UNSUSPECTED BACTERIAL INFECTION IN DECEASED DONORS AND ITS IMPACT ON IMMEDIATE POST OPERATIVE INFECTIONS IN LIVER RECIPIENTS.

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CERTIFICATE

This is to certify that the dissertation entitled **"UNSUSPECTED BACTERIAL INFECTION IN DECEASED DONORS AND ITS IMPACT ON IMMEDIATE POST OPERATIVE INFECTIONS IN LIVER RECIPIENTS"** is the bonafide original work of **Dr. R. KAMALAKANNAN** in partial fulfillment of the requirements for **M.Ch. (SURGICAL GASTROENTEROLOGY & PROCTOLOGY) BRANCH –** Examination of the Tamilnadu Dr. M.G.R. Medical University to be held in August 2012. The period of study was from August 2009 to January 2012.

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DECLARATION

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The dissertation is submitted to Tamilnadu, Dr. M.G.R. Medical University, towards partial fulfillment of requirement for the award of **M.Ch Degree (BRANCH – VI) in Surgical Gastroenterology & Proctology .**

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UNSUSPECTED BACTERIAL INFECTION IN DECEASED DONORS AND ITS IMPACT ON IMMEDIATE POST OPERATIVE INFECTIONS IN LIVER RECIPIENTS.

INTRODUCTION :

For end stage liver disease, liver transplantation is the best treatment. The leading cause of morbidity and mortality in liver transplant patient is infection, especially bacterial infection in early post operative period. Donors are one of the important source for bacterial infection. In past, It was considered systemic bacterial infection in donors as contraindication for organ donation for transmitting infection to immune suppressed recipient. It also affect transplanted liver's preservability and its function. Transplanted liver is less able to respond to the infective organisms because of recipient's immunosuppressive state. Their potential risks must be weighed against recipient's disease severity without transplant .

At the same time, in the scenario of increasing demand for organs due to rise in liver diseases, every potential liver graft must be considered for transplant regardless of the infection, to minimize waiting list and mortality.[1]

Till now, unstable brain dead patients with severe bacterial and fungal sepsis(culture proved) is a contraindication for organ retrieval. [18,59,64]

Though some donors look clinically stable, but still they may harbor bacterial infections. In most of the time, donor's cultures results are available only few days after transplant surgery [10.] There must be every possibility of transmission of donor derived bacterial infection. This consequence of transmission of unsuspected, donor infection to the recipients are not clearly known. Still controversies persists.

In recent studies, the infection related complication in recipient due to infected graft are reported as less common and recommend for less restrictive policy of organ duration. But still the evidence are scarce and controversial [11,53,78.]

AIM:

The aim of this study is to analyze the impact of unsuspected donor bacterial infections in recipients.

OBJECTIVES:

- To determine the incidence of bacterial donor infection.
- To analyze duration of ICU stay and donor infections
- To analyze donor risk factors for donor infection.
- To analyze about recipient infection in immediate post operative period (one week).
- To analyze about type of bacterial infections both in donors and recipients.
- To analyze about the main risk factors and its impact on recipient infections.
- To analyze the influence of donor infection on graft and patient short-term survival(30-day patient survival)

REVIEW OF LITERATURE:

HISTORICAL REVIEW:

Liver transplantation is a life saving procedure for end stage liver disease and acute fulminant liver failure.

In 1963, Thomas Stazl performed first human liver transplantation at the university of Colaradu [21]. But no one-year survival until over next 15 years. Only few liver transplantation were performed and achieved only 30% one year survival rate until late 1970s. One year survival was doubled in early 1980s due to introduction of cyclosporine based immunosuppressants.[3]

In 1966, Guy Alexandre from France brought about the concept of brain dead. Followed by the Harvard Ad Hoc Committee report outlined the criteria for brain death determination in 1968. After implementing these polices in clinical practice ,the donor pool increased significantly .

Starzl and his colleagues first described about the technique of multiple-organ procurement (kidney, liver, pancreas, small bowel) in 1984 In1992 Nakazato and hi colleagues described th new technique of total abdominal evisceration with ex vivo dissection.

Since then, there was significant advancement in all aspect of liver transplantation including donor management, recipient selection, operation technique, immunosuppressants and post-operative care for recipient.

The first successful Living Donor Liver Transplantation (LDLT) was done for a paediatric patient using lateral segments by Strong R.W in 1989.

Presently one year survival for Decreased Donor Liver Transplantion (DDLT) is more than 90% with 5 and 10 year survival in excess of 70% and 69% respectively [34,35]

TABLE 1. INDICATIONS FOR LIVER TRANSPLANTATION

Acute liver failure
Complications of cirrhosis
Ascites
Chronic gastrointestinal blood loss due to portal hypertensive gastropathy
Encephalopathy
Liver cancer
Refractory variceal hemorrhage
Synthetic dysfunction
Liver-based metabolic conditions with systemic manifestations
α_1-Antitrypsin deficiency
Familial amyloidosis
Glycogen storage disease
Primary oxaluria
Tyrosemia
Urea cycle enzyme deficiencies
Wilson disease
Systemic complications of chronic liver disease
Hepatopulmonary syndrome
Portopulmonary hypertension

TABLE 2. ABSOLUTE CONTRAINDICATIONS TO LIVER TRANSPLANTATION

Acquired immunodeficiency syndrome
Active alcoholism or substance abuse
Advanced cardiac or pulmonary disease
Anatomic abnormality that precludes liver transplantation
Child-Turcotte-Pugh score <7
Cholangiocarcinoma
Extrahepatic malignancy
Fulminant hepatic failure with sustained ICP >50 mm Hg or CPP <40 mm Hg
Hemangiosarcoma
Persistent noncompliance
Uncontrolled sepsis

ICP, intracranial pressure; CPP, cerebral perfusion pressure; CPP, equals the mean arterial pressure minus ICP.

DONOR MANAGEMENT:

Brain death is defined as the irreversible loss of all function of the brain including the brain stem. Coma, absence of brain stem reflexes and apnea are essential findings in brain death.

Evaluation for brain death should be considered in patients with a massive irreversible injury of identifiable cause. A patient who is declared as brain dead is legally and clinically dead.

TABLE 3. Physiological derangements seen in brain-dead donors[85] :

Derangement	Cause
Hypothermia	Hypothalamic damage,reduced metabolic rate, vasodilation and heat loss.
Hypotension	Vasoplegia, hypovolaemia, reduced coronary blood flow; myocardial Dysfunction.
Diabetes insipidus	Posterior pituitary damage.
Disseminated intravascular coagulation	Tissue factor release; coagulopathy.
Arrhythmias	'Catecholamine storm', myocardial damage, reduced coronary blood flow.
Pulmonary oedema	Acute blood volume diversion,capillary damage.

PRINCIPLES OF DONOR MANAGEMENT [66] :

General care:

Patients are managed in ICU(Intensive care unit). Minimum invasive cardiovascular monitoring includes arterial and central venous pressure. Cardiac output monitoring preferred. Unnecessary drugs should be Stopped, e.g. sedatives. Reduce heat loss and actively warm if necessary to maintain core temperature >35C. Current infections should be actively identified and treated. May require bronchoalveolar lavage.

Respiratory system:

Tidal volume should be 6–8 ml kg with optimal PEEP(Positive end expiratory pressure) to allow minimum $FIo_{2.}$. Maintain tracheal cuff pressure should be maintained at 25 cm H 2 O and nurse with the head of the bed elevated to reduce the risk of aspiration. the administration of excessive fluids should be avoided. Diuretics should be considered if marked fluid overload is suspected.

Cardiovascular system:

Fluid balance should be reviewed periodically and hypovolaemia should be corrected. Cardiac output monitoring should be used to titrate fluids and inotropic or pressor drugs to intended goals as guided by retrieval team. If vasopressor drugs

required, vasopressin 0–2.4 units/h may reduce catecholamine requirements. High doses of catecholamines (e.g. norepinephrine .0.05µg/kg/ min) should be avoided if possible. Consider triiodothyronine bolus and infusion.

Fluids and nutrition:

Positive balance and hypernatraemia should be avoided. Urine output should be maintain at 0.5–2.5 ml/kg/h . If urine output is .4 ml/ kg, consider diagnosis of diabetes insipidus and treat with vasopressin infusion or Desmopressin. Blood glucose target concentrations 4–8 mmol/litre. Electrolyte abnormalities should be corrected to normal values.

Blood and coagulation:

Coagulation should be corrected if evidence of active bleeding; coagulation support should be considered during retrieval. Consider need for transfusion may be considered. Thrombo prophylaxis considered maintained as there is a high incidence of pulmonary emboli found at retrieval.

Systemic effects:

Methylprednisolone 15 mg/kg bolus should be administrated immediately after brain death is confirmed and also triiodothyronine.

Infections:

All should be treated with proper antibiotics and urine, sputum , blood, other cultures if necessary other cultures should be obtained before starting antibiotics.

Investigations:

Routine ECG, echocardiogram should be done. Bronchoscopy and lavage followed by lung recruitment maneuvers should be done. Chest X-ray after lung recruitment maneuvers should be taken.

RECIPIENT SELECTION:

Deog-bog Moon et al[21] sai that the presence of cirrhosis alone is a not a sufficient indication for transplantation, since the well compensated cirrhotic patients can remain stable for long time.

Since 2002, the unite network for organ sharing applying model of end stage liver disease (MELD) scoring system for an organ allocation, cirrhotic patients has to meet minimal listing criteria for placement in waiting list [47.] This score predicts the 3 months mortality of the waiting patient. This score is based on laboratory value : Serum creatinine, bilirubin and INR.

TABLE. 4: MELD SCORE

MELD score [84]	Three-month mortality(Hospitalized patients)
≤9	4%
10-19	27%
20-29	76%
30-39	83%
≥40	100%
MELD score=9.57×log e (Creatinine mg/dl)+3.78×log e (Bilirubin mg/dl)+11.20×log e (INR)+6.43	

