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SURGICAL SITE INFECTION IN CLEAN, CLEAN-CONTAMINATED AND CONTAMINATED CASES

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Abstract: The present prospective study has been carried out in the Department of General Surgery, KIMS Karad, out of 200 cases that had undergone other surgical procedures. The rate of infection of the surgical site and the frequency of various pathogens caused surgical site infection in general surgery units with their antibiotic resistance patterns. Aim of the study is to prevent or reduce the incidence of surgical site infection in clean, hygienic and contaminated cases.Surgical site infection (SSI) is both the most frequently studied healthcare-associated infection and the most common healthcare-associated infection. Incidence of General Surgical Site Infection is 5.5%. Older age group is commonly involved. Risk factors like anemia, diabetes mellitus, hypoproteinemia, and hypertension are associated with increased Surgical Site Infection rate. Contaminated cases had more SSI rate (23.33%) as compared to clean- contaminated cases (4.82%). Most of the bacterial isolates were multidrug resistant.

Keywords: Surgical site infection, Staphylococcus aureus, clean-contaminated surgery

1. INTRODUCTION

Nothing can be more disheartening and damaging to the morale of a surgeon than to see the result of a technically perfect operation marred by a prolonged morbidity related to Surgical Site Infection. Surgical site infections have always posed a very important surgical problem. SSIs are the most common healthcare associated infection (HAI) and account for $3.2billion in attributable cost per year in acute care hospitals [1]. Before Lister (1867) introduced the principles of antiseptic treatment of wounds, wound sepsis (SSI) was inevitable [2]. John Bell (1801) observed that " there is no hospital, however, small, airy or well regulated, where this epidemic ulcer is not found at times let him (the surgeon) bear in mind that this is a hospital disease".[3]

The picture of surgical site infection has undergone tremendous change in recent years [4]. With advances in discovery of antimicrobials, hopes ran high that the days of post-operative wound infections (SSI) were over. Contrary to this, wide spread and inappropriate use of antibiotics has lead to the emergence of antibiotic resistant bacterial isolates [5]. In the pre-antibiotic era, Staphylococci and Streptococci were found to be more common pathogens in wound infection (SSI) and even now-a-days, Staphylococcal infection of surgical site infection is important but strains of Staphylococcus have become resistant to most of the antibiotics in common use. This has been essentially due to the injudicious use of antibiotics

and greater reliance on antibiotics rather than use of the time honored methods of asepsis and antisepsis [6]. The menace of antibiotic resistance continues to grow and is posing a real challenge to medical world [7]. Moreover, infection by Gram Negative Bacillary group of bacteria is of equal and even of more importance currently.

2. AIM AND OBJECTIVES

AIM

Our aim is to prevent or reduce the incidence of Surgical Site Infection in Clean, Clean-Contaminated and Contaminated cases, which would result in reduction of post-operative morbidity, mortality and hospital expenditure.

OBJECTIVES

To study the incidence of Surgical Site Infection in Clean, Clean-Contaminated and Contaminated cases. Risk factors associated with the Surgical Site Infection. Most common organisms encountered and its antibiotic sensitivity and resistance in Surgical Site Infection cases.

3. REVIEW OF LITERATURE

Wound infection was defined as reaction in or around the wound margin due to activity of bacteria or their products. The infection was labeled as serious if there were systemic effects of infection besides local tissue destruction due to suppuration and trivial if there were only local signs of inflammation or if it was not progressive or did not unduly prolonged hospital stay [8,9]. The history of wound infection is probably as old as mankind. The historical account of wound infection can be divided into four areas;

1) Pre Listerian Era upto 1857
2) Listerian Era 1857 to 1920
3) Chemotherapeutic & Antibiotic Era 1920 to 1950
4) Present day situation 1950 onwards

Wound infection had been a problem throughout the ages wherever the sick have been housed. It was particularly common in some of the larger hospitals of Europe in Pre Listerian Era making most of the operations unthinkable. Cause of infection was unknown until Hieronymus Fracastorius of Verona in 1546 advanced the conception of contagium vivum as the possible cause of infective disease and Von Plenois accounted for the specificity of disease on the basis of a microbial etiology in 1762 [10,11]. For many years there were two opposed views with regard to genesis of microbial form of life. One group believed in spontaneous generation of living organisms from decomposing organic matter. Other believed that living organisms had their origin only in other living organisms. It was Pasteur who through his studies on fermentation of wines was able to show that disease was always caused and transmitted by living organisms and put the theory of biogenesis on firm footing [12-14].Surgery had its limitation due to fear of infection. The graphic account of John Bell at the beginning of nineteenth century had clearly shown the gravity of wound infection. Spreading type of cellulitis known as ‘Hospital Gangrene’ set in every wound. John Bell had no solution to the problem. Semmelweis reduced the infection in his ward by scrupulous hand washing. Edward Lund in 1862 used carbolic acid successfully in treating the open wounds. The man chiefly responsible for introducing pure carbolic acid into therapeutics was F. Grace Calvert, Professor of Chemistry in the Royal Institution at Manchester. The achievements of Semmelweis and Edward Lund were isolated and were not accepted universally. The wounds generally remained septic, proceeding to pyaemia, septicaemia and/or death [15-17] in 1935,

