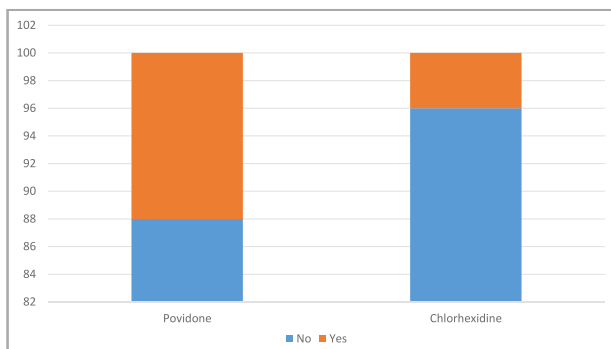
no significant difference between age and weight of patients having wound infection or not. Mean age of patients having wound infection was  $46.6 \pm 11.3$  years compared to  $45.7 \pm 10.2$  years in patients having no wound infection. Similarly mean weight of patients

**Table 1:** Characteristics of the participants.

Characteristics	Group A	Group B	P-value
Mean Age	$46.6 \pm 11.3$ years	$45.7 \pm 10.2$ years	0.84
Mean Weight	$70.5 \pm 11.7$ kg	$69.8 \pm 13.2$ kg	0.31

having wound infection was  $70.5 \pm 11.7$  kg as compared to  $69.8 \pm 13.2$  kg in non infected patients. Incidence of wound infection is more in females (06) as compared to male (02). Among wound infection patients 01 had diabetes mellitus, 02 had hypertension, 02 had ischemic heart disease and 01 had hepatitis C. No statistical co relation was found between these co morbidities and wound infection.

**Figure 1:** Incidence Of Wound Infection In Povidone Iodine And Chlorhexidine Group



**Table 2:** Comparison of groups related to Surgical Site Infections.

Groups	Surgical Site Infection		P-Value
	YES	No	
Povidone iodine	12	88	0.03
Chlorhexidine Gluconate	04	96	

## DISCUSSION

Surgical site infection is a major complication that results in increase in morbidity and mortality of the patient. Surgical site infection can be prevented by proper scrubbing of patient skin with anti septic, following aseptic techniques during procedure, use

of appropriate antibiotics pre and post operatively. Laparoscopic cholecystectomy is a clean contaminated procedure. Incidence of surgical site infection in these procedure in international study is 6-15%.<sup>10,11</sup> The incidence of surgical site infection in our study is 08% which is within the limits of national and international data. Use of appropriate antiseptic solution for patient skin preparation plays a vital role in prevention of surgical site infections. Many aseptic solutions are used for scrubbing which includes 10% povidone iodine, 4% chlorhexidine gluconate and alcohols. In our study we compared wound infection in patients undergoing povidone iodine scrub with patients in whom chlorhexidine gluconate is used. In our study patients having chlorhexidine gluconate (4%) scrub had lesser incidence of wound infection as compared to povidone iodine (12%) and it is also statically significant with p-value of 0.003. It is similar to results presented by Luwang et al in which incidence of wound infection was less in chlorhexidine (5.4%) as compared to povidone solution (8.6%).<sup>12</sup> However in few international studies no such difference is documented.<sup>13</sup> Among the laparoscopic port site wound infection umbilicus port wound was mostly infected. In our study among all 16 patients having surgical site infection 13 had umbilical port site wound infection followed by epigastrium port site. Poor personal hygiene of umbilicus is a major cause of wound infection at umbilical port site. However gall bladder in all patients were removed from body through epigastric ports which may be the reason of wound infection in epigastric port site wounds. The documented umbilical port site wound infection is between 8-89%.<sup>14</sup> In our study its incidence is within this value (81.5%).

## CONCLUSION

Many antiseptic solutions are used for patient skin preparation before surgery which includes chlorhexidine gluconate, povidone iodine and alcohol. Among these solutions povidone iodine solution is commonly used. In our study we compared povidone iodine with chlorhexidine gluconate solution which showed less surgical site infection which implies

chlor-hexidine gluconate solution can be safely replaced with povidone iodine solution for skin preparation.

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