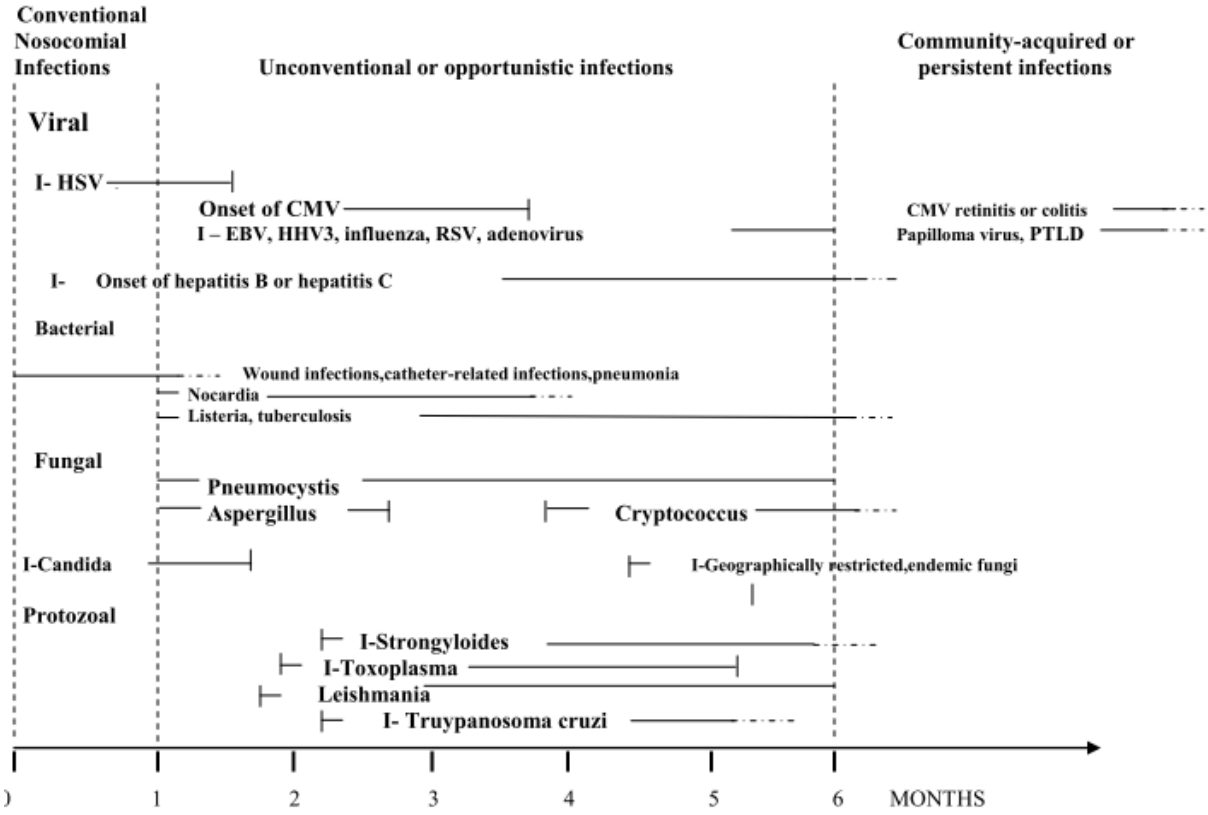
In patient with MELD score more than 30, 3 month survival rate is less than 20%. MELD score of less than 15 can lead a near normal life without liver transplant. MELD score more than 10 (Child-Turcotte-Pugh score ≥ 7) or any complication related to portal hypertension or acute fulminnt liver failure are the indication for transplant evaluation [52]. MELD score of less than 10 are ineligible for listing since they have better survival without transplant.

IMMUNOSUPPRESSANT TREATMENT:

The basic regimen used in liver transplant is combination of tacrolimus and steroids. Target trough level of tacrolimus in first 2 weeks should be maintained as 10-15ng/ml and 5-10ng/ml during first 2 months after liver transplant.

Methylprednisolone (20mg/kg body weight) should be give during the anhepatic phase of surgery, then 2mg/kg for first 3 days. It is tapered to 1 mg/kg for 3 days and converted to 1 mg/kg/day prednisolone. Prednisolone is weaned gradually and discontinued after 6 months.

INFECTION PATTERN AFTER LIVER TRASNPLANTATION:



INFECTIONS AFTER ORGAN TRANSPLANTATION

HSV – Herplex Simplex Virus
CMV – Cytomegalovirus
EBV – Epstein-Barr virus
HHV3 – Human herpesvirus 3
RSV – Respiratory Syncytial virus
PTLD – Post transplantation lymphoproliferative disease

Post transplantation recipient's infection are studied into three time periods [86]. First period immediately starts after transplantation and extend to one month. Most of the infections are bacterial infection either related to donor or recipient like technical or surgical issues and complications. Bacterial and candidal wound infections, central catheter related infection , urinary tract infections and pneumonias are common in this period.

Second period extends from second month to sixth months. During this period , opportunistic infections are dominating as result of immunesuppression. Cytomegalovirus,Aspergillus and pneumocystis jiroveci are commonly seen.

The third period starts from seventh month to twelfth month and beyond. Reactivation of human herpes virus and manifest as herpes zoster, and also cytomegalovirus infections can occur. Apart from this, the pattern of infections are similar to the patients ,not underwent transplant surgery.

BACTERIAL INFECTION IN LIVER TRANSPLANTAION

CDC DEFINITIONS FOR NOSOCOMIAL INFECTIONS: [33]

Bacteremia is considered to be present when Staphylococcus aureus, Candida species, or Gram- negative rods are isolated from at least 1 blood culture. The other pathogens are considered positive when they are isolated from 2 blood cultures from the site considered as the infection site.

Primary bacteremia is defined as bacteremia with no physical, radiological, or pathological evidence of a definite infection source.

Secondary bacteremia is defined as bacteremia if the source of the bacteremia was identified [ie, an organism isolated from a blood culture was compatible with a related nosocomial infection at another infected site(urine; intra-abdominal abscess, bile, or peritoneal fluid; or bronchoalveolar fluid or bronchial aspirate)].

Catheter-related bacteremia is defined when more than 15 colony-forming units of bacteria is cultured from the catheter tip, irrespective of whether the same organism is isolated from the blood culture.

Bacteremia caused by common skin contaminants is considered significant only if the organism is isolated from 2 blood cultures and it was accompanied by clinical signs of infection.

Donor-derived disease transmissions are defined as any disease present in the organ donor that is transmitted to at least one of the recipients.

BACTERIAL INFECTION IN BRAIN DEAD:

The diagnosis of infection is very difficult in brain injured patient only based on clinical suspicion. It is because that brain injured patients presents with

hyperthermia and hemodynamic instability as found in bacterial sepsis , attributed to brain damage rather than sepsis. Brain injury impair the cellular immune system and also cause hemodynamic instability. This will predispose to infection due to bacterial translocation from gut [46,71.]

IDEAL DONOR :

The ideal donor should have following features [50]:

1. Age 50 years or less
2. Donors without hepato biliary disease
3. Hemodynamically stable donor(systolic blood pressure ≥100 mmHg and central venous pressure more than 5cm of water)
4. Donor with respiratory stability
5. Donor without severe abdominal trauma, systemic infection and cancer(with few exceptions).
6. Diuresis >50ml/hr with normal serum creatinine
7. Dopamine requirement < 10µg/kg body weight/min

SUBOPTIMAL DONORS :

In past, donor with severe bacterial sepsis are considered as absolute contraindication for organ donation[17] . Recently many reports have documented only isolated incidents of infection transmission from donor to recipient [29,57,72]. But when it is transmitted to recipients , it is associated with significant morbidities. This may result in hepatic artery anastomotic disruption, poor graph function, sepsis and death [7,15,60,24,25,27,57,72]. Especially, when there is combined bacterial and fungal infection in donor [1 ,10].

But considering critical shortage of organ and waiting list mortality ,these infected suboptimal organs are now accepted for organ donation [22].

At present, donor with abnormal liver function test, prolonged ICU stay, hemodynamic instability, age > 65 years and steatic liver are not considered as contraindication for organ donation [23,36,50].

DONOR INFECTION IN ICU :

Donor stay in ICU increases the risk of nosocomal infection and account for 33% to 45% of all nosocomal bacteremias [6,67.] The common infections are vascular access infection, bladder catheter-related infection and ventilator associated pneumonia [14.]

The European prevalence of infection in intensive care study (EPIC) have reported that 45% of ICU patients had atleast one or more infections [70.]

Coma is associated with high risk of nosocomial pneumonia especially if they are with ventilator support [13,26,68.]

Approximately 3-8% of patients with urinary catheter develop urinary tract infection and its related secondary bacteremia [48,54.]

Cerrutti et al [11] reported 48% of donors had atleast one culture is positive for bacterial growth. These infected donors were either older age or had longer ICU stay (>=3 days). In spite of that , only 3.7% of donor infection transmission to recipient occurred without affecting one year survival of the graft. Similarly Gonazales – Segura et al reported prolonged ICU stay resulted in more donor infection incidence [35].

Another study stated as the risk factors of donor infection are prolonged ICU stay, mechanical ventilation, invasive procedure and devices, inadequate nursing and medical management [1,9,63].

DONOR ORGAN CONTAMINATION:

Bacterial contamination of organs in the donor occurs frequently but rarely infection is transmitted to recipients. [10] organ perfusion fluid Cultures may be

positive in up to 40% . Most of them are with non virulent skin flora and correlated poorly with the occurrence of post transplant allograft infection. [22]

Gottesdiener KMet al [37] reported that these bacterial- fungal contaminations occur during harvesting and in preservation fluid . It can occur with many common aerobic bacteria. And also said that fungi, yeast and toxoplasmosis are transmitted less frequently.

But in another study by Zibari GB et al warned about the contamination of organs during process of harvesting he reported as they may lead to severe infection in the recipient, especially if contaminants are by more virulent organisms.[79]

EVIDENCE OF DONOR DERIVED BACTERIAL INFECTION IN RECIPIENT :

To confirm the donor transmitted bacterial infection in recipient, it is important to identify the type of microorganism causes infection in both donor and recipient. Identifying the bacterial genome is the only way to confirm the transmission of infection from donor to recipient. Unfortunately the bacterial genome typing is not widely available and not feasible in practice. So practically, the evidence of information transmission is confirmed by identifying the same organisms with same antibiotic susceptibility pattern identified between the donor and the recipient [1].

INCIDENCE OF THE BACTERIAL TRANSMISSION :

The incidence of donor derived bacterial infection in recipient varies between 1-8% [1,10,35,79]. The incidence of unsuspected donor derived infection in recipient is less than 1%. The donor should always be considered as the source of infection for all early post transplant bacterial infection in recipient. Since, currently no standardized bio vigilance system is available to recognize the transmission [43].

Donor culture positivity do not influence the global recipient and graft survival rates. The explanation is that the transmission rate was kept low by careful microbiologic surveillance of the graft and prompt institution of the specific antimicrobial therapy against any pathogen microorganism isolated in the donor. [62]

THE RISK FACTORS TO SUSPECT DONOR INFECTION:

Wu JJ et al did a study in DDLT patients and found that ICU stay ≥7 days, inotrope supports and cardiac arrest are independent factors to predict donor infection. But these infections did not affect the one year survival of the recipient [74].

In another study, it was reported as combined bacteremia and sepsis in donor is associated with higher incidence of infection transmission to recipient and

infection related morbidity[17]. Still, donor infection with low virulence organism with adequate antibiotic treatment allow safer organ donation [25,32,79].

Length of ICU stay ≥2 days, mechanical ventilation, trauma, invasive devices, interventional procedures, adverse background and stress ulcer prophylaxis are considered as important risk factors for donor information [2,70].

RECIPIENT INFECTIONS :

Most of the bacterial infection occurred in first month after transplantation with incidence of bacteremia ranging form 21% to 33% [38,49]. In which donor related bacterial infections manifest within 3 to 12 days [46,71]. Hence, for any early post operative bacterial infection, it is always better to consider the potentiality of donor origin.

RISK FACTORS FOR RECIPIENTS :

The intensity of exposure to pathogens and overall immune suppression level are the main risk factors determining the chance of infection transmission to the recipients. Regarding immunosuppressants , the dose, duration of treatment, choice of the immunosuppressant are important factors which influence “the net safe of immune suppression level”.

Similarly other factors must be considered are underlying immune deficiencies state ,the presence of lymphopenia, neutropenia, the presence of necrotic tissue, intra-abdominal fluid collection, intestinal mucosa integrity, poorly controlled diabetic mellitus and associated infection due to immune modulating viruses [31].

The patients with cirrhosis are vulnerable to bacterial infection and with risk of dying from uncontrolled sepsis. The recipients with cirrhosis are susceptible to infection due to immune dysfunction [30],especially if the recipient is with higher MELD score [40].

Post operative management, duration of ICU stay, early removal of invasive device like central venous catheter, urinary catheter and short duration of hospital stay are important factors in reducing the rate of recipient infection.

One study has reported that uncontrolled diabetes mellitus, renal failure and hypoalbuminemia are independent predictors of bacterial infection in liver transplant recipients [65].

The patients vulnerability to infection are strongly influenced by surgical factors, environmental exposure, the state of immunesuppression and the type, dose and duration of prophylaxis [80].

Hill et al reported that longer hospitalization before transplantation or in post operative period, the diabetic control , pretransplant renal failure and hypoalbuminemia are independently significant risk factors for recipients bacterial infection [39].

