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# Impact of Wound Infected Patients based on Demographic and Comorbidities

**Edwina Jospiene M[1], S. Subramaniam[2], Shyama Subramaniam[3]**

[1]Research Scholar, Regenix Super Specialty Laboratories Pvt., Ltd., Affiliated to University of Madras), Chennai - 600 094, Tamil Nadu, India
Email ID: edwina18[at]ymail.com

[2]Lab Director and Professor, Regenix Super Specialty Laboratories Pvt., Ltd., Affiliated to University of Madras, Chennai - 600 094, Tamil Nadu, India
Email ID: subramaniam[at]regenix.in

[3]HOD and Professor of Biochemistry, Apollo Lab Services, Chennai, Tamil Nadu, India
Email ID: shyamasubramaniam[at]gmail.com

**Abstract**: ***In modern human history, infectious disease has posed a threat to public health several times. Antimicrobial resistance intimidates the effective prevention and treatment of an expanding range of infections caused by pathogenic microorganisms. In particular, some people are at higher risk of developing serious infection. Antimicrobial resistance occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder for treat and increasing the risk of disease spread, severe illness and even death. As an effect, the medicines become ineffective and contagions persist in the body, increasing the risk of spread to others. Certain risk factors including age, gender and comorbidities developed during lifetime can put them at increased risk of severe effects from infections. Objective: To study about the various risk factors affecting the severity of bacterial infection in Chennai population. Method: The samples were cultured and categorized using structural and diagnostic biochemical tests. The analysis of the frequency of the isolates and their age, gender and comorbidities were calculated using SPSS (version 21) at a significant level of P - value < 0.05. Results: In this study, bacterial isolates were collected from the 300 clinical specimens, in which of 103 male and 197 were females. The results showed that 38% were gram - positive and 62% were gram negative. In our study, the frequency of staphylococcus aureus bacteria was higher and the penicillin group of antibiotics shows more resistance in most of the organisms. Conclusion: To prevent further spread of resistance, increase the efficacy of antibiotics and prevent multidrug resistance, it is essential to establish accurate schedule for the use of antibiotics and assess the resistance pattern intermittently in each region based on the antibiotic resistance pattern.***

**Keywords:** Antimicrobial resistance, Bacterial infection, gram - positive, gram negative, staphylococcus aureus, antibiotics.

## 1. Introduction

One of the frequent infections of the human and animal epidermis and soft tissue is infection caused by microbial pathogens during or after a trauma, burn injuries or a surgical procedure. This infection results in the production of pus, (a white to yellow fluid comprised of dead WBC's, cellular debris and necrotic tissues) often leading to delayed healing and sepsis. Open resection poses unique challenges to the perioperative care team. Several patients suffering from open intestinal resection is at risk for perioperative difficulties, such as pulmonary compromise, wound dehiscence, intra - abdominal infection, anastomotic leak, and postoperative ileus [1]. Resulting in increasing mortality and morbidity as well as increasing length of stay and price. It is clinically characterized as an infection that occurs within 30 days of surgery or within a year if an implant is left in place after the procedure and affects either the incision or deep tissue at the site of the surgery or the open resection. [2] These infections can be superficial or deep incisional infections, or infections affecting organs or body spaces. Hospital acquired infection contaminations are the most common associated with health care settings. They are associated with significant morbidity and over one - third of postoperative deaths have been reported to be linked to SSI [3, 4].

Surgical site infection (SSI) still accounts for the most common hospital - associated infection (HAI) at 31% of all HAIs in hospitalized patients, despite the advances in infection control mechanisms and preoperative antibiotic prophylaxis. (10, 11) Patient's predischarge conditions may play an important role in the development of SSI. (12) Although preoperative assessment or so - called preoperative "clearance" has been instituted in the routine preoperative process, there is no specific procedure, preoperative patient risk profiles constructed during the process for patient risk stratification and planning. In recent years, there have been some risk assessment models developed for surgical patients. These risk assessment models provided intangible frameworks about the study of risk factors correlated with adverse outcomes in surgical patients and the development of clinical prediction rules for surgical patients. These surgical risk assessment models included the American Society of Anaesthesiologist's Physical Status (ASA PS) model, (5) the Acute Physiology and Chronic Health Evaluation (APACHE) model, (6) the physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) models, (6, 7) and the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) models. (11) The multifactorial index of cardiac risk in noncardiac surgery and the revised cardiac risk index are cardiac focused risk assessment models. (12, 13). Despite the progress and application of these risk valuation models for surgical