Domagk introduced Prontosil, a type of sulphonamide which reduced the infection remarkably [18]. Colebrook and Kenny established the remarkable action of Prontosil in Streptococcal infections in 1936. The benefits that these sulphonamides introduced in the treatment of war wounds and the freedom their use gave to the surgeon had a profound effect [19,20]. Success of sulphonamides was overshadowed by the discovery of Penicillin by Sir Alexander Fleming in 1929. Penicillin brought death warrant for the Staphylococcus aureus and conquest over hospital infections seemed complete [21]. Then came Streptomycin discovered by Selman Waksman. Since then a large number of antibiotics had been discovered and were in use [22]. It was frequently suggested that as antibiotics became available and began to be used prophylactically as well as therapeutically surgical interest in the finer details of aseptic techniques waned [23,24]. The antibiotic umbrella produced an unwarranted sense of security [25,26]. Unfortunately, early hopes with antibiotics were not fulfilled. Streptococcus lost much of its menace but not so the more adaptable Staphylococcus. Due to indiscriminate and injudicious use of antibiotics in hospital practice, bacteria developed resistance to the antibiotics. Soon the resistant isolates to Penicillin and other antibiotics emerged particularly of Staphylococcus. This created a new problem of cross infection and was reflected by a disturbing rise in the incidence of hospital sepsis.

Attention was then directed to operating room technique and air ventilation in an attempt to reduce the incidence of cross infection [27-29]. Refined methods for change of dressing such as, no touch technique were evolved [30,31]. Use of ultraviolet radiation in the operating room was recommended but somehow it met with a notable lack of widespread acceptance [32,33]. Altemeier et al, Howe, Mckittrick and Wheelock and others called attention to the narrow limits of the prophylactic benefits of the antibiotics in surgery, magnitude of still unsolved problem of wound infection and necessity of resorting to a rigid aseptic technique during operations.[33-35]

As a result of this, hospital Staphylococcal infection was reduced to a great extent and hospital infection no longer remained synonymous with Stapylococcal infection [36]. But decrease in Staphylococcal infection was associated with a rising incidence of infection with Gram negative bacilli [37]. Due to changing patterns of post- operative wound infection there arose the need for a proper definition so that incidence and interventions by various observers could be compared. Surgical site infection rate reported by different workers have differed considerably. Nature of bacterial flora to which the wound during or after operation was exposed, the nature and site of wound, the type of operation, the environmental factors present in different hospitals and wards, the state of the health of the patient, remote infections etc. have their bearing on the incidence of SSI.

Goswami NN, Trivedi HR, Patel TK et al.(2011) reported overall surgical site infection rate as 11.73%. Among isolates predominant organisms were Staphylococcus aureus (26.23%), Klebsiella pneumoniae (20.77%), Pseudomonas aeruginosa (20.22%) and Escherichia coli (15.85%). 183 organisms were identified from 110 cases which developed post-operative wound infections. 57 were Gram positive (31.50%) and 126 were gram negative (68.85%)[87]. Mohamed Issa Ahmed (2012) reported in bacterial isolates of nosocomial wound infections that Staph. aureus (55%) was predominant organism followed by Proteus mirabilis(35%), E.coli(5%), Pseudomonas aeruginosa(3%) and Proteus vulgaris(2%).[38]

4. METHODOLOGY

The present prospective study was carried out in the Department of General Surgery, KIMS, Karad from Nov. 2014 to April 2016 on 200 admitted patients who underwent various surgical procedures. Surgical site was considered to be infected according to the criteria of

CDC definitions of surgical site infections.[39]

5. OBSERVATION AND RESULTS

Table 1: Incidence Of General Surgical Site Infection

No. of Cases	No. Of Cases Infected	Percentage
200	**11**	**5.5%**

As seen in table no.1, study included 200 General Surgical patients, out of which 11 were infected. So the incidence is 5.5%.