Losada et al stated administration of parenteral nutrition, duration of recipient surgery for more than 5 hours, organ rejection and pretransplant CMV status are the sole factors for early infection in liver transplant recipients. The incidence is higher for first thirty days, predominantly due to bacterial infection. Among all duration of recipient surgery, especially more than 5 hours is most important risk factor for acquiring bacterial infection. Selective bowel decontamination especially for gram negative organisms.

Paya CV et al [59] reported bacterial infections most commonly occurred in first two months after liver transplantation. In his series, the duration of the transplantation surgery especially more than 12 hours is the main risk factor for bacterial infection.

Hsin-yun sun et al [41] studied about bacterial infection related mortality in one hundred consecutive transplant recipients. He concluded that the recipients with high MELD score is the important predicting factor for post transplant

infection. The adequately treated pretransplant bacterial infection do not pose a significant risk for post transplant bacterial infections or related outcomes.

Similarly, the spectrum of bacterial organisms and its antibiotic sensitivity pattern are not influencing the post transplant infection rate .

The underlying disease severity, high intra operative blood loss, renal failure, subsequent dialysis strongly influence the morbidity and mortality of recipient due to post transplant bacterial infections.

Singh et al [64] stated that diabetes mellitus, CMV status and hypoalbuminemia are important risk factors for bacterial infections in recipient.

Wade JJ et al [73] reported acute rejection, longer hospitalization, acute liver failure , elevated serum bilirubin level, prolonged operative time [4] are the risk factors for bacterial infections.

BACTERIAL ORGANISMS :

The type of bacterial organisms commonly reported in donor and recipients infections widely varies between institutions.

Several centers have reported that gram – negative infection constitute about 65% of bacterial infections [38,49,76] .

Paya CV et al [59] reported that gram negative organisms are more commonly (60%) seen in recipient in early infection.

Losada et al 81 reported that 77.9% of bacterial infection are due to gram positive organisms in his study.

Bull DA et al stated that gram negative bacterial infections pose a great risk of transmission and associated with poor outcome [7].

Virulence of pathogens remain as an important risk predictor of the outcome of the bacterial infection. Bacterial infection caused by acinetobacter baumanni, results in worst outcome and high mortality varying between 22-52%.

Another study reported as gram positive bacteria such as Staphylococcus aureus and Enterococcus are commonly found organisms in bacterial infection and also associated with high morbidity and mortality [75].

Regarding donor infections, the European Prevalance of infection in Intensive Care (EPIC) study [70]. studied about the prevalence of nosocomial infection in ICU. They reported most commonly found organisms were Staphylococcus aureus (30.1%) which include MRSA- 60% and enterobacteriaceae (34.4%) followed by Pseudomonas aeruginosa(28.7%) Coagulase negative Staphylococci (19.1%) and importantly fungal infection (7.1%).

Though the prevalence of type of bacterial organisms are varying between centers, the virulence of organisms and associated fungal infection are associated with greater risk of transmission and following morbidity and mortality in recipient.

ROLE OF ANTIBIOTICS IN DONORS :

The donor with proven bacterial sepsis must be treated with appropriate antibiotics at least for minimum period of 2 weeks by bactericidal therapy and followed by proof of cure before organ retrieval.

Similarly donor with only bacteremia considered for organ donation after receiving appropriate antibiotics for at least 48 hours prior to organ retrieval.

Regarding duration of antibiotics in recipients, no controlled trials are available indicating the optimal duration. These recipients should treated with antimicrobial prophylaxis for at least 48 hrs after transplantation. But most of transplant centers, continues culture specific antibiotics for 5-7 days[1].

Regarding the eligibility of infected donor for organ donation. The Israel transplant guideline recommended that the organisms must be susceptible to antibiotic therapy, irrespective of the virulence of organisms. At least 48 hrs duration of antibiotic therapy prior to organ retrieval should be given. There must be evidence of clinical response to antibiotic treatment with decreasing fever total

white cell count and reducing requirement of inotropic support. Similarly the recipient with infected donor grafts should receive culture specific antibiotics for at least one week following transplantation.

ROLE OF ANTIBIOTIC IN RECIPIENT'S INFECTIONS :

Although no randomized controlled studies are not available, most of the transplant centers administer perioperative antibiotics prophylaxis for 24 -48 hrs following transplant surgery [58]. The antibacterial regimen should be chose, based on targeting gastrointestinal flora and Staphylococcus aureus.

In recently infected recipient with known culture and sensitivity status, the antibiotic should be chose based on pretransplant culture report till getting the recipients post transplant culture status [58].

Routine post transplant antibiotic in recipients definitely reduces the risk of transmission of bacterial infection from donors [22].

HOSPITAL STAY :

Infection related complications prolong the recipient hospital stay. These recipients are undergoing number of invasive procedures and interventions. This will increase associated medical expenditures. It possess huge financial burden and man power utilization to both the patient and health system [42].

MATERIALS AND METHOD :

Deceased donor liver transportation are done in our department since 2008. This is a prospective comparative study to find out risk factors for bacterial infection in donors and donor related recipient infections. The study was conducted from August 2009 to January 2012. The study period is thirty months.

Inclusion criteria:

- The clinically stable donors whose culture status is not known before transplantation.
- The recipients underwent deceased donor liver transplantation.

Exclusion criteria :

- Cadaver with overt sepsis
- Ineligible cadaver for organ donation , due to other medical and ethical reasons.
- Recipient with pre transplant culture positive status
- Recipient who developed infection after one week.
- Recipient who died in first week after transplantation due to non-infectious cause.

Donor data composed of age, sex , BMI, duration of intensive care unit stay before organ harvesting, associated injuries, pre-harvesting intervention procedure, antibiotic therapy, blood and urine culture, organ preservative fluid culture, duration of donor surgery. Recipient data composed of age, sex, etiology, MELD score, indication for transplantation , pre and post-operative infection status of recipient, duration of hospital stay and outcome. Data were collected prospectively.

Infections found in recipient in first week of post operative period were considered as donor origin, provided no evidence of pre operative recipient infections and no organ contamination were ensured. Thirty days infection related morbidities and mortality were studied.

Since genomic typing techniques were not applied at the time of microorganism isolation in the donor, definite evidence of infection transmission from donor to recipient could not be acquired. However, for the purpose of the study, Infection transmission was considered to have occurred when all of the following surrogate criteria were satisfied:

(1) identity of species between the microorganism isolated in the donor and the one isolated in the recipient,

(2) identity of antibiotic susceptibility pattern of the isolated microorganisms,

(3) presence of clinical signs of infection in the recipient.

DONOR:

Liver was harvested from various institutions. Brain dead patient are managed in ICU with ventilator support by specially trained anesthetist team. Patient are resuscitated and maintained with supportive treatment .

All precautions are taken to prevent donor sepsis .Hemodynamic stability was maintained with vasopressors to prevent hypo perfusion of vital organs. Culture from blood , urine , tracheal aspiration and external wound (if present) were routinely done periodically , one at the time of admission and another one just before donor surgery.

Patients are routinely given prophylactic broad spectrum antibiotics after taking culture. Organ were not harvested from donor overt sepsis, hemodynamically unstable despite appropriate inotropic support and donors who sustained multiple cardiac arrest.

Donor samples obtained in the ICU on the days or before organ recovery included blood, tracheal aspirate, urine and any other site of clinically suspected infection, as well as the preservation fluids at organ recovery. Blood cultures in the donor may therefore frequently be unavailable at the time of harvesting of the

organs. Donor surgery is conducted by a well trained anesthetist and surgeons team.

HTK solutions is used as organ perfusion fluid. Just before starting the surgery , carbapenam antibiotics, anti fungal will be given . Just before cross clamping the aorta , unfractioned heparin are given. Bench dissection is done in our operation theatre by donor team . All the vascular anomalies are noted . Appropriate reconstruction are done. Donor iliac vessels were used as vascular graft for hepatic artery reconstruction if needed.

RECIPIENT:

Recipient are selected on basis of MELD score. Preoperative cultures taken from blood , urine , throat swab along with basic blood investigations and organ specific investigations. Recipient surgery are started after ensuring the donor liver status. Intra operative culture are done if free fluid is found in abdomen.

Explanted liver gross cut section are studied before sending it for histopathological examination. Cadaveric liver is transplanted to recipient. First the recipient's IVC to donor hepatic vein anastomosis is done by " PIGGY BAG " technique. Then followed by portal vein , hepatic artery and at last bile duct anastomosis are done. New liver perfusion are confirmed by intra operative

ultrasound doppler examination. Recipients are managed in ICU in early post operative periods.

Recipient data included the prophylaxis received and the type and etiology of infection. Samples from biological fluids were cultured only in cases of clinically suspected infection. Periodical culture to recipient were done on clinical grounds.

All bile samples and ascites or pleural fluid samples were obtained from a proper drainage tube or by puncture, and were collected in a sterile container. Gram-staining and conventional culture were performed. Identification of fungal species was done in accordance with standard method.

we considered a true bacterial infection as an isolation of a microorganism from a sterile site or from another site in the presence of clinical symptoms or signs of infection. We did not consider true infection those febrile episodes without microorganism isolation and resolved without empirical antibiotic treatment.

When pathogens were isolated from donor cultures, the standard prophylactic regimen was changed to specific antibiotic therapy against the donor's microorganism and infection; In non- survivors, the date and cause of death were recorded. Recipient data were collected up to 30 days following the procedure.

Patient received immunosuppressant – tacrolimus after 24 hrs . Dose will be adjusted according to periodical serum tacrolimus level assay. Additionally, MMF are started after one week. Oral steroid dose gradually tapped and stopped in- 4-6 months period.

The following data were recorded: organism, antimicrobial susceptibility, source of bacteremia, temperature, severity of sepsis, treatment and outcome. Blood cultures sample at harvest were always drawn through femoral artery with particular attention to asepsis made. Samples from preservation fluid were collected at the beginning of the back-table procedure that.

Donors with 1 or more samples positive for bacteria or fungi were defined "culture positive" (CP); the others were defined "culture negative" (CN). Cultures were evaluated by a microbiologist to distinguish pathogen microorganisms from contaminants/possible pathogens.

For the purposes of the study, donor-to-host transmission was established when a positive isolate from a donor matched any positive culture in the respective recipient during the first 7 days after the procedure in the presence of clinical signs of infection and the same antibiotic susceptibility pattern.[82]

STATISTICAL ANALYSIS:

The statistical analysis of this study was done by using the SPSS software version 15. Values were expressed as means ± standard deviations, and range as appropriate. Statistical analysis of qualitative variables were performed using the chi-square test, and quantitative variables were tested using the student t-test test. A difference was considered statistically significant when p vaue was < 0.05.

RESULTS :

The study period was thirty months from august 2009 to January 2012. Thirty three transplantation were done within the study period. They were all included in the study. Since all the donors and recipients met both inclusion and exclusion criteria.

DONORS:

BRAIN DEAD:

During this study period, twelve brain dead patients with severe sepsis with hemodynamic instability not harvested Thirty three donors, who were clinically stable underwent donor surgery. 73.3% of brain dead patients were effectively utilized as ideal donors.

CAUSE OF DEATH:

Regarding the donors ,Thirty two donors died due to road traffic accidents. One donor died due to subarachnoid hemorrhage due to cerebrovascular accident and underwent craniotomy.

ORGANS HARVESTED:

Number of organs harvested were : Thirty six liver, seventy two kidneys , ten hearts and fifty corneas.

