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A study on various factors influencing the wound infection following abdominal operations

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Abstract
The "antiseptic principle" or "Listerian method" although initially resisted by some surgeons they were gradually adopted. Even late in 19th century antiseptic surgery was not practiced. Surgeons washed their hands after surgery, but seldom before. Ernest Begmann said in 1882 that the new thing in surgery is "we wash our hands before surgery". The study subjects included 100 Patients admitted for Elective and Emergency abdominal surgeries in Department of Surgery. Patients who are undergoing elective and emergency abdominal surgeries are randomly divided into two groups. In this study 22 patients were of lower class and out of which 11 patients had infection i.e. 50%. Out of 64 middle class patients 17.18% patients had infection and out of 14 upper class patients one had infection i.e. 7.14%. So lower class people have chances of infection P value is <0.05 and is statistically significant.

Keywords: Wound infection, abdominal surgeries, diabetes

Introduction
Infection is encountered by all surgeons, who, by the nature of their craft, invariably impair the first lines of host defenses; the cutaneous and mucosal barrier between environmental microbes and host's internal milieus. The entrance of microbes in to host tissues is the initial requirement for infection preventing microbial penetration, reducing microbial inoculum and treating established infection have been important developments in reducing the mortality associated with surgery [1, 2]

Bacterial cause of surgical infection was appreciated towards the end of 19th century. Before Lister, the mortality rate due to surgical infections was 25-90%. Joseph Lister, in 1865, started using Carbolic acid for wound dressing and found that wounds healed without infection. Wound antisepsis was not new with Lister. Numerous agents had been placed in wounds since ancient times in an attempt to foster healing and prevent death. This agents included resins, such as turpentine, pitch & tar, balsams and balms, myrrh, and frankincense, honey, alcohol, glycerin, mercuric-chloride, silver nitrate, iodine hypochlorite's, creosote's, ferric chloride, zinc chloride and carbolic acid [3]

The "antiseptic principle" or "Listerian method"[1, 2] although initially resisted by some surgeons they were gradually adopted. Even late in 19th century antiseptic surgery was not practiced. Surgeons washed their hands after surgery, but seldom before. Ernest Begmann said in 1882 that the new thing in surgery is "we wash our hands before surgery" [4]

Rubber gloves were introduced by W. Halstead but their routine use by entire operating team was implemented by Joseph Blood good. Between 1880 and 1890 sterilization of operating room and instruments by chemicals and steam gradually came in to practice. By early 20th century routine hand washing and wearing masks, caps, gowns and gloves were also introduced.

Pere discovered the safe-guarding of local resistance of the wound and semmelewis [1, 2] realized that infection was transmitted directly. Despite the advances made by these pioneers misery and mortality of surgical infection continued until 1890. Kocher introduced meticulous bloodless surgical technique and by 1899 was able to report a 2.3% infection rate in clean surgery [5].

Introduction of antibiotics was a major step in the treatment of infections. Although the discovery of penicillin was first introduced by Alexander Fleming [1, 2] in 1928 the clinical administration of this drug was done by Howard Florey in the 1940s. It was hoped that antibiotics would eliminate the risk of infection and surgical easily cared. However such has not been the case wound infection and other post-operative infection continue to be the risk. The bacteria causing wound infection have changed. Wide use of antibiotics have even led to emergence of strains of antibiotic-resistant bacteria. Nature of post-operative infection has also