patients, few studies focused on the construction of an individual patient surgical risk profile using only preoperative patient personal province profile, social history domain profile, and comorbidity domain profile. Assessing the impact of preoperative patient profiles on surgical outcomes of open intestinal resection may assist in developing a specific procedure preoperative patient risk - profiling tool for the construction of an individual preoperative patient risk profile. This preoperative patient risk profiling process may significantly contribute to patient risk stratification, surgical planning, and surgical care coordination for managing surgical patients in the perioperative period.

Infection of wound site and pathogenicity of microorganisms, balanced against the host's immune response will determine the existence of SSI [7–9]. The organism which causes SSI—are usually derived from the endogenous environment, that is the patient skin or opened viscus. Surgical instrument or theatre atmosphere will contaminate the site during operation leads to exogenous causes of SSI [2, 10, 11]. Hematogenous spread of organisms from distant sources of infection can rarely cause surgical site infection by attachment to the prosthesis or other implant left in the operative site. The contagion and prevention and control practices of surgical site infection are therefore aimed at minimalizing the number of pathogens at surgical site.

## 2. Materials and Method

**Method:**

**Study area and period:**

The samples from varies collection centres of 'Regenix Super Speciality Laboratories Pvt. Ltd'. (NABL accredited) from all over Chennai, Tamil Nadu, India from August 2019 to January 2020 were collected for this study. These are mainly hospital attached laboratories with both in patients and out patients. The wide range of patients from Diabetic, Paediatric, Gynaecology, orthopaedicpatients were part of this study. Regenix Super Speciality Laboratories Pvt. Ltd. is a diagnostic laboratory (<400 sample/ day) covering specialities from biochemistry, immunology, haematology, hormones, microbiology, molecular biology and other special parameters. All the data presented in this study are the values from the sample analyser data in the lab. A detailed questioner and consent form were collected and filed for future reference and information about the study is also given to educate the patients. This cross - sectional review was directed on patients from August 2019 to January 2020 and followed for advancement of clinical signs and side effects on careful site and circulation system disease until the hour of release and post release. Wound swab and venous blood tests were collected and handled for bacterial separation and antibiogram study.

**Inclusion and Exclusion criteria:**

The samples considered for this study were pus samples and wound swabs. These samples were cultured for growth and the samples with positive growth were further tested for anti - biotic sensitivity. The haematological and biochemical parameters for the samples with positive growth were correlated for the studies. Exclusion criteria for the study were neonates apart from that all other pus and wound swabs are falls under inclusion criteria.

**Culture of specimens**

The plates were incubated aerobically at 37°C over night and the interpretation of the results of the antimicrobial susceptibility was made based on the CLSI criteria as sensitive, intermediate and resistant by measuring diameter of inhibition of the zone. The standard reference strains, Staphylococcus aureus (ATCC25923), Escherichia coli (ATCC25922 and P. aeruginosa (ATCC 27853) were utilized to guarantee testing execution of the power of drug discs as well as the quality of culture media. The quantitative data was checked for completeness, coded and fed into SPSS version 21 and P - value <0.05 was considered statistically significant for association between variables. Samples are approved by Hy - care Ethical Committee - reference number 033/HYC/IEC/2019.