TABLE 5. THE BASELINE CHARACTERISTICS OF CADAVERIC LIVER DONORS

Serial no.	Donor variables	N	Mean±SD(range)	'p' value				
				Univariate analysis	Multivariate analysis pertaining to donor culture status	Multivariate analysis pertaining to (Recipient factors)		
						Same organisms	Morbidity	Mortality
1	Age : More than 50 yrs Less than 50 yrs	 6 27	35.2±13.2(19-65)	0.13	0.63	0.49	0.864	0.33
2	Sex: Male female	 30 3	-	0.12	0.39	0.13	0.16	0.25
3.	BMI	-	25.25±1.5(21.6-28.9)		0.49	0.32	0.80	0.73
3	Alcoholic	13	-	0.822	0.72	0.15	0.96	0.66
4	ICU stay: More than 2 days Less than 2 days	 23 10	3.58± 1.9 (2- 9)	0.231	0.86	0.24	0.44	0.38
5	Diabetes	5	-	0.443	0.91	0.37	0.62	0.38
6	Inotropic support	-	1.61 ± 0 .704 (1 - 3)	0.001	0.001	0.05	0.006	0.24

7	Total WBC count (per cumm)	-	11862 ± 5711 (2700 - 30000)	0.001	0.001	0.75	0.36	0.47
8	Platelets count (Per cu mm)	-	96039±45828(12 300- 160000)	0.04	0.33	1.0	0.033	0.002
9	Total bilirubin (mgs/dl)	-	1.05 ± 0.64(0 .4 - 2.6)	0.63	0.40	0.46	0.62	0.38
10	ALT(U/dl)	-	175±95.6 (42-1400)	0.01	0.01	0.45	0.06	0.22
11	Blood urea(mgs/dl)	-	47.91 ± 12.16 (23.5 - 74.4)	0.07	0.03	0.27	0.066	0.56
12	Serum creatinine(mgs/dl)	-	3.2 ±0.3 (0.58-1.14)	0.02	0.01	0.12	0.29	0.29
13	Serum sodium(meq/L)	-	147.03 ± 7.4 (132.3 -164.3)	1.00	0.81	0.10	0.25	0.85

TABLE 6. COMPARISON OF THE BASELINE CHARACTERISTICS OF CADAVERIC LIVER DONORS WHO HAD BACTEREMIA WITH THOSE OF DONORS WHO DID NOT HAVE BACTEREMIA.

s.no	Characteristic	Donor status		'P' value
		Had donor infection	No donor infection	
1	Age	34.7±13.0(19-60)	35.5±12.4(19-65)	0.63
2	BMI	25.5±1.7(23.4-28.9)	25.1±1.5(21.6-28.3)	0.49

3	ICU stay	3.5±1.8 (2-8)	3.6±2.06(2-9)	0.86
4	Inotropic support	2.3±0.5(2-3)	1.0±0.3(1-2)	0.05
5	Total WBC count (per cumm)	15978±6125(6700-30000)	8325±2920(2700-14000)	0.001
6	Platelets count (Per cu mm)	109857±51191(31000-205000)	106818±46361(12300-160000)	0.33
7	Total blirubin (mgm/dl)	1.2±0.81(0.44-2.6)	0.96±0.5(0.45-2.3)	0.40
8	ALT(U/dl)	256.4±102(45-1400)	115.3±88.7(42-320)	0.01
9	Blood urea(mgs/dl)	49.9±15.01(23.5-74.4)	46.5±8.5(23.7-61.4)	0.03
10	Serum creatinine(mgs/dl)	1.44±0.7(0.73-3.2)	0.9±0.35(0.3-2.0)	0.01
11	Serum sodium(Meq/L)	147.9±8.6(132.3-163.4)	146.4±7.1(136-164.3)	0.81

AGE:

Fig. 1.Donor age

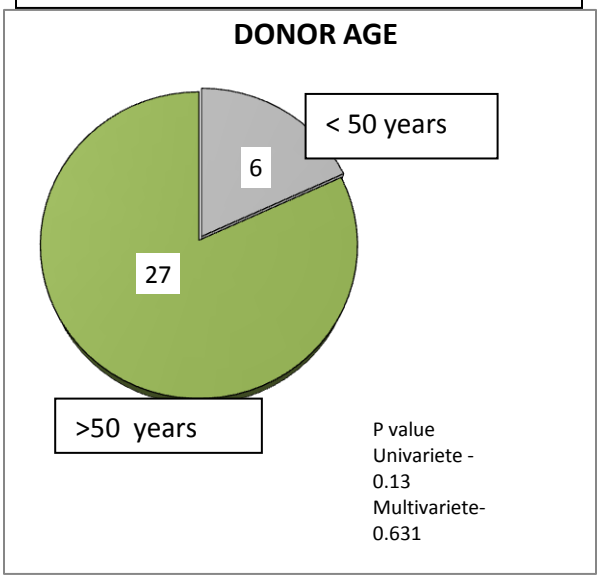
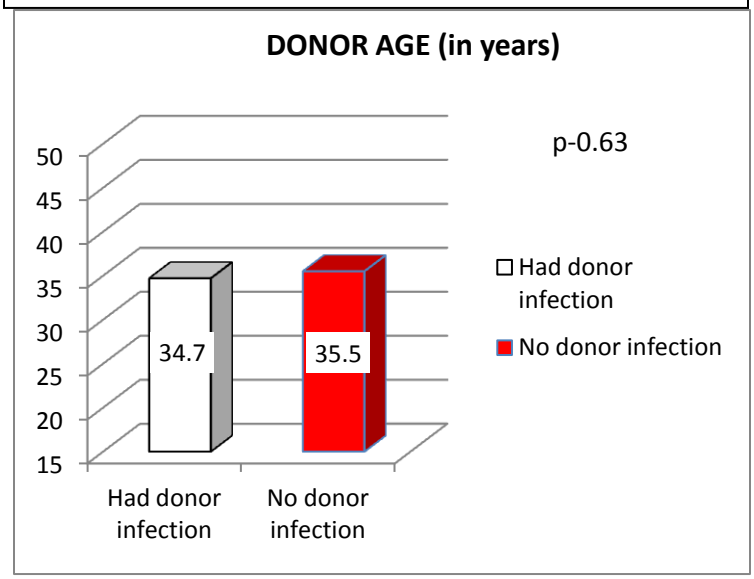


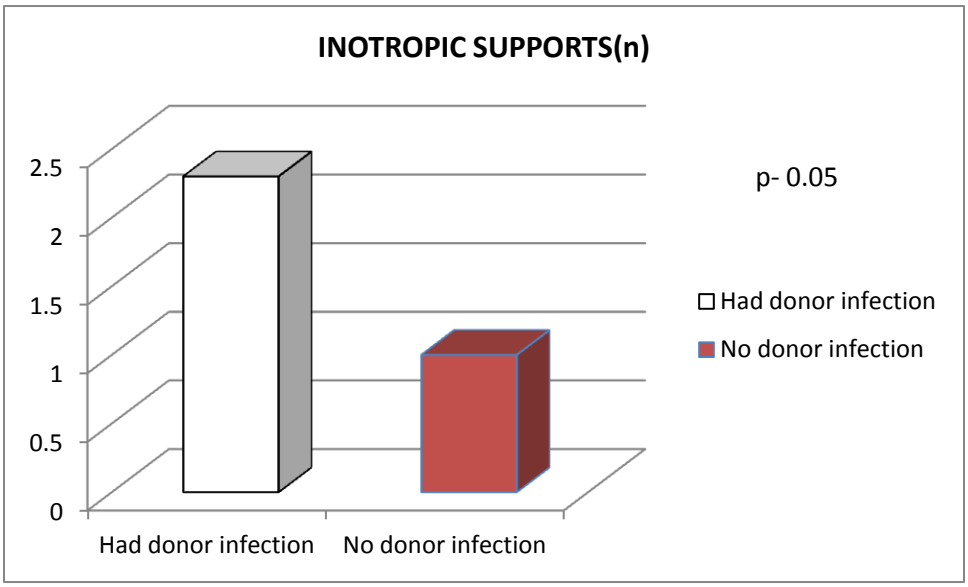
Fig.2. Donor age and donor infections



Mean age of donor is 35.1±13.19 , with range from 19 to 65 yrs. Six donors were more than 50 yrs. Only three donors were female. Average BMI was 25.2±1.5, with range from 21.6 to 28.9. Thirteen were alcoholics. Five donors were diabetics (15.1 %). All patients were managed in ICU.

INOTROPE SUPPORT:

Fig.3. Inotropic support and donor infections



Initially all donors were heamodynamically unstable and received inotropic supports. Sixteen donors(48.5%) maintained with more than one inotrope . One donor sustained cardiac arrest and revived .

ICU STAY:

Fig. 5. Donor infections

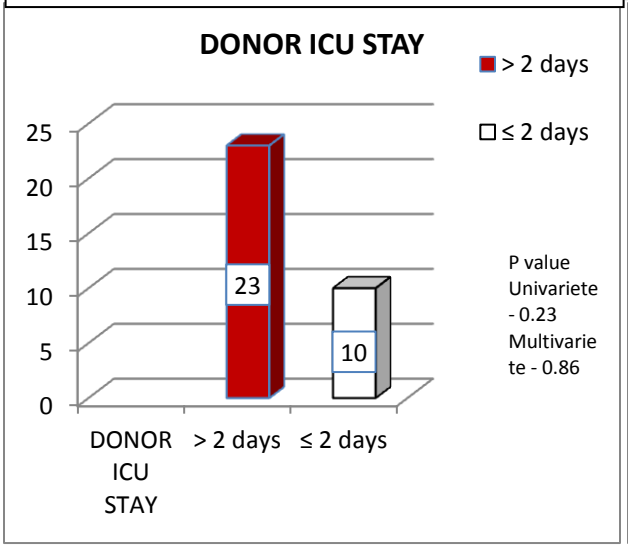
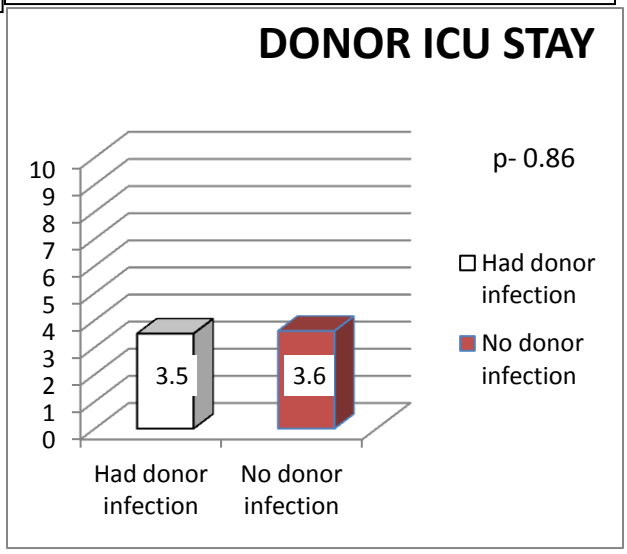


Fig. 4. Donor ICU stay and infections



Mean ICU stay was 3.57±1.89, with range from 2 to 9 days. Twenty two(66.6%) stayed more than 48 hrs. For donors excluded due to sepsis with haemodynamic instability , The mean average ICU stay was 5.8±1.2 days.

