

NOSOCOMIAL INFECTION: GENERAL PRINCIPLES & THE CONSEQUENCES, IMPORTANCE OF IT'S CONTROL AND AN OUTLINE OF THE CONTROL POLICY - A REVIEW ARTICLE

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Abstract

Nosocomial Infections or more commonly known as Hospital Acquired Infection [HAI], in short, may be defined as "Any infection that is being acquired in a hospital, particularly when the source or the risk factor for it is one peculiar to the hospital". The matter of concern is that nosocomial infection or hospital acquired infection at the moment affect not less than 400,000 hospitalized patients at anytime in the world² and are direct or contributory causes of death of more than 80,000 cases a year in the U.S.A. alone³. Billions of dollars are used annually in the developed countries alone for the control of just these hospital acquired infections alone which reflect another aspect of the magnitude of the problem. The magnitude of the problems of the nosocomial infections in other countries is even more serious and in a developing country like Bangladesh, one could assume (since there is no established recognized statistics) the pathetic picture in terms of morbidity, mortality as well as the invisible but very valuable economic loss.

The other frustrating fact regarding the natural history of Nosocomial or Hospital Acquired Infections is that they can not be eradicated entirely; but many of them can be prevented by proper control measures. In places where control programmes can be implemented, there had been a proven reduction of morbidity and mortality. Furthermore, the money that can be saved by reduction of nosocomial infections is much more used for infection control⁴.

Introduction:

Hospital acquired or nosocomial infections are the infections that were not present or even not incubating in the patient when he or she was admitted into the Hospital. Williams while defining Hospital Acquired Infection said, "any infection that is acquired in a hospital, whether from ordinary risk or from one peculiar to hospital, whether the results

appear in the hospital or after the patient has gone home, this including infections from one person to another and infection from one tissue to another in the same person." Hospital acquired or Nosocomial infection is the result of the result of transmission of pathogenic organisms to a previously un-infected patient from a source in the environment of a Hospital. Most nosocomial infection manifest while the patient is still in the hospital; occasionally, however hospital acquired infections may have onset after the patient has left the hospital these cases has also been recognized as Hospital acquired Infection.

Classification or Types:

Hospital Acquired infections may be:

Endogenous or Autoinfection: When the pathogenic organisms are derived from the patient himself.

Exogenous or Cross infection: When the causative organisms are acquired from the hospital environment.

Sources of Infection & Modes of Transmission:

Regarding the micro-organisms of nosocomial infections:

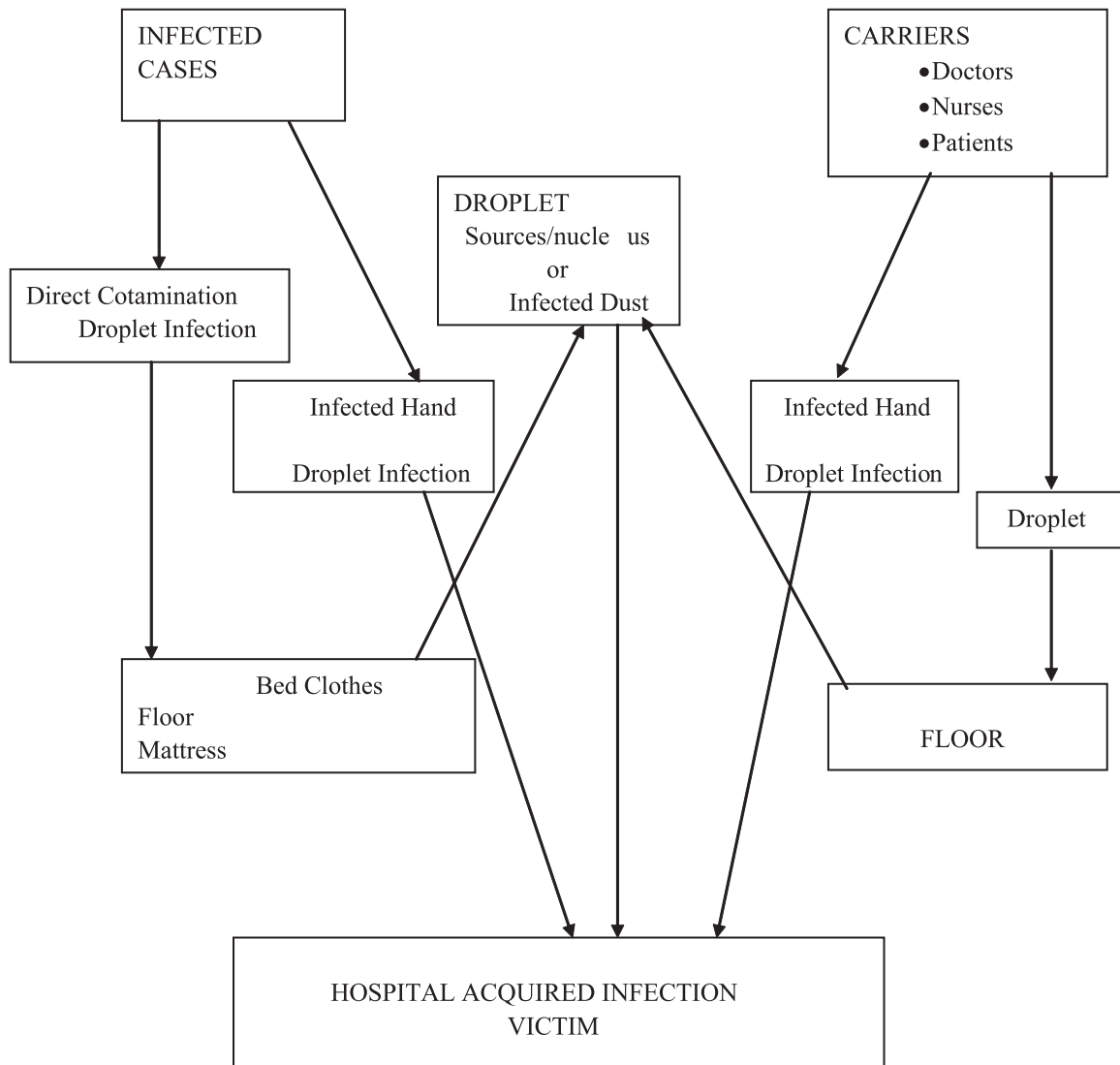
Common Sources are:

- a) Animal: Patients themselves other Common Source are: Infection patient care personnel e.g. Doctors, Nurses.
- b) In-animate Environment.

Common modes of Transmission:

- A. Direct Contact:
E.g. Direct contact between patients and patient care personnel is the most important mode of transmission.
Self-infection: From patients own pathogenic floras of skin, nose, mouth, throat perineum, infected lesions.
- B. Indirect Contact: E.g. Indirect contact with contaminated inanimate objects like improperly sterilized instruments, dressing materials; contaminated fomites e.g. bed pans, blankets etc etc.
- C. Air Borne Transmission:
From outside hospital-With air flow from infected areas like-Dustbins, open morgues.
- D. Vector Borne Transmission: E.g. Via. Mosquitoes-malaria, Dengue etc.
- E. Transmission by Common Vehicles: e.g. Via. Food, blood, Water (contaminated) Medications etc.

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Discussion

Bacteriology of hospital acquired infection: (ref : 12,13)

Studies before 1956 show approximately 2/3rds of Hospital acquired infection are caused by gram positive cocci, It's the last 30 to 40 year the bacterial pattern of nosocomial Infections showed significant changes which include.

- i. Increase on the incidence of gm-negative infection.
- ii. Development of super-infection.
- iii. Increasing incidence of infection caused by bacteria formerly recognized as little harmy or no Virulence.
- iv. Increase in number of infection with atypical microbial variety.
- v. Greater incidence of infection by viruses and fungi.

