* **HOSPITAL ACQUIRED INFECTIONS**
* Assist Professor Microbiology
* Dr. Syed Yousaf Kazmi
* **LEARNING OBJECTIVES**
* Discuss the common routes of spread of infection in hospital setting
* Discuss common hospital acquired infections and common pathogens causing these infections
* Discuss briefly the pathogenesis of hospital acquired infections
* Describe laboratory diagnosis of hospital acquired infections
* **HOSPITAL ACQUIRED INFECTIONS**
* “Infections acquired while in the hospital”
* The infection is not for which patient is admitted
* Excludes all disease that patient is incubating during admission (e.g. Chicken pox incubation period is 10-21 days)
* 1/3rd of all HAI are preventable
* In USA alone 2 million infections & 100,000 deaths/ year
* **HAI-COMMON ROUTES OF SPREAD**

**RESPIRATORY ROUTE**

* Common route of infection
* Inhalation of environmental pathogens
* Through instrumentation e.g. airway, ET tube etc.
* Mostly viral pathogens e.g. Influenza virus, RSV
* Pneumonia, lung abscesses etc.

**URINARY SYSTEM**

* Usually through instrumentation e.g. cystoscopy
* Foley catheterization
* Rarely from patient’s own flora- poor hygiene
* Most frequent HAI
* **HAI-COMMON ROUTES OF SPREAD**

**DIRECT INOCULATION**

* Direct inoculation of org on wound
* From healthcare providers, patient’s own flora etc.
* Usually due to improper antisepsis, poor hand hygiene and inappropriate dressing technique
* Surgical site infection, Blood stream infection

**GIT**

* Through ingestion or alteration of gut flora
* Intake of antimicrobial disturb flora
* E.g. Pseudomembraneous colitis, Norovirus diarrhea
* **HOSPITAL ACQUIRED INFECTIONS**

**HOSPITAL PATHOGENS**

* Pathogens from other patients, healthcare staff, environment etc.
* Opportunistic pathogens of own flora
* Pathogens are multiple antimicrobial resistant
* MRSA, VRE, MDR pathogens
* Organisms select out due to antimicrobial use
* **HOSPITAL ACQUIRED INFECTIONS**

**HOSPITAL ACQUIRED UTI**

* Mostly catheter related e.g. foley catheter
* Cystoscopy also increase risk
* *Enterococcus sp., Pseudomonas aeruginosa., E coli, Staphylococcus sp., Candida spp* .
* Multi-drug resistant due to use of broad spectrum antimicrobial
* Both male and female
* **HOSPITAL ACQUIRED INFECTIONS**

**HOSPITAL ACQUIRED RTI**

* Micro-aspiration of upper airway secretions
* Ventilator/ET intubation associated
* *Pseudomonas aeruginosa, Staph aureus, E coli, Klebsiella spp., Acinetobacter baumannii, Haemophilus infleunzae*, etc.
* Usually multidrug resistant
* Poor cough reflex also predispose
* **HOSPITAL ACQUIRED INFECTIONS**

**SURGICAL SITE INFECTIONS**

* Infection of surgical incision
* Mostly by *Staph aureus, Enterococcus, Pseudomonas aeruginosa, E. coli,* Anaerobes etc.
* Pathogens transmitted by healthcare staff hands, dirty equipment, etc.
* Poor hand hygiene of healthcare
* Poor technique for dressing
* Failure to use sterilized equipments
* **HOSPITAL ACQUIRED INFECTIONS**

**BLOOD STREAM INFECTION**

* Usually through I/V catheters, CVP lines
* Org from staff/ own flora
* Enter through gap b/w skin & catheter
* Contaminated I/V fluids
* Also from other focus e.g. UTI org can enter blood stream
* *Staph aureus, Co Neg Staph, Enterococci, Candida*
* **HOSPITAL ACQUIRED INFECTIONS**

**GASTROENTERITIS, COLITIS**

* *Cl. Difficile* spores in hospital wards
* Norovirus from healthcare members
* Use of broad spectrum antimicrobials
* Disturbs normal flora
* Pseudomembraneous colitis
* **HOSPITAL ACQUIRED INFECTIONS-PATHOGENESIS**
* Three factors play role in HAI
* Host factors, Environmental factors and chain of transmission

**HOST FACTORS**

* Extreme age
* Underlying dis e.g. DM, CLD, CKD, Cancer
* HIV infection
* Special medications e.g. cytotoxic drugs, steroids intake
* Trauma e.g. burns, lacerated wounds etc.
* Instrumentation e.g. foley catheter, endoscopy, ET intubation etc.
* **HOSPITAL ACQUIRED INFECTIONS-PATHOGENESIS**

**ENVIRONMENTAL FACTORS**

* Hospital pathogens
* Pathogens from other patients, healthcare staff, environment etc.
* Opportunistic pathogens of own flora acquired in hospital
* Multiple antimicrobial resistant
* MRSA, VRE, MDR
* Lack of lamellar air current
* Frequent visitors
* **HOSPITAL ACQUIRED INFECTIONS-PATHOGENESIS**

**CHAIN OF TRANSMISSION**

* Direct contact b/w patients, visitors, healthcare staff
* Indirect contact-through dust, environment, equipment etc.
* Indwelling equipment most imp source-urinary or I/V catheters, ventilators, N/G tube, etc.
* Manipulation of wound, dressings etc.
* VIDEO
* **HOSPITAL ACQUIRED INFECTIONS-LAB DIAGNOSIS**

**Collection of specimen**

* Collect the primary specimen
* Also other specimens e.g. blood, sputum, urine, stool etc. for routine examination & for C/S
* Blood for CRP, serology

**Blood count**

Show leucocytosis-indicate infection

**CRP**

Elevated in bacterial infection

**URINE RE**

Show WBC/ RBC/ Protein etc.-points to UTI

* **HOSPITAL ACQUIRED INFECTIONS-LAB DIAGNOSIS**

**Specimen for direct microscopy**

* Direct Gram stain of blood, sputum, urine, stool, pus
* Gram reaction helps in guiding empirical therapy
* May save time and life
* Very helpful in Meningitis, blood stream infections etc.

**Toxin detection**

Rapid toxin detection kit of *Cl. difficile*

* **HOSPITAL ACQUIRED INFECTIONS-LAB DIAGNOSIS**

**SPECIMEN FOR C/S**

* Blood, sputum, urine, stool, pus etc.
* Culture for bacteria & fungi
* Antimicrobial and antifungal sensitivity testing
* Helps identify pathogen & guide in antimicrobial therapy
* Primary antimicrobial sensitivity testing
* **HOSPITAL ACQUIRED INFECTIONS-LAB DIAGNOSIS**

**Molecular tests**

* PCR, DNA probes
* Rapid and sensitive
* Saves time and life
* Expansive