changed because of compromised host defenses [6] Wound infection is still the commonest complication seen in surgical practice, and the prevention and control of infection is still one of the most difficult problems faced by surgeons today. Sepsis is one of the most important case of postoperative morbidity. The complication includes wound sepsis, intra-abdominal pelvic abscess, and septicemia. The consequences of these potentially preventable complications in gastro intestinal surgery include thromboembolism, malnutrition, anastomotic dehiscence, wound disruption, disseminated intravascular coagulation and death [7, 8]
Etiology of wound infection is mainly of microbes. These microorganisms include bacteria, viruses and fungi. These microbes can be endogenous or exogenous and their invasion is influenced by various factors like body defense mechanisms, pathogenicity of organisms, operative technique, post-operative wound care, pre-operative status of the patients, presence of sepsis elsewhere in the body sterility of instruments, gowns, gloves, caps and masks; kind of surgery, duration of hospitalization etc. Prevention is better than treatment. Hence evaluation of these factors will definitely help to prevent the occurrence of infection [9].
Infection once occurred, it should be treated promptly. The mainstay of treatment of infection is antibiotics but once pus is there, surgery is invariable. For proper treatment the organism that is grown in the wound should be isolated by culture studies and appropriate antibiotics should be administered according to sensitivity test factor [10].
The advent of antibiotics, hailed as "magic Bullets" promised an era of infection free surgery and freedom from morbidity and mortality due to infections. Unfortunately these hopes did not come true, due to an inadequate understanding of the pathology of surgical infection and how best to use antibiotics to control them.
The rationale for preoperative antibiotics can be explained on the basis of pharmacokinetics. The most vulnerable period for wound infection is the time from when the incision is placed till the time of closure. Therefore to prevent infection prophylactic antibiotics should be administered in such a way that the maximum tissue concentration is during the most vulnerable period. This can only be achieved by giving the antibiotics 30 to 60minutes before the time of surgery. The antibiotics used should be bacterial [11].
Post-operative antibiotics therapy mean administration of antibiotics in the post-operative period for 5 to 7 days from this may arise complication like antibiotics resistance, super infection or specific toxicity [12].
This study is to evaluate various possible factors that influence the process of post-operative abdominal wound infection

Methodology

The study subjects included 100 Patients admitted for Elective and Emergency abdominal surgeries in Department of Surgery.
The method of study consists of

- Detail history taking & clinical examination
- Investigations after taking written informed consent
- Factors influencing Post-Operative Abdominal Wound Infection will be detailed.
- Patients who are undergoing elective and emergency abdominal surgeries are randomly divided into two groups.

Inclusion Criteria

- Abdominal Surgeries
- Age greater than 18 years.

Exclusion Criteria

- Pre-operative infectious diseases
- Allergy to the antibiotics being used
- Antibiotic administration prior to prophylactic dose

All patients who have not given consent for study.

Results

Table 1: Incidence of Infection with Age

Age 1	No	Percentage (%)	Sepsis	Percentage (%)
1-10 years	0	0	0	0
11-20 years	5	5	1	25
21-30 years	25	25	4	16
31-40 years	20	20	3	15
41-50 years	20	20	3	15
51-60 years	14	14	7	50
61-70 years	13	13	5	38
71-80 years	2	2	2	100
81-90 years	1	1	0	0
	100		25	

The age of patients who were studied are belonged to the age group 10 to 90 years. Maximum age group belongs to 21-30, and minimum patients in 80-90 years. Mean age is 25 years, youngest age is 18 years, and oldest age is 85 years. Incidence of infection is high in old age.

Table 2: Incidence of Infection with Sex.

	Infected	%	Non-Infected	%	Total no
Males	16	41.6	49	42.46	65
Females	9	12.6	26	12.13	35
	25		75		100

In this study the males outnumbered females i.e.41.6%.
Male have higher chances of infection when compared to females, *P value < 0.05*

Table 3: Incidence of Infection with Socio-Economic Status**.**

	Infected	%	Non-Infected	%	Total No
Lower Class	11	50	11	50	22
Middle Class	13	17.18	51	79.6	64
Upper Class	1	7.14	13	92.85	14
	25		75		100

In this study 22 patients were of lower class and out of which 11 patients had infection i.e. 50%. Out of 64 middle class patients 17.18% patients had infection and out of 14 upper class patients one had infection i.e. 7.14%. So lower class people have chances of infection *P value is <0.05* and is statistically significant.

Table 4: Incidence of Infection with Nutritional Status.

	Infected	%	Non Infected	%	Total no
Poorly Nourished	10	45.45	12	54.55	22
Moderately Nourished	12	18.46	53	81.15	65
Well Nourished	3	23.07	10	76.92	13

The incidence is more in the poorly nourished patients (45.45%) and there is statistical association between the nutritional status of the patients and the outcome of infection. *P value is <0.05*