DONOR CULTURE:

Fig. 5. Donor cultures status

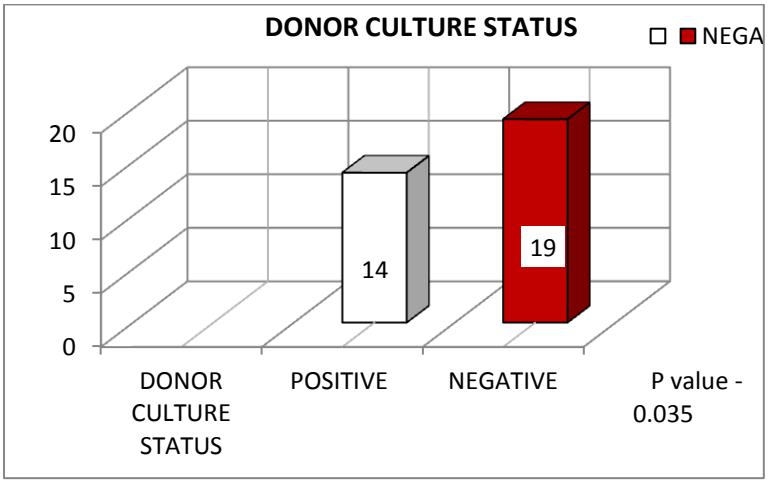


TABLE 7. DONOR CULTURES

S.no	CULTURES	No of positive growth
1	Blood	11
2	Urine	3
3	Peritoneal fluid	2
4	Tracheal fluid	1
5	Perfusion fluid	0
Total		17

Fourteen donor(42.4%) had bacterial infection. Eleven blood culture, Three urine culture, two tracheal fluid culture and one peritoneal fluid culture had bacterial growth.

BACTERIAL ORGANISMS:

TABLE 8. BACTERIAL ORGAINISMS

S .no	Bacterial growth	Numbers
1	Single organism	10
2	Polymicrobial organisms	4
3	Gram positive organisms	3
4	Gram negative organisms	15

Three culture shown gram positive organisms and gram negative organisms(83.3%)were found in fourteen cultures. Four donors had multiple organisms.

BLOOD INVESTIGATIONS :

TABLE. 9 . BLOOD PARAMETERS

Donors blood parameters	Mean with SD	Range
Hb (gm/dl)	**10±2.6**	8.2- 15.6
Total WBC (per cumm)	11862±5711	2700 - 30000
Platelets(per cumm)	96039±45828	12300- 160000
Blood urea(mgs/dl)	47.9±12.3	23.5 – 74.4
Serum creatinine (mgs/dl)	1.14±0.58	0.3 – 3.2
Total bilirubin (mgs/ dl)	105±0.64	0.44- 2.6
ALT (u/dl)	175±95.6(42-1400)	42-1400
Serum sodium(meq/l)	147±7.44	132.3 – 64.3

RECIPIENTS :

TABLE 10. The Baseline Characteristics Of Recipients Of Cadaveric Liver Transplantation

Serial no.	Recipient variables	N	Mean ±SD(range)	'p' value			
				Univariate analysis	Multivariate analysis pertaining to (Recipient factors)		
					Same organisms	Morbidity	Mortality
1	Age : More than 50 yrs Less than 50 yrs	 12 21	 47.12 ±10.6(16- 65)	0.28	0.18	0.63	0.56
2	Sex: Male Female	 28 5	 -	0.4	0.37	0.62	0.03
3	BMI	-	25.248±1.53(21.6-28.9)	0.19	0.08	0.76	0.71
4	DCLD: Cirrhosis Non cirrhosis	 28 5	 -	0.4	0.37	0.12	0.57

5	Cirrhosis complications (SBP/HE/ HRS)	12(36.4 %)	-	1.0	0.912	0.63	0.11
6	Diabetes Mellitus	9	-	1.0	0.91	0.44	0.38
7	MELD	-	18.9±3.15(12 -25)	0.875	0.34	0.14	0.31
8	Cold Ischemia Time	-	377.12 ±68.16(300-500)	0.685	0.22	0.002	0.14
9	Recipient infections	17(51.5 %)	-	0.227(0.003)	0.22(0.08)	0.124	0.33
10	Infection both in donor and recipient	9(27.3 %)	-	0.73	0.002	0.001	0.29
11	Recipient infection due to same donor organism	3(9.1%)	-	0.23	-	0.005	0.25
12	Morbidity	10(30.3 %)	-	0.001	0.005	-	0.001
13	Mortality	4(12.1 %)	-	0.29	0.25	0.001	-

14	Hospital stay (days) All recipient For recipient with infection For recipient without infection	-	- 13.7±4.5 22.1±2.1 11.5±1.5	0.05	-	0.09	-

TABLE 11 . Comparison of the baseline characteristics of recipients of cadaveric liver transplants obtained from donors who had bacteremia and donors who did not have bacteremia.

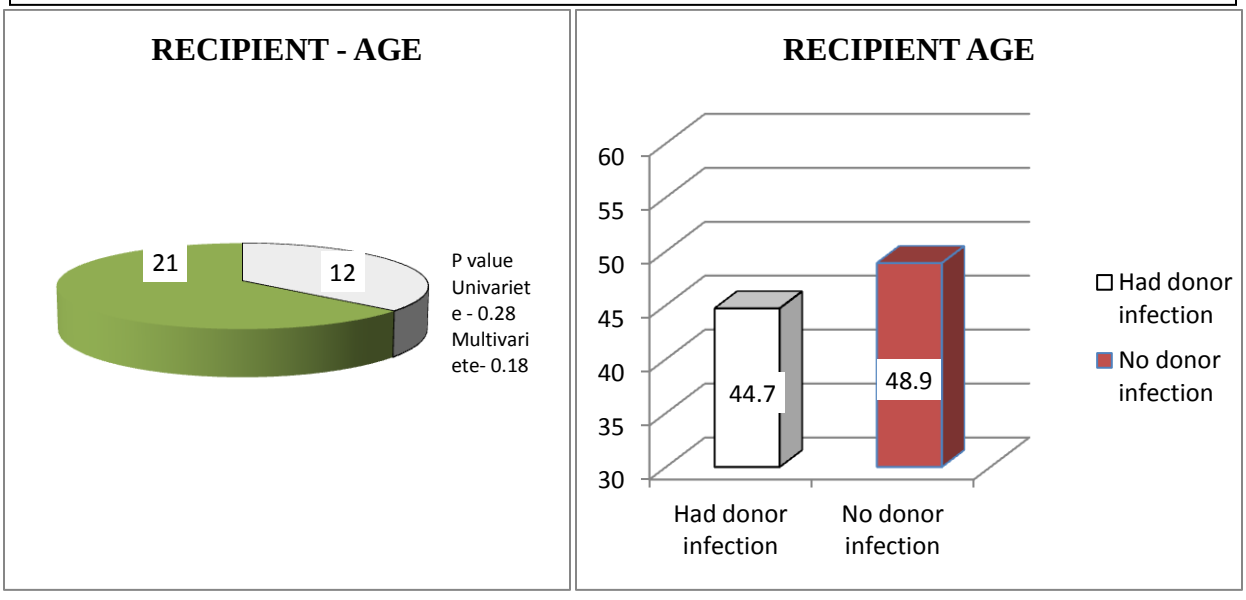
S.no	Characteristic	Recipient status		'p' value
		Had donor infection	No donor infection	
1	Age	44.7±5.8(16-55)	48.9±10.6(26-65)	0.18
2	BMI	25.7±2.3(22-29.3)	24.6±2.08(21.2-28.0)	0.08
3	MELD	19.8±2.4(16-25.2)	18.3±3.3(12-25)	0.34
4	Cold Ischemia Time(minutes)	383.6±71.2(300-500)	372.3±67.6(300-480)	0.22
5	Warm ischemia	91.07±11.6(65-	87.9±14.4(65-	0.13

	time(minutes)	110)	120)	
6	Recipient infections(n)	9	8	0.33
7	Recipient infection due to same donor organism(n)	3	nil	0.005
8	Morbidity(n)	8	2	0.005
9	Hospital stay(days)	16.4±6.5	12.2±2.6(10-18)	0.11
10	Mortality(n)	3	1	0.25

Thirty three patients underwent deceased donor liver transplantation. Twenty eight (88.2%)were male and five female .

AGE:

Fig.7. Recipient age and donor inefctions



Age range from 16 to 65 yrs with mean of 47.1±10.3.

BMI was 21.2 to 29.3 with mean of 25.1±2.9.

INDICATIONS:

TABLE 12. INDICATIONS FOR LIVER TRANSPLANTATION

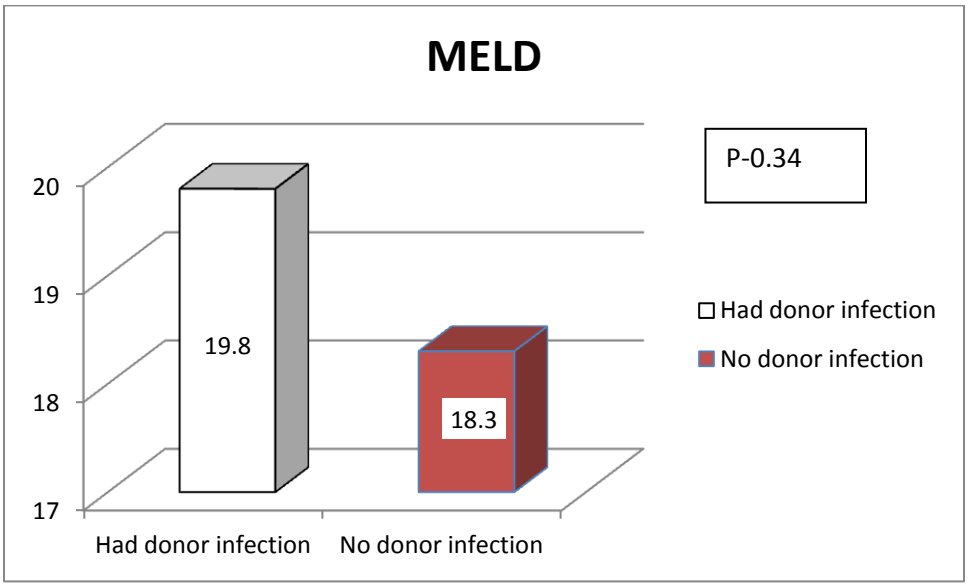
Serial no.	INDICATIONS	Number of patients
1	Cryptogenic	14
2	Viral (HBV – Hepatitis B virus, HCV- Hepatitis C virus)	9 (HCV – 3 & HBV - 6)
3	Auto immune	1
4	NCPF	1
5	Secondary biliary cirrhosis	1
6	Primary biliary cirrhosis	1
7	NFLD	1
8	Budd-Chiari Syndrome	2
9	Hepatoma (denova origin) (On cirrhosis background)	3 (8)
Total		33

Twenty eight had decompensated liver disease. Three underwent transplantation for hepatoma de ova origin and two for acute fulminat liver failure due to Budd-Chiari Syndrome. Twelve had history of either SBP(Spontaneous bacterial peritoitis) or HRS(Hepatorenal syndrome) or HE(Hepatic encephalopathy) or coagulopathy (complications of chronic liver disease and associated portal hypertension). Nine recipients were diabetic.

MELD SCORE :

MELD of the recipient : Mean was 18.9±3.2(12-25) . p-0.34

Fig .8. MELD and donor infections



Preoperative blood culture of two recipients had growth . since it was skin commensals , therefore considered as insignificant.