The commonest micro-organisms associated with Hospital Acquired Infection reported recently in order of relative frequency pattern are more and less like as follows ^{12,13}.

- *E. Coli.*
- *Enterococci.*
- *Pseudomonous aveginoses.*
- *Proteus.*
- *Staphylococcus auereus (resistant variety)*
- *Etc etc. like this*

All of the mentioned organization of nosocomial infection show similar features like:

- They are ubiquitous.
- Can survive at room temperature or under refrigeration.
- Have the properly to acquire resistance against antibiotics.

Prevalence Of Nosocomial Infection:

Hospital Departments & Individual Systems of involved more: ^{6,10,11}

In general nosocomial infection rates vary by service and by levels of invasive management of seriously ill patients. Accordingly the incidence of Nosocomial infections are highest

in Intensive care Unit (ICU) followed by Coronary care unit (CCU), High dependency Unit, Prost operative ward etc in prevalence to be followed gradually in rank by general surgical and medical departments. Departments with low infection rates include Ophthalmology and Maternity.

Studies on Nosocomial infections show that incidence of HAI is highest in large teaching or academic hospitals, intermediate in small teaching hospitals and lowest is small non-teaching Hospitals. These studies show that immunity of the patient is the major factor in Hospital Acquired infection. In large Hospital, more seriously ill patients are admitted, more sophisticated therapy is given and the patients are immunocompromised by the disease itself as well as the treatment (surgery ± chemotherapy ± radiotherapy) that is immunosuppressive therapy etc.

As for the sites of infection, Urinary tract infection (UTI) by far, is the commonest infection Pneumonia, Surgical wound infections are the next most common, Skin infection, though relatively un-common in temperate zone, are relatively more prevalent in hot countries. Then comes. Blood stream infection namely septicaemia, bacteraemia, IV infection site infection. Infection of the peritoneal cavity (peritonitis).

Consequences of Nosocomial Infections

The most obvious result of nosocomial infection is the increase in morbidity to the patients. Hospital stay is prolonged by 3.1 to 4.5 days in one study.⁹ The prolongation of hospitalization increases patient care charges in private hospitals. In Thailand, 10-25% of annual budgets for hospital are used for the treatment of nosocomial infections.

The mortality attributed to nosocomial infection has to be interpreted cautiously. Direct cause of death of 1% was reported from the United States³ and 5.9% from Thailand. Nosocomial infections contribute to death in 3% and 4.3% in the two countries respectively. Pneumonia, primary bacteraemia, meningitis are more likely to cause death whilst asymptomatic bacteraemia, minor surgical wound infections are less likely to do so.

Apart from causing morbidity, mortality, economic loss, nosocomial infections compromise the result of treatment especially in surgical wound infection patients with these infections are sources, that may spread the infection to other patients, medical personnel or family members after discharge. Bacteria causing nosocomial infections are generally more resistant to antibiotic. Treatment of nosocomial infection is less successful than that of community acquired infections. These causative micro-organisms can be endemic in some places and their eradication is very hard to achieve.

Hospital Acquired Infection Control: Hospital Acquired Infection Control Committee:^{4, 11, 14}

Surveillance:^{3, 8, 9, 14}

Nosocomial Infection was affecting the hospital and health budget in the USA mostly and understanding that prevention and proper control measures in the most vital role to play in dealing with the problems The American Medical Association first of all (in 1958) recommended that hospitals set up infection control committees. Though not initially widely accepted now with some modification of the original policy (1976), infection control committee is now a world wide accepted phenomenon that the infection control committee is the control policymaking body for infection control in all individual hospital.