Table 2: Incidence In Relation To Sex

Sex	No. Of Cases	Infected	Percentage
Male	136	8	5.88%
Female	64	3	4.68%

According to table no. 2, Incidence of infection among males is 5.88% whereas incidence of infection among females is 4.68%.

Table 3: Incidence In Relation To BMI (kg/m2)

BMI (kg/m^2)	No. Of Cases	Infected	Percentage
<20	19	0	0.0%
20.1-25	106	6	5.66%
25.1-30	53	2	3.77%
>30	21	3	14.29%
Total	200	11	

As seen in table no. 3, Most of the patients were having BMI of 20.1 to 25, followed by 25.1 to 30. Incidence of infection was more in patients having BMI of >30 (i.e.14.29%) and 0.0% in < 20 group.

Table 4: Incidence In Relation To Pre-Op Preparation

Shaving Time (Hours)	No. Of Cases	Infected	Percentage
0 to 5	57	3	5.26%

6 to 10	63	3	4.63%
11 to15	51	3	5.88%
> 15	29	2	6.89%
Total	200	11	

According to table no. 4, 29 patients had preparation of their parts by shaving done >15 hours before operation and the incidence of infection was 6.89% while those who had preparation done within 0 to 5 hours, had infection rate of 5.26%.

6. DISCUSSION

The present prospective study has been carried out in the Department of General Surgery, KIMS Karad on 200 admitted cases that had undergone various surgical procedures. The cases were followed up from the day of operation to 30 days after discharge and in those cases where mesh was used, they were followed upto one year. Overall incidence of SSI in the present study was 5.50%. The incidence of SSI has differed considerably as reported by different workers all over the world. Cruse and Foord in 1980 reported an incidence rate of 4.7% in a study of 62,939 operations. Different studies from India at different places have shown the SSI rate to vary from 6.09% to 28.09% as shown in table below. Its rate varies in different countries, different areas, different hospitals and in different wards of a hospital. The SSI rate in male patients was 5.88% and in female patients, it was 4.68%. The possible reason for the male patients being more prone to operative wound infections could be depressed cell mediated immunity in males in response to trauma.

7. CONCLUSION

Incidence of Surgical Site Infection at KIMS Karad is 5.5%. Incidence of infection among males is 5.88%, which is more than in females i.e. 4.68%. SSI rate is maximum in patients of age >60 years which is 9.25%. Out of 200 cases, 137 were elective and 63 were emergency surgeries. Elective cases had an incidence of 3.65% and emergency cases had more incidence of 9.52%. Out of 200 patients, 53 cases who had BMI in the range of 25.1-30 kg/m2 were having less incidence of infection, whereas infection was more among high(>30 kg/m2) BMI patients accounting for 14.29%. Out of 200 patients, 51 were anemic, who had incidence of 10.91% of infection rate; 11 had hypoproteinemia, who had 27.27% of infection rate; 18 were diabetic, who had 16.67% of infection rate and 24 were hypertensive, who had 8.33% of infection rate. 106 cases had less than 24 hours of pre-op hospitalization. But infection rate was more among 49 to 72 hours of pre-op stay in the hospital that accounting for 11.11%. Acute/ chronic appendicitis and inguinal hernia were the most common operations performed.

Surgical site infection was more among carcinoma stomach, sigmoid volvulus, hepatic abscess, carcinoma rectum, chronic cholecystitis, small bowel obstruction (jejunal stricture) and perforated appendix. The cases who were prepared pre-operatively by shaving in >15 hrs; had more rate of infection (i.e. 6.89%) whereas infection rate was less in cases who were prepared pre-operatively by shaving in <15 hrs. Clean cases were 87 and no infection was seen among them, clean- contaminated cases were 83 and had an infection rate of 4.82%; and contaminated cases were 30 and had an infection rate of 23.33%. Longer the duration of surgery more was the infection rate. Use of drain increased the incidence of Surgical Site

Infection. Most of the cases had Surgical Site Infection detected on5th and 6th post- operative day. Gram-ve bacilli were the more common isolate detected and Klebsiella spp. was the most common isolated organism in this study. Most of the bacterial isolates were multi- drug resistant. Overall Cefoperazone/sulbactam and Colistin (50.0%) were the most sensitive antibiotics. Overall Piperacillin/tazobactam (50.0%) is the most resistant antibiotic noted followed by Amikacin, Gentamycin and Ceftriaxone.

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