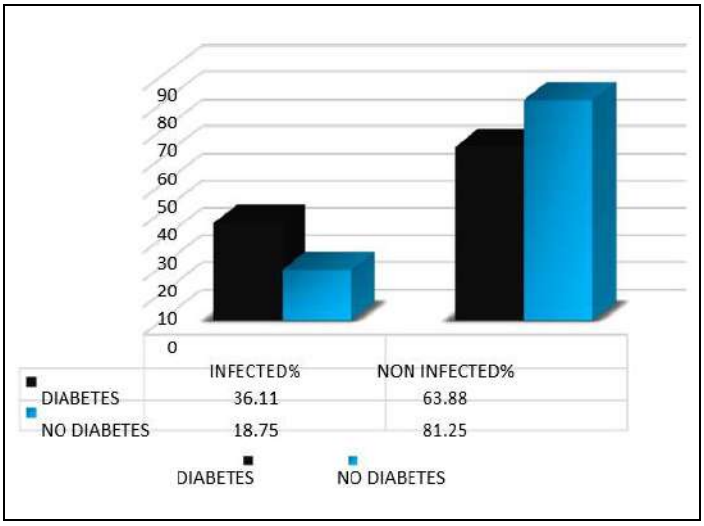

Fig 1: Diabetes and infection

Out of 100 patients, 36 patients had type 2 diabetes and out of which 13 patients had infection accounting to 36.11% and remaining 23 patients did not have infection 63.88%.

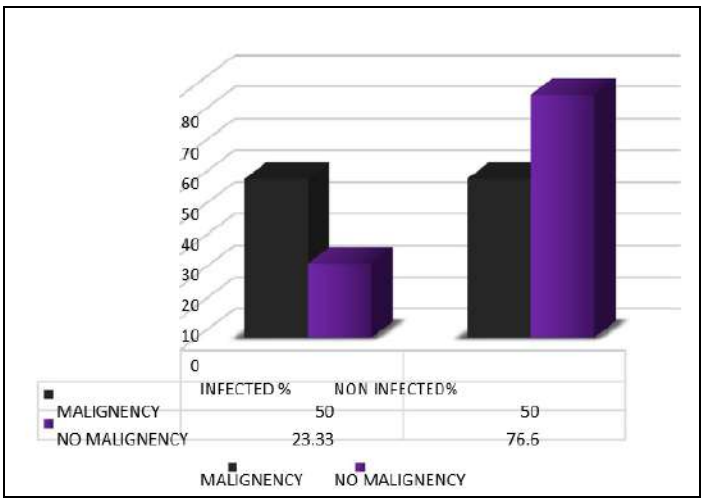

Fig 2: Malignancy and infection

Out of 100 patients 8 patients had malignancy, out of which 4 had infection accounting to 50%, none of them were on steroids or anti-malignant drugs.

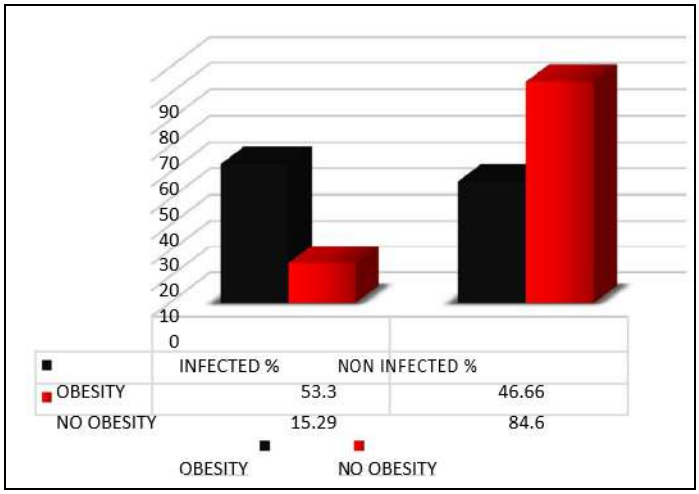

Fig 3: Obesity and Infection

Out of 100 patients 15 patients were obese, out of which 8 patients had infection accounting to 53.3% and remaining 7 patients had no infection 46.7%