“Hospital infection control Committee” is a established reality now for accreditation of hospital, constitution of the infection control committee varies between hospitals, however a generalized outline may be as follows:

- A). Chairperson: Usually a General Surgeon Or General Physician.
- B). Members :
 1. Influential representatives from major clinical departments respectively.
 2. A representative from the micro-biology department.
- C). Working Persons:
 1. An epidemiologist.
 2. Infection Control Nurse/s.

However behind all these the important factor is that the committee have an adequate back from hospital administration.

Activity of the Committee:

Varieties of activities have been implicated to the committee of which the vital or basic ones include.

- a. Institution of infection control policy for the hospital.
- b. Issue of guide lines and programmes.

The infection control Policy:¹⁵

The infection control policy of a hospital is based on the following:

- a. The problem of nosocomial infection of the hospital with respect.
 - It's magnitude.
 - Problem infections.
 - High risk patients.
 - Common outbreaks (epidemics)
- b. The availability of resources e.g.
 - Supporting Services.
 - Central Supply.
 - Manpower in infection control.

- c. The acceptability of the hospital personnel.
- d. The influence of outside organization. e.g.
 - Food and drug administration
 - Environment protection agencies.
 - Local administration.

Before issuing any policies, the infection control committee should consult with the people concerned to ensure that the policies can be carried out. Policies requiring financial support should be accepted by the administration of the hospital. Policies on technical issues, for example, antibiotic policy, should be approved by the clinical departments concerned and by the pharmacy department. The infection control policy must be approved by the administration before implementation. After the approval, the information should be distributed to all clinical departments and the microbiological laboratory¹.

Hospital infection control policy should cover the following areas¹⁵:

1. Problem infection:
 - Immediate reporting of any significant infection.
 - Detection of source and epidemiology.
 - Continuous monitoring and surveillance or such infection.
2. Antibiotic policies to be established in the Hospital.
3. Antiseptic, dis-infection, sterilization.
4. Isolation of patients.
5. Outbreak intervention.
6. Quality assurance.

The infection control policy in a hospital leads to programmes and guidelines for infection control. The important programs includes, surveillance and training personnel on infection control programmes, ad hoc programmes and research should be focused on specific problems in the hospital, for example, problem infections, special immunization programme etc. Guidelines should be issued for use in the hospital or in a group of hospital with similar characteristics.

Guidelines used in other hospitals or countries should be adapted so that they are appropriate to be implemented in the hospital. The guidelines should cover most routine procedures and treatments as follow:

1. Guidelines on hospital hygiene.

- Disinfection.
- Sterilization.
- Cleaning.
- Laundering.
- Catering.
- Waste-disposal.

2. Guidelines on procedures:
 - Urethral Catheterization.
 - Prevention of surgical wound infection.
 - Tracheostomy.
 - Intravenous fluid administration.
 - Prevention of nosocomial Pneumonia
 - Hand washing etc.
3. Guidelines on special issues.
 - Prevention of nosocomial H.I.V Infection.
 - Hepatitis B immunization.
 - Prevention of infection in haemodialysis unit; transplant unit etc.

The infection control programmes and guidelines should be evaluated after a certain period of implementation. Their effectiveness should be assessed. Reviews of the programs and guidelines lead to subsequent alterations, which will render them more practical and more effective. All these programs and guides should serve the infection control policy of the hospital. The results of infection control activities should be evaluated, by surveillance and research. Infection control policy should be adapted according to be changes in problems in nosocomial infections in the hospital.

Conclusion:

Nosocomial Infection or Hospital Acquired infection puts on a considerable burden on the health budget — both in the developed and developing countries, with the increasing application of advanced treatment which prolongs patient's life, but at the expense of immunity. In other words, there are more patients liable to nosocomial infections at the time of better infection control. The net result of these factors is the relatively constant nosocomial infection rates. If there has been no infection control policy, this symmetry is lost and the incidence rate of nosocomial infections might have increased substantially and dangerously. Only continuous and effective infection control can reduce or less favorably, stem the magnitude of nosocomial infections¹⁻³.

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