## 3. Results

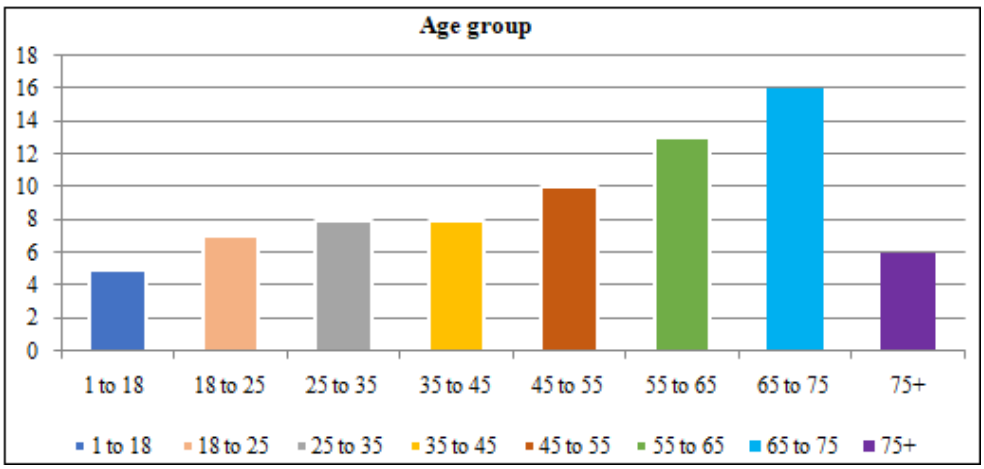


**Figure 1:** Distribution of age group the infection frequency differs according to the data collected 65 - 75 years patients are getting more infection then the any other age group, followed by 55 - 65 and 45 - 55.

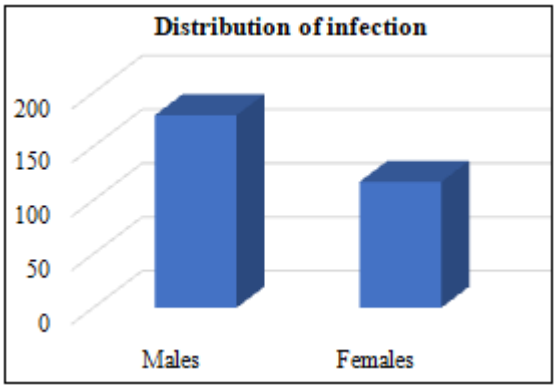


**Figure 2:** Distribution of infection is high in males when compared to females

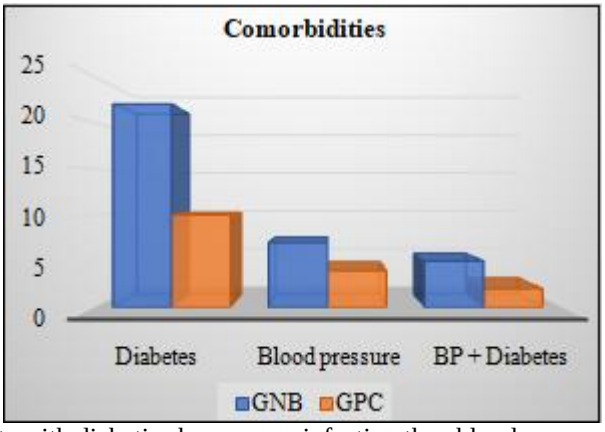


**Figure 3:** Comorbidities - Patients with diabetic shows more infection than blood pressure or infected patients without any comorbidities

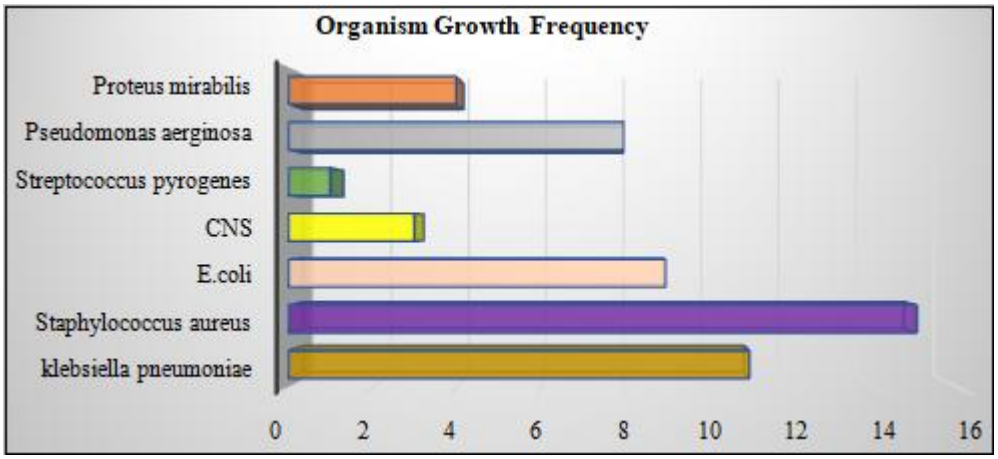


**Figure 4:** Organism growth Frequency, in this study, *Staphylococcus aureus* shows maximum number of growth among others followed by *Klebsiella pneumoniae*, *E. coli., Pseudomonas aerginosa and proteus mirabilis.*