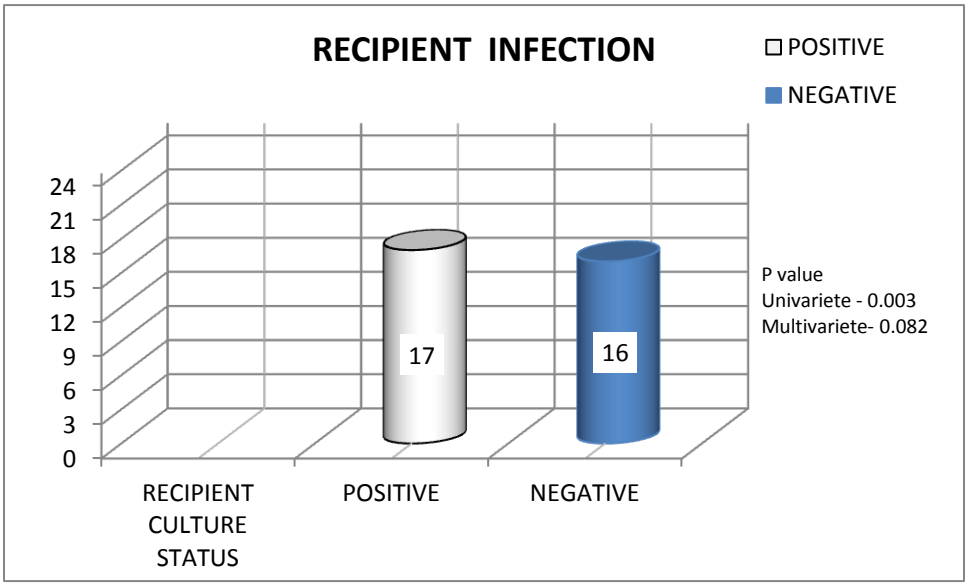
PERFUSION FLUID: HTK (Histidine-Tryptophan-Ketoglutarate) solution was used as organ perfusion fluid in all donor liver as perfusate.

COLD ISCHEMIA TIME : Cold ischemia time was from 300 to 500 minutes with mean value of 377.1±68.15 minutes. (p- univariate analysis : 0.003, multivariate analysis:0.224)

WARM ISCHEMIA TIME: Warm ischemia time was from 65 to 120 minutes with mean value of 89.2±12.9 minutes. P- 0.739

RECIPIENT INFECTION STATUS:

Fig .9. Recipient infections



Seventeen recipients had bacterial growth in cultures in first week . One had fungal growth (candida albicans)in blood culture.

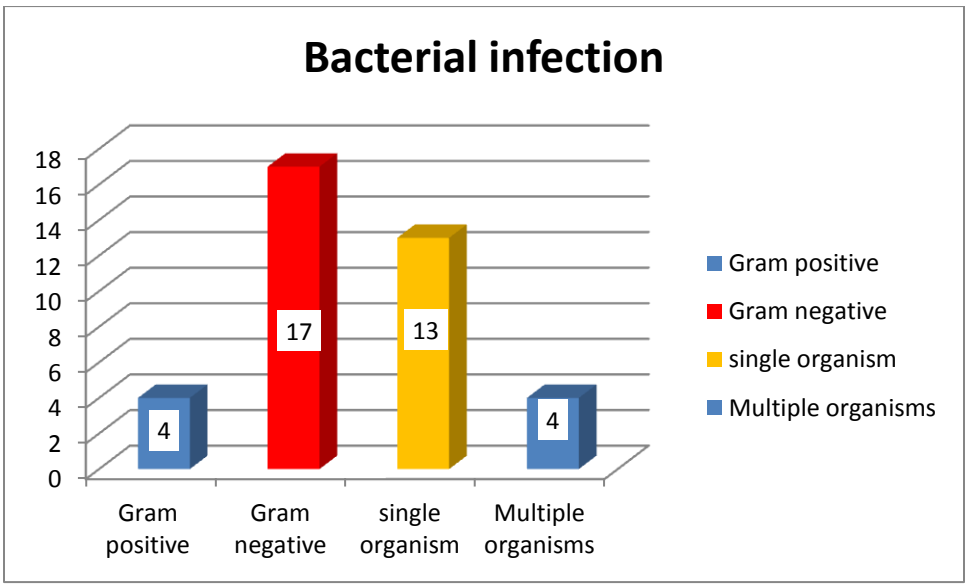
TABLE 13.RECIPIENT'S CULTURE STATUS

S.no	CULTURES	No of positive growth
1	Blood	7
2	Urine	3
3	Peritoneal fluid	3
4	Sputum	4
5	Bile	1
6	Wound	1
Total		19

Seven blood , three urine , three peritoneal fluid ,four sputum ,one bile and one wound culture had shown bacterial growth.

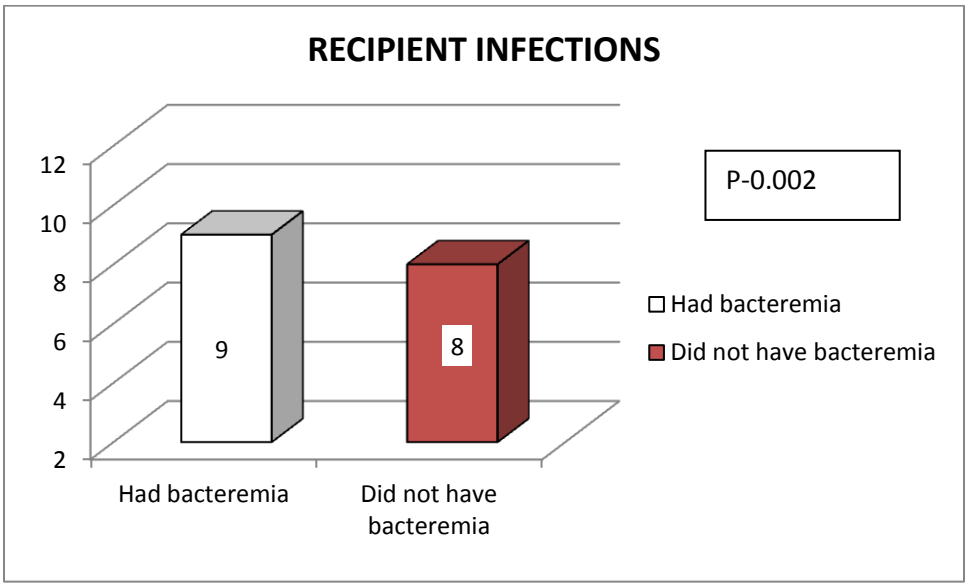
GRAM STAINING STATUS:

Fig. 10. Bacterial organisms



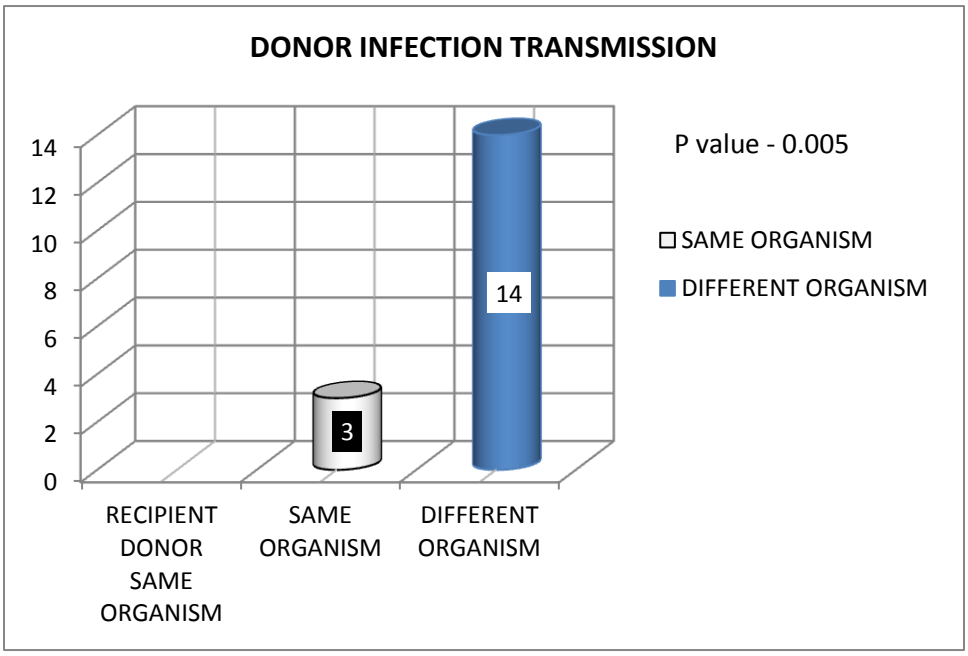
Gram positive infection was seen in four cultures . Gram negative organisms were seen in seventeen cultures. Four cultures grown poly microbial bacterial organisms and another one(peritoneal fluid)had associated fungal growth(candida albicans).

Fig. 11. Recipient infections and donor infections



Nine had infection in both donor and recipient.

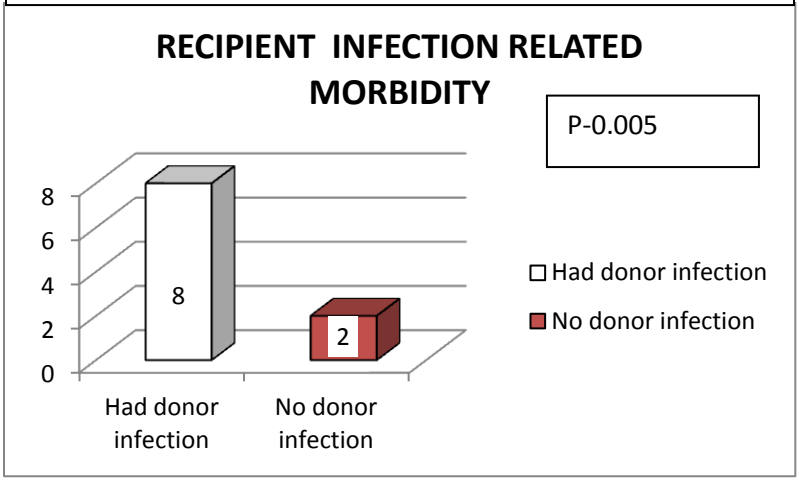
Fig. 12. Donor infection transmission



Three donor and recipients had same organisms. Transmission rate is 9.1%.Two of the recipients had same antibiotic sensitivity as in donor. One recipient had both bacterial and fungal growth in blood culture..

MORBIDITY:

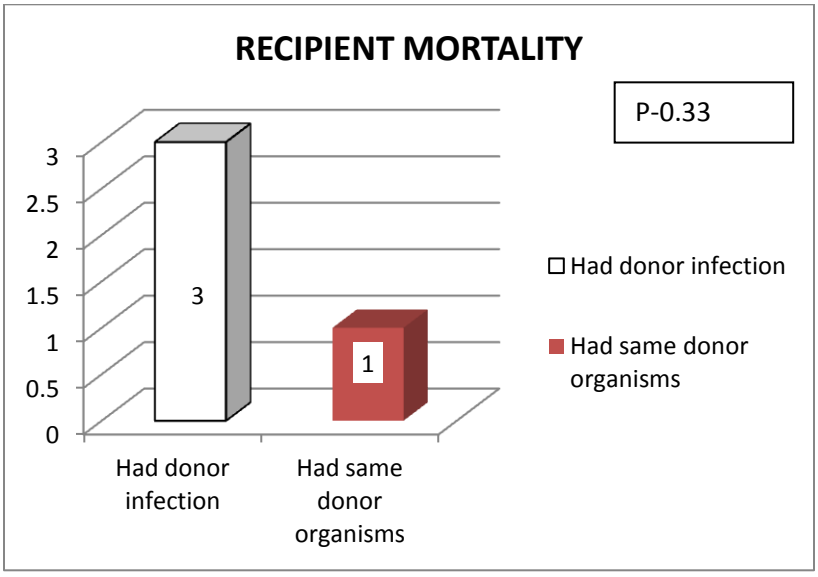
Fig. 13. Recipient infection and related morbidities



Ten(58.8%)had infection related morbidities related to bacterial sepsis, (P-0.005) No patients had primary graft failure , or vascular complications.

