ORIGINAL RESEARCH PAPER

Surgery

STUDY OF RISK FACTORS ASSOCIATED WITH POSTOPERATIVE WOUND INFECTIONS IN ELECTIVE SURGICAL OPERATED CASES.

KEY WORDS: Postoperative wound infections, Risk factors.

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ABSTRACT

Postoperative wound infections are a major concern for surgeons worldwide and are an important cause of nosocomial infections. They have a significant impact on the patient's morbidity and mortality. These postoperative wound infections are associated with a number of risk factors. Among the patient related factors diabetes, anaemia and obesity significantly contribute to the development of these infections. Increased pre-operative hospital stay, prolonged duration of operation, use of drains are also important risk factors leading to an increase in the incidence of surgical infections.

MATERIAL AND METHOD - A consecutive study of 1000 operations was carried out in the department of Surgery, M.G.M. Medical College and M.Y. Hospital, Indore with the aim of evaluating the risk factors associated with postoperative wound infections.

RESULTS – The rate of infection among the 1000 cases with surgical wound was 31.8%. The most common pathogen isolated from wound infections was *Staphylococcus aureus* (29.2%). The highest infection of 53.2% was observed in patients more than 60 years of age. A steady increase in the incidence of infection was noted with increasing pre operative hospitalization stay. Higher incidence of infection (63.6%) was seen when duration of operation exceeded 180 minutes. Diabetes, use of drains and presence of remote site infections were also observed to be important risk factors.

INTRODUCTION –

Surgical practice primarily depends upon the healing of the wound without any complications. But even with the advances in wound care post operative wound infection continues to occur. These infections have a significant impact on the patient's morbidity and mortality. These infections vary from simple wound discharge as seen in superficial skin infections to complicated conditions such as septicemia [1]. Postoperative wound infection prove to be an economic burden on the patient because of the prolonged convalescence, prolonged postoperative hospital stay, additional expenditure, nursing care and unnecessary waste of time [2].

The incidence and microbiology of nosocomial surgical wound infections varies radically from place to place and from time to time. Postoperative wound infections affect about five percent of surgical patients and is the most common complication occurring in surgically operated cases [3]. The infection rate varies from as low as two percent to as high as sixty six percent [4,5]. A number of microorganisms have been implicated in causing surgical site infections. The most common bacteria responsible for post operative infection is *Staphylococcus aureus*. Other responsible organisms include *Escherichia coli, Pseudomonas aeruginosa*, *Enterococcus* spp, Coagulase-negative *Staphylococci*. [6,7]. These bacteria represent the endogenous flora of the region from which they infect the surgical site. Some infections can be caused due to contamination from exogenous source. These include the people in the surgical team, the air and the materials used during surgeries [8]. Inadvertent use of antimicrobials has caused disturbance in the ecology of bacteria and hence resistant bacteria have come into prominence. The most significant among these drug resistant bacteria is Methicillin resistant *Staphylococcus aureus* (MRSA) which poses a challenge to effective treatment [9].

Many risk factors are associated with the development of post operative wound infection. Pre morbid conditions like diabetes mellitus and anaemia have been associated with increased incidence of post operative infections due to decreased immunity[10]. Excessive body fat accumulation has also been associated with increased risk of infection in surgical patients[11]. Increased pre - operative hospital stay and prolonged duration of operation leads to more exposure of the body to microbial flora of the hospital environment, thus increasing the risk of nosocomial infections[12,13]. Use of drains post operatively and presence of a remote site infection prior to surgery act as independent risk factors in development of surgical site infections[14,15]. Judicious use of Pre operative antimicrobial has been shown to decrease the risk for development of infection[16].

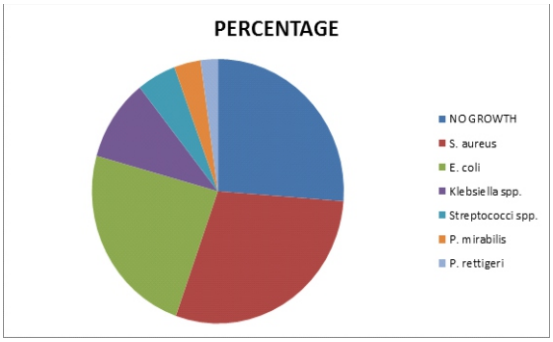
MATERIALS AND METHODS –

The study was carried out in the department of Surgery, M.G.M. Medical College and M.Y. Hospital, Indore with the aim of analysing the post operative wound infection rate in general surgery and the risk factors associated with it. A consecutive study of 1000 operations was done. Relevant epidemiological data of all the patients was collected. The duration of all the operations, the use of drains and duration of preoperative hospital stay were noted. The operative site was inspected 48 hours after operation and then weekly thereafter. A surgical wound was said to be infected if pus, inflammation, haematoma or serous discharge was present. If the wound was deliberately opened by the surgeon due to collection of discharge, then too such cases were reported to be infected. The sample was collected aseptically and sent to the Department of Microbiology for culture and sensitivity examination.

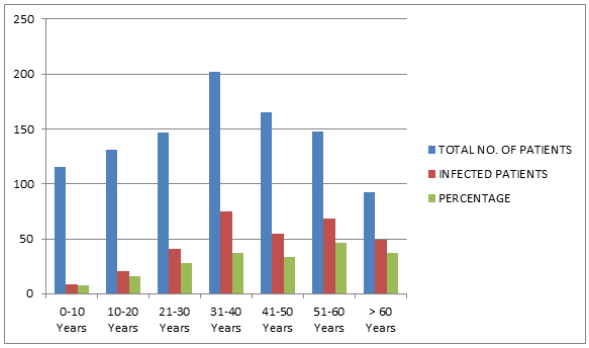
Gram stain was performed on all the samples and culture was done on Blood Agar and McConkey Agar. The culture plates were incubated at 37°C for 48 hours. Any growth on the culture plate was identified by the following biochemical tests – Catalase, CoagulaseTests for Gram positive Cocci. Catalase, Oxidase, Indole Production, Motility, Citrate utilization and Urease Tests were done for identification of Gram negative bacilli. Antibiotic sensitivity test was done on Mueller Hinton Agar following the CLSI guidelines.