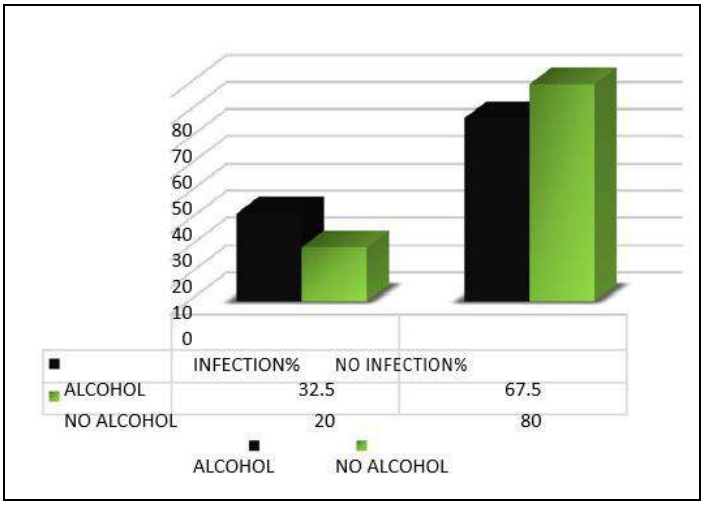

Fig 5: Smoking and Infection

Out of 100 patients 37 were known smokers and among them 13 had infection accounting to 32.5%.
This states that smokers are prone to SSI and is statistically significant as *P value 0.05*

Discussion

Identification of factors influencing wound infection will help to avoid or prevent wound infection to a certain limit. The rationale behind the perioperative antibiotic prophylaxis is that a high dose of antibiotic should be present in tissues and circulation at the time of operation and this assists the host defenses to prevent bacterial invasion [8, 9] By this study, it is tried to evaluate, various factors affecting post-operative abdominal wound infection and effect of perioperative antibiotic prophylaxis.
Over all incidence of wound infection in the study is 25%.
In this study wound infection rates are high comparing to various other studies reported. This study shows 17.9% clean wound infection, 27.7% clean-contaminated wound infection, 42.8% contaminated wound infection out of 25 cases in 100 cases.
In this study the infection rate of clean surgery is 17.9% and that it is a cause for concern, as so many other factors were involved in causing infection, whereas contaminated surgery infection rate is 48.7% The various factors that might contribute are discussed below.
Maximum incidence is seen in 70-80 years and minimum in 10-20 years. The peak incidence, is in the 60-70 years, in this study. In the previous studies, maximum incidence were in >60yeras. This high infection rates in old age is due to reduced host defense mechanism. Wound healing, in young and elderly, normally occurs but the speed of healing is reduced in elderly.
In this study there are 41.8% of infection in males and 12.5%in females. This is significant statistically P-value is <0.05.
In this study 44 patients were from low socioeconomic level, 64 from middle class and 4, from upper class. Their infection rates are 50%, 17.18% and 7.14% respectively. There is a definite difference in observation and are seen to be statistically significant. This high rate in poor class may be due to poor nutritional status and hence the body defense mechanisms.
In this study there are 40 poorly nourished patients, 48 moderately nourished and 12 well-nourished patients. The

infection rate in these groups are 45.45%, 18.46%, and 23.07% respectively. There is definite difference in observation and statistically significant (p-value is <0.05).

In this study 32patients had anemia. These patients were operated after correction of anemia and sepsis rate was 12%. The remaining patients had no anemia and comparing to infection rate of this group, there is definite difference of infection and this observation is statistically significant. (P value is <0.05).

In this study there were 15 Obesity patients and their infection rate was 53.3%. Comparing to the other group there is increased incidence in this group and is statistically significant. (P value is <0.05).

There were 36 diabetic patients in this study and their infection rate was 36.11%. Comparing to those have no diabetes, this rate is very high and is statistically significant (P value is <0.05).

There were 31 hypertensive patients in this study and their infection rate was 32.5%. Comparing to those Non-Hypertension, this rate is very high and is statistically significant (P value is <0.05).

There were 8 patients with malignancy in this study. Their infection rate 50%. There is not much difference in the infection rate comparing to that of non-malignant group.

There were 13 Alcoholic patients in this study and their infection rate was 32.5%. Comparing to those are Non-Alcoholic this rate is very high and is statistically significant (P value is <0.05).

There were 13 Smoker patients in this study and their infection rate was 32.5%. Comparing to those are Non-smoker, this rate is very high and is statistically significant (P value is <0.05).

In this study 7 patients had UTI among which 5 patients had sepsis i.e.71.4%, 7 patients had URTI among which 4 patients had sepsis i.e.57.1% and 6 patients had LRTI among which 4 patients had sepsis i.e.66.66%.

Conclusion

- The overall incidence of wound infection in this series is 25%. the total number of cases studied is 100 and sepsis found in 25cases.
- As clean wound infection rate is 17.9%, it is a cause for concern as so many other factor where responsible as described in causing infection in clean surgeries.
- The mean age of incidence of wound infection is 45 years and wound infection is more in elderly >60 years.
- Males females in the ratio 1.08:1 infection is more in females but not statistically significant.

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