MORTALITY:

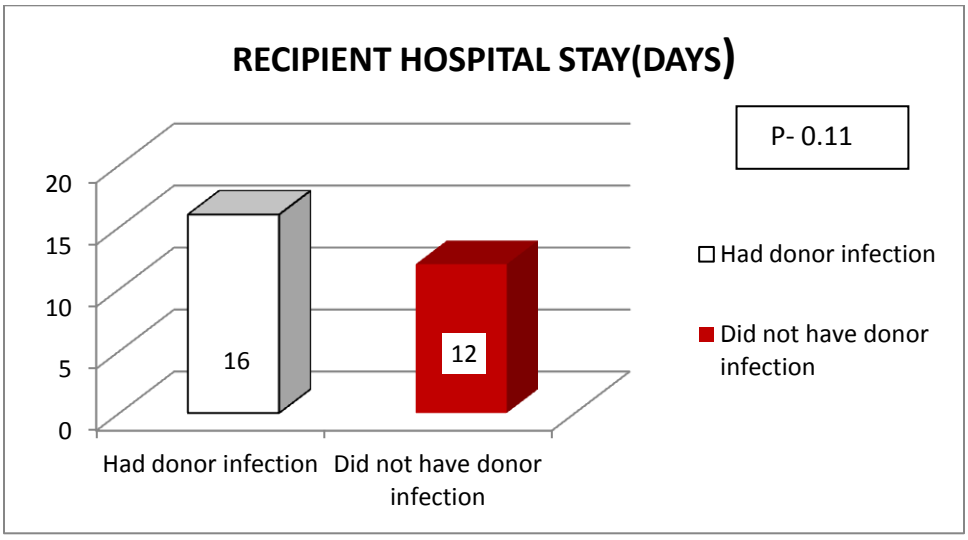
Fig. 14. Recipient's infection related 30 days mortality



Thirty day mortality of recipient due to bacterial sepsis was four. Three of them had infection since first week and also had donor infection . But only one of them shared same organism as in donor, p- 0.33.

HOSPITAL STAY:

Fig . 15.Recipient's duration of hospital stay



Mean hospital stay of recipient was 13.7±4.5 days , with range from ten days to twenty four days. Recipients without infectious complications had mean the hospital stay of 12.3±3.6days. Those had infection related complications had prolonged hospital stay was17.6±6.1 days . But Hospital stay of recipient with donor bacterial infection was 16.4±6.5 and for without donor infection was 12.2±2.6(10-18) , p- 011.

DISCUSSION

Infection is the most common complication of orthotopic liver transplantations and a major cause of mortality. Bacterial infections are the most common infection in early post operative period. The majority (81%) of bacterial infections occur within first two months after liver transplantation . [59]

In the solid-organ transplantation, and particularly for liver transplantation, donor infections are not only transmitted to the recipient, the donor infection also may affect the donated liver's preservability and subsequent function in the recipient irrespective of the systemic consequences of the infection. In addition, infected organs are less able to respond to the pathogens because of their immunosuppressive state. [1]

DONOR:

In our study, fourteen donors (42.4%) had bacterial infection,(p- 0.035) which is very significant and nearly half of the recipients were exposed to donor infection. On analyzing the donor risk factors. In this study, age was not considered as an important factor for donor infections as only two of the older donor(Age above 50 yrs) had infection. Twenty seven donors were below 50yrs. Twelve of them developed infection P (0.86).

Male/female ratio was 10:1. Most of the donors were young male. Twelve male and two female had infection (p –0.39). Since of most the donors were in their younger age , not many medical co morbidities were found in the donors. Only Five (15.2%) donors were diabetics. Two(40%) of them had infection ,(p –0.91) .

Regarding the mode of death in donors, majority of donors sustained brain death due to road traffic accident. Nearly forty percent of donors were alcoholic and about 72% of them were sustained injury under the influence of alcohol. Five among them had infection – (p -1.0 , 0.721 , 0.964).

All the brain dead patients were treated in ICU for variable period. All underwent various invasive procedures like central venous line insertion, arterial lines , tracheostomy and urinary bladder catherisation. All had ventilator support . It has been reported that comatose patients are commonly associated the risk of nosocomial pneumonia, especially if they are in ventilator support.[13,26,68]

Similarly , Bacterial or fungal infection are acquired in the terminal stage of the donor's care in an intensive care unit (like vascular access infection, nosocomial pneumonia, bladder catheter-related infection) [10,14]

The European Prevalence of Infection in Intensive Care study has reported as 45% of ICU patients had 1 or more infections and 12% of them had bacteremias. [70]

Moreover, generally there is a depression in immunity level in brain dead, either due to brain injury itself or due to admission various immune suppressants like steroids. It is very difficult in diagnose or suspect sepsis in brain dead . Because they exhibit clinical signs as in sepsis due to head injury as the result of alteration taking place in central control lead to features of SIRS(Systemic inflammatory response syndrome) . Paradoxically using drugs like steroids masks the signs of clinical sepsis. Conversely in brain-injured patients the hyperthermia and hemodynamic instability are often due to brain damage rather than infections.[10]

About fifteen donors were disqualified for harvesting organs due to profound sepsis. In these patients, the mean average ICU stay was 5.8±1.2 days . For donors who were clinically stable in whom organs harvested., the mean ICU stay of donors was 3.57±1.89, with range from 2 to 9 days. Twenty three(69.7%) donors were treated in ICU for more than 48 hrs . Ten (43.5%)of them had infection (p - 0.86). This result is statistically insignificant. The possible explanation is these stable donors were not completely representing the infections in brain dead since others with frank sepsis were excluded.

Many studies have reported about the risk factors bacterial infection in donors. Among them , duration of ICU stay is important factor. ICU stay increases the risk of nosocomial infection and that 33% to 45% of all nosocomial

bacteremias occur in these patients. But the upper limit of ICU stay in which less donor infections reported are extremely variable.[6,67]

In most of the studies, ICU stay of three or more days is a significant predictor of donor infection. [11,35] In some studies, ICU stay of more than seven days is a significant predictor of donor infection.[74]

Vincent JL et al described seven risk factors for ICU-acquired infection: increasing length of ICU stay (> 48 hours), ventilator support, trauma, central venous, pulmonary artery catheterisation, and urinary catheterization, and stress ulcer prophylaxis [74].

Varying results from these studies regarding duration of ICU stay indicate that it is very difficult to define the upper limit for ICU stay which depends upon many factors like ICU management policies, trained personals and facilities.

Since most of the donors were haemodynamically unstable, all received inotrope support. Seventeen donors received single inotrope support. Twelve received two inotropes and Four received three inotropes support. Donors treated with single inotrope , not developed infection. whereas Ten (83.3%)donors who received two inotrope and all four donors who received three inotropes had donor infection (p - 0.001). Wu TJ et al reported as in brain dead, haemodynamic instability and changes in various organ homeostasis are due to brain injury and

sepsis and the necessity of multiple inotropes are directly proportionate to the extent of injury due to sepsis. Both revived cardiac arrest and inotropic supports were the independent factors to predict donor infection. [74]

Elevated total WBC counts, low platelet count, elevated hepatic enzymes and renal parameters are important indicators of bacterial sepsis. Nineteen(57.6%) donors had elevated total WBC counts . Thirteen (68.4%)of them had infection.(P-0.001). Eleven donors (33.3 %)had platelet counts below 100,000. Six(54.5%) of them developed infection. P- (0.33). Five(15.2%) donors had elevated total bilirubin . Two of them contracted infection. (p-0.40)

Liver enzymes(ALT) were elevated in fifteen donors(45.5%). Ten (66.7%)of them had infection .p- (0.01). In this group, recipient's infection morbidities also increased.(p-0.01). Twelve (36.4%)had elevated blood urea. Eight (66.7%) of them had infection. (p- 0.03)Nine(27.3%) had elevated serum creatinine. Seven (77.8%)had infection ,(p- 0.01) Eighteen(54.5%)had hypernatremia. Eight(44.4%) of them had infection. (p- 0.81).

Generally sepsis associated with elevation other systemic parameters like elevated WBC counts , Blood urea ,serum creatinine and liver enzymes .In our study elevated WBC counts, blood urea , serum creatinine and elevated liver enzymes were found in infected but clinically stable donors. Drop in platelet

counts and elevated serum sodium were not significantly associated with donor infection.

After analyzing all the factors , duration of ICU stay , number of inotropes required to main haemodynamic stability, elevated WBC counts , Blood urea ,serum creatinine and liver enzymes are factors throw the light to suspect donor infection who are otherwise clinically stable without signs of overt sepsis.

RECIPIENT:

When a recipient gets infection in the early post liver transplantation period , the sources could be from donor or contamination during donor surgery or recipient surgery ,or post operative ICU. Since incidence of contamination is insignificant and negligible. Similarly contracting infection from transplant ICU in first week after transplantation is uncommon. Naturally ,the main source is donor unless proved otherwise.

Seventeen(51.5%) had infections (p- 0.003). Fifteen recipient were male (88.2%)p- 0.37. The mean BMI was 25.08±2.16, (range : 21-29) (p- 0.08). Six recipients were more than 50 yrs in age . p-, (0.18). MELD – Mean : 18.97 ± 3.15 (range : 12-25) ;(p- 0.34).

Twenty eight recipients underwent liver transplantation for chronic liver disease (84.8%); Fourteen had infection in first week (50%); (p- 0.37). In our

study, the major indication for liver transplantation was decompensated liver diseases. Most common indication was cryptogenic DCLD followed by viral etiology. In viral liver diseases , HBV related DCLDs were predominant. Regarding HCC , Most the transplantation was done for HCC with cirrhosis background .

Preoperatively ,Twelve recipients(36.4%) were treated for cirrhosis related complication like SBP, HRS or for hepatic encephalopathy. Seven(58.8%) had infection . Only one(8.3%) of the recipient had same organism as found in donor . (0.91).Ten(30.3%) recipients were diabetic. One recipient developed donor infection, p-0.91. None of the recipient's factors analysed in this study significantly associated with donor related recipient infections.

Mean cold ischemia time of the donor organ was 377.12±68.15(range : 300-500 minutes) ; p-0.33. Paya CV et al [59] reported as prolongation of cold ischemia time certainly affect the quality of the organs which become susceptible for infection. Similarly, the main risk factor predisposing to bacterial infection appears to be the duration of the transplantation operation, especially beyond 12 hours.

Duration of cold ischemia time depends upon various factors like type of liver transplantation deceased donor /living donor), experience of the surgical team , Coordination between donor institute / transplant team , distance between place

of donor and recipient surgery, transport facilities. All our case were deceased donor liver transplantation .We use to get organs from various government and private institutions at various distance which range from 6 to 200 kilometers. In the initial period of our programme , the cold ischemia time was longer which presently reduced considerably including the total duration of surgery. The mean cold ischemia time in our study was only 377 minutes and no major difference between two groups. But recipient's infection morbidities were more common in donor organ with prolonged cold ischemia time indicating vulnerability of the harvested organ for infection in post operative period.

Warm ischemia time : mean 89.2±12.9 minutes ; p-0.739 . Carlos Lumbreras et al reported that prolonged warm ischemia time was significantly associated with donor bacteremia [10] Recent studies show a cumulative negative effect induced by prolonged Cold ischemia time and Warm ischemia time [8,32,69] .

The harvested organ contamination also a source for recipient infection . In our study, though none of our perfusion fluid had bacterial growth , many studies reported the cultures of perfusion fluid and transport medias may be positive in up to 40% . Most of positive cultures are caused by non virulent skin floor have correlated poorly with the occurrence of post transplant infections.[22]

The type of bacterial infection found in donor transmitted recipient infection varies in literature. Paya et al reported as gram-negative organisms are more common (66%) organisms found in recipients. [59] In our study, Most of the organisms found in donor and recipient were gram negative organisms. (73.7%). All organisms found in donor transmitted recipients were gram negative organisms.