RESULTS –

Among the 1000 cases with surgical wound, 318 were clinically suspected to be infected leading to an infection rate of 31.8%. On culture 235 of the clinically suspected samples showed growth of organisms. There was no growth on 83 (26.1%) culture plates. The most common pathogen isolated from wound infections was *Staphylococcus aureus* (29.2%), which was followed by *Escherichia coli* (23.8%), *Klebsiella* spp (10%), *Streptococcus* spp. (5%).



AGE AND INFECTION RATE



The highest infection of 53.2% was observed in patients more than 60 years of age and the lowest rate of 7.8% was seen in 0-10 years age group.

INCIDENCE OF WOUND INFECTION AND PRE OPERATIVE HOSPITALIZATION PERIOD

Pre operative hospitalization in days	Total no. Of patients	No. Of infected patients	Percentage
0-5	438	79	18
6-10	387	127	32.8
11-15	123	68	55.2
> 15	52	44	84.6

A steady increase in the incidence of infection was noted with increasing pre operative hospitalization stay. The lowest infection rate (18%) occurred in 0-5 days of stay whereas the highest rate (84.6%) was seen when the patient stayed for more than 15 days preoperatively.

DURATION OF OPERATION

Duration of operation in minutes	Total no. Of patients	No. Of infected patients	Percentage
< 60	265	48	18.1
61-120	598	197	32.9
120-180	126	66	52.3
>180	17	7	63.6

The infection rate increases significantly with duration of operation. Least infection rate (18.1%) is seen in surgeries lasting less than 60 minutes and the most (63.6%) is seen in surgeries exceeding 180 minutes.

Amongst other factors that were studied diabetics had an infection rate of 69.5%, obese patients 49.2% and anaemic patient had infection rate of 38.6%. Patients in whom (38.7%) drains were used had a higher incidence of infection as compared to those in whom (24.6%) no drains were used. Higher incidence of post operative wound infection was seen in those patients who had some infection at remote site (56.1%) than those who had no remote site infection (30.1%).

DISCUSSION –

Post operative wound infection is a major complication after surgery. The incidence of infection in the study is 31.8%. Similar studies in India have shown that infection rate varies from 4.04 % to 66% [5,17,18]. The most common isolate was *Staphylococcus aureus* (29.2%), which was followed by *Escherichia coli* (23.8%), *Klebsiella spp* (10%), *Streptococcus* spp. (5%). *Staphylococcus aureus* has been the leading cause of surgical site infection in various other studies as it is the predominant flora of the skin [6,7,11,12]. In the study *Escherichia coli* was the most common organism isolated amongst the gram negative bacteria which is consistent with various similar studies [6,18].

Age is an unmodifiable risk factor and increasing age has been demonstrated to have a definite effect on the rate of operative wound infection. In the present study lowest infection rate was 7.8% in 0-10 years age group and highest rate was 53.2% in more than 60 years age group. In a study by Cruse and Foord on 23649 surgical wounds a similar pattern was seen. The wound infection rate was as low as 0.6% in the 1-14 years age group and as high as 3.8% in over 60 years age group [20]. Apart from decreased immune response, concomitant presence of chronic disease at later age contributes to the development of infection.

A steady increase in the incidence of post operative infection is noted with increasing pre operative stay in hospital due to excessive exposure of the patient's body to the hospital environment which is filled with various microorganisms capable of causing infections [15]. In the present study the highest infection rate of 84.6% was found in patients in whom the preoperative hospital stay was more than 15 days. In a similar study by Anvikar et al the infection rate was 1.74% for one day hospital stay and it steadily increased to 5% when hospital stay was more than 7 days [14].

In this study a correlation was seen between prolonged preoperative hospital stay and infection rate. Prolonged preoperative stay increases the exposure of patients to hospital environment[12,19]. An increased incidence of infection is seen with longer duration of operative procedures. In this study the infection rate was maximum (63.6%) when operation time increased beyond 3 hours which is similar to other studies[19,21]. Longer procedures are associated with more tissue trauma, more exposure to microorganisms and ever decreasing level of tissue antimicrobials.

A wound infection rate of 24.6% was observed in operations without drains as compared to infection rate of 38.7% in operations with drains. Lilani et al reported a similar finding with infection rate of 22.4% in drained wounds and 3.03% in non drained wounds. Drains acts as a communication between tissue and exterior and may act as a pathway for infection. Haematogenous spread of a remote infection to the surgical site can lead to increase in wound infection. Out of the 1000 patients 938 had no remote infection. Of the 62 patients having remote infections 48 had urinary tract infection 9 had respiratory tract infection and 5 had skin infection. The overall infection rate was 30.1% in patients without remote infections and 56.4% in patients with remote infection. Among the 1852 patients studied by Garibaldi et al, the presence of of a distant infection was associated with an overall wound infection rate of 16%, considerably greater than 6.1% seen in patients without a distant infection[22].

CONCLUSION –

Despite the use of aseptic measures by surgical team, postoperative wound infections are still an important nosocomial infection. Judicious use of antimicrobials and strict antiseptic measures are required to counter this menace. Proper evaluation and control of risk factors associated with postoperative wound infections can bring down the incidence of this infection.

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