## 4. Discussion

The age, gender and comorbidity differences observed in Bacterial pathogenic infection vulnerability emphasise the need to understand the impact of age, gender and comorbidity on the incidence and case fatality of the disease and to tailor the treatment according to age, gender and comorbidities. Experiences from the past outbreaks and infection rates have clearly shown the importance of incorporating age, gender and comorbidity analysis into the preparation and response efforts of health interventions. This is due to increase in comorbidities and low immune response in the body. Likewise, Adnan Hamza et., al says Bacterial isolation from wound swab was more likely among males than females. Similarly, lack of medical attention, life style modification also plays a major role in this. The number of males admitted was twice that of the females but it was found that the females who were admitted had a slightly higher severity of illness and a greater number of deaths. [21]

According to this study 65 to 75 age group is having more infection than any other age group followed by 55 - 65 and 45 - 55. Similarly, many clinical and animal studies at the cellular and molecular level have examined age - related changes and delays in wound healing. [14] It is commonly recognized that, in healthy older adults, the effect of aging causes a temporal delay in wound healing,

but not an actual impairment in terms of the quality of healing [15, 16] Delayed wound healing in the aged is associated with an altered inflammatory response, such as delayed T - cell infiltration into the wound area with alterations in chemokine production and reduced macrophage phagocytic capacity. Similarly, Niranjan, Vet., al stats the same as the age increases the bacterial infection will also get increased [17]

Bacterial isolation from wound swab was more likely among males than females. Similarly, Niranjan, V et., al states the same as the age increases the bacterial infection will also get increased. Likewise lack of medical attention, life style modification also plays a major role in this. Generally, the infection rate is higher in male comparing to female. According to the above study the males getting more affected than female patients, Like wise KhalimWangoyeet, al. says females are getting more affected then males its because of the climatic condition in that particular place or the use of antibiotics used depends on that.

Comorbidities - Patients with diabetic shows more infection than blood pressure or patients without comorbidities (Fig.4). People who have had diabetes for a long time may have peripheral nerve damage and reduced blood flow to their limits, which increases the chance for infection. The high sugar levels in your blood and tissues allow bacteria to raise and allow infections to develop more quickly. Similarly, Johan R Simonsonet, et., al the frequency of bacterial infections was significantly higher in patients with type 1 diabetes comparing with age - matched and gender - matched population, and correlated with the severity of diabetic nephropathy in inpatient and outpatient setting. likewise multifactorial, including the type and source of infection; distribution of chronic comorbid medical conditions; social, cultural and economic factors; and both access to health care and the delivery of health care.

Organism growth Frequency highest rate of infections occurs in *Staphylococcus aureus* followed by *Klebsiella pneumonia, E. coli, Pseudomonas aerginosa and proteus mirabilis.* (Fig.1). In this study population, there is less or no similar work done in this population so comparing the obtained results with other similar studies done in different parts of the world, KemebradikumoPondeiet., al says at Nigeria Pseudomonas aeruginosa shows highest number of infection followed by *Staphylococcus aureus and E. coli.* SimilarlyP. G. BOWLER et, al at Arizona shows Staphylococcus aureus has the highest number infection growth frequency. This is purely based on the climatic condition of the study population, number of antibiotics exposed by the individual, wound location, patient's co - morbidities and poor sanitization.

## 5. Conclusion

The age, gender and comorbidity differences seen in the bacterial infection susceptibility emphasise the need to understand the effect of these factors on the incidence and case fatality of the infection. Our study reflects the unities and differences in patients with or without comorbidities. The infection and mortality rate appears to be increased in patients having diabetics. The patients with the age group of 65 and above that are more prone to infection due to their low immunity level and comorbidities effect. In this study majority of the infections were gram negative in origin comparison with Western studies where gram - positive organisms were more common, among which staphylococcus aureus shows morepositive. Fast or quick detection of bacterial species or its resistance pattern will help the medical practitioner to treat better. Larger multicentred cohorts and prospective analysis may help for better understanding of the impact of comorbidities in patients, which helps in improved medical practice for the infection.

**Conflicts of Interest**

All authors declare no conflicts of interests. The graphical abstract has been designed using SPSS software version 21.

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