Though more than half the recipients had infection in first week and nine had both donor and recipient infection Seven(77.8%)of nine had infection related morbidities. P- 0.001. Only three of them had same organisms, traceable to donor with same antibiotic sensitivity. Though the rate of transmission is 9.1%, it is statistically insignificant (p-0.227) and must be interpreted as the chance for transmission of donor infection is very remote. Low intensity infection, Low virulent organisms , preemptive antibiotic therapy both in donor and recipient and new unfavorable environment [83] in recipient could be the reasons for low infection transmission to recipient.

All three recipients (100%) had infection related morbidities p-0.02 , But no one had major complications like hepatic artery thrombosis , donor organ dysfunction or anastomotic disturbance.

It appears significance of transmission bacterial infection to recipient from stable and adequately treated donor is negligible. Since all donors and recipient were treated with broad spectrum antibiotics empirically and then to specific antibiotics according culture sensitivity , there must be definite role for antibiotic in preventing bacterial infection from donor to recipient. Moreover it is not known some organisms which not shown any growth in donor cultures and could grow as predominant organisms in new recipient environment and produce infection related morbidities. So all the early recipient infection(in first week) must be viewed as source from donor unless otherwise proofed or excluded other possibilities.

Though donor derived bacterial infection in recipient is not statically insignificant , Transmission of infection from donor produce significant infection related morbidities. Since knowledge about the source, virulence and antibiotic sensitivity pattern of donor related recipient infection are available in time which will help to avoid major complication like hepatic artery thrombosis , arterial anastomotic disruption or poor function of the graft . [15,16,24,25,27,57,72]

Thirty day mortality due to first week bacterial infection was four. Three of them had infection since first week. Two of them also had donor infection . But only one of them shared same organism as in donor, p- 0.33. His blood had both bacterial(MRSA strain of staph. aureus) and fungal growth (candida albicans). This explain the severity of infection due to highly virulent bacteria and combined

fungal sepsis. In this study, 30-day mortality of patients receiving organs from donors with infection was insignificant when to compare with recipient of organs from uninfected donors. This suggests that there was no significant compromise of the preservability or subsequent function of organs from infected donors. Hsin-Yun Sun, et al [41] reported as if pretransplant infections that have been adequately treated they do not pose a significant risk for poor outcomes in recipients, including post transplant mortality.

Hospital stay : Mean 13.79±4.6 days ; range : 10-24 days. Recipient with infectious complications stayed twice the duration as recipient without infections or related complications. Hence, it is obvious that Infectious complications in recipients increases the hospital stay and also medical expenditure.

CONCLUSION:

By analyzing all the factor in donors and recipients, It can be concluded as :

- Duration of ICU stay , number of inotropes required and its dose are well associated with donor infection.
- Total WBC count, elevated liver enzymes and renal parameters are important risk indicators for donor infection.
- Cold ischemia time plays a major role in recipient infection related morbidities by rendering the organs vulnerable to infection.
- Routine usage of broad spectrum antibiotic followed by appropriate antibiotics prevent effective transmission infection from donor to recipient. [22,58]
- The rate of infection transmitted from donor to recipient is neglible. So infection in clinically stable donors are not a contraindication to harvest the organs.
- But the same time , whenever the donor infection is transmitted to recipient , it produce significant major infection related morbidities.
- Though the mortality rate was statically insignificant , it increase recipient's hospital stay and medical expenditure.
- Appropriately treated pre transplant donor and recipient infections do not adversely affect outcome including the risk of post transplant infections or

mortality after liver transplantation. Over all , by not rejecting the clinically stable but infected donors , expand the donor pool[51,55] .

- Many literature supporting the organs donation from donor with sepsis . Most of them are from western studies which is not representing the developing countries . Scenarios in developing countries like India is totally different especially standard of ICU care , medical facilities, surgical experience. This study is from the a government institute typically representing the rest of country.

LIMITATIONS:

- Power of the study is weak due to smaller group of patients.
- Management policy of brain dead patients differ from institute to institute which leads to selection bias in assessing the risk factors for donor infections.
- Regarding donor infection, all the brain dead patients should be included in the study to find out the factors influencing donor infection. This study analyzed only about the stable donor without clinical signs of infection. They were only partly representing the cadaver pool.
- In this study , it was considered (on based on literature evidence[82]) as recipient infection in first week after transplantation was exclusively due to donor source. There might be possibility of recipient source also. To address this bias , only same organism with same antibiotic sensitivity found in both donor and recipient were considered as definite evidence of transmission, Though identifying the bacterial genome is the only way to ensure the infection transmission which is not available in present clinical setup.

UNSUSPECTED BACTERIAL INFECTION IN DECEASED DONORS AND ITS IMPACT ON IMMEDIATE POST OPERATIVE INFECTIONS IN LIVER RECIPIENTS.

DEPARTMENT SURGICAL GASTROENTEROLOGY , GOVT. STANLEY HOSPITAL , CHENNAI.

DONOR PROFORMA FORM

DONOR NAME: **AGE:** **SEX:**

IPNO: **DATE:**

Mode of death:

Date of accident:

Alcoholic: yes / no.

Co morbidities:

Duration of icu stay:

Hypotension:

No of inotropes used:

History of cardiac arrest:

Antibiotics and duration of treatment:

Surgery/ invasive procedure:

Perfusion fluid:

Blood transfusions:

Blood culture:

Urine culture:

Throat swab:

Tracheal aspirate:

Other cultures:

CLINICAL FEATURES:

BLOOD INVESTIGATIONS:

Complete haemogram:

Liver function test::

Blood urea:

Serum creatinine:

Serum electrolytes:

DONOR SURGERY DETAILS :

Duration of surgery:

Intraoperative events:

Perfusion fluid used in no:

Organ transport time:

Cold ischemia time:

OTHER REMARKS:

VERIFIED BY

UNSUSPECTED BACTERIAL INFECTION IN DECEASED DONORS AND ITS IMPACT ON IMMEDIATE POST OPERATIVE INFECTIONS IN LIVER RECIPIENTS.

DEPARTMENT SURGICAL GASTROENTEROLOGY , GOVT. STANLEY HOSPITAL , CHENNAI.

RECIPIENT PROFORMA FORM

RECIPIENT NAME : **AGE:** **SEX:**

IP NO : **DATE:**

Diagnosis :

Indications for liver transplantation :

CTP score:

MELD:

Pre op events of complications:

Associated malignancies:

Pre op culture status:

Duration of recipient surgery:

Warm ischemia time:

Total duration surgery:

Blood loss:

Blood transfusion:

Intra operative events:

Immunosuppressants :

Antibiotics:

CLINICAL FEATURES:

Morbidities and treatment details:

Acute rejection:

Vascular complications:

Mortality details:

Hospital stay (duration in days)

BLOOD INVESTIGATIONS:

Complete haemogram:

Liver function test::

Blood urea:

Serum creatinine:

Serum electrolytes: Other tests:

POST OP CULTURE STATUS (Organisms/Antibiotic sensitivity):

Urine: Blood:

Bile: Wound discharge:

Tracheal fluid: Intra abdominal fluid:

Other cultures:

VERIFIED BY

ANNEXURE TABLE CHARTS

DONOR DETAILS

DONOR NAME	AGE	SEX	BMI	ALCOHOLIC	DM	DURATION OF ICU STAY	> 2 DAYS	NO OF INOTROPES	CULTURE POSITIVITY	TC	PLATELETS	T BILIRUBIN	INCREASED LIVER ENZYMES	BLOOD UREA	ELEVATED UREA	S. CREATININE	ELEVATED CREATININE	S. NA+
Karthick	24	M	26	YES	NO	3	YES	1	NO	4500	123000	0.7	NO	45.9	NO	0.8	NO	136.4
Suganya	21	F	24	NO	NO	5	YES	3	YES	18300	45000	1.2	YES	63.1	YES	1.5	YES	156.8
PALANIVEL	35	M	25	YES	NO	5	YES	1	NO	7500	160000	0.7	NO	47.3	NO	0.8	NO	142.1
Jayabharathi	23	F	22	NO	NO	5	YES	1	NO	8600	146000	0.8	NO	47.9	NO	0.8	NO	136
Parthiban	46	M	26	NO	NO	2	NO	1	NO	14000	150000	1.2	YES	52.3	YES	1.2	NO	156
Kuppan	45	M	24	YES	NO	2	NO	1	NO	9600	145000	1	NO	41	NO	0.9	NO	138
Perumal	30	M	25	NO	NO	3	YES	1	NO	7400	12300	1.1	NO	47.2	NO	0.8	NO	144
Prabakaran	29	M	26	YES	NO	9	YES	1	NO	8900	140000	0.89	NO	46.3	NO	0.8	NO	142
Gaja	50	M	27	YES	YES	4	YES	2	NO	10000	136000	1	NO	36.2	NO	1.1	NO	150
Kasinathan	40	M	26	NO	NO	6	YES	2	YES	11,400	96,000	0.9	YES	44.85	NO	0.88	NO	144.4
Thadi themothi	20	F	24	NO	NO	2	NO	3	YES	15000	86000	1	YES	50.2	YES	0.78	NO	149.3
Mohan	25	M	24	NO	NO	8	YES	1	NO	6700	120000	0.8	NO	42.3	NO	0.45	NO	140
Deysingh	32	M	26	NO	NO	2	NO	2	YES	16,000	103000	2.5	YES	50.78	YES	1.19	NO	145
Jothi	60	M	24	NO	YES	4	YES	2	YES	6,700	128000	1	YES	74.36	YES	1.78	YES	148.6
Annamalai	36	M	25	YES	NO	2	NO	1	NO	2,700	57,000	0.94	YES	61.4	YES	2	YES	152.1
Sekar	24	M	23	NO	NO	2	NO	1	NO	10,600	113000	0.99	YES	60.12	YES	1.07	NO	164.3
Ragavan	50	M	25	YES	YES	3	YES	2	YES	16,000	80000	2.6	YES	63.2	YES	1.3	YES	149
Shankar	38	M	29	NO	NO	3	YES	2	YES	23,600	161000	0.74	YES	73.89	YES	3.23	YES	132.3
Arun	22	M	25	NO	NO	3	YES	1	NO	12,800	84000	2.1	YES	56.2	YES	1.3	YES	146
Sivaprakasam	35	M	26	NO	NO	3	YES	2	YES	22,200	205000	0.54	NO	36.46	NO	1.09	NO	155.6
Gurulingam	48	M	27	YES	NO	2	NO	3	YES	10,800	104000	0.44	YES	54.1	YES	1.57	YES	163.4
Mani kandan	21	M	24	YES	NO	8	YES	2	YES	30,000	111000	0.6	NO	23.54	NO	0.73	NO	155.7
Mani kandan	19	M	24	NO	NO	3	YES	3	YES	16,100	31,000	2.6	YES	58.83	YES	2.04	YES	138
Siva doss	19	M	25	NO	NO	5	YES	1	NO	10,560	12600	0.5	NO	45.6	NO	1	NO	150
Jagan	28	M	26	NO	NO	3	YES	1	NO	8,900	120000	1.2	NO	48.2	NO	0.9	NO	147
Jagadesan	26	M	26	NO	NO	3	YES	2	YES	12,200	143000	0.51	NO	35.65	NO	1.13	NO	147.9
pari	39	M	27	YES	NO	3	YES	2	YES	14,000	190000	1.15	YES	44.87	NO	2.16	YES	139.3
Ram babu	36	M	28	YES	NO	3	YES	2	NO	7,700	101000	0.45	NO	44.5	NO	0.97	NO	151.7
srinivasan	23	M	24	NO	NO	3	YES	1	NO	4,200	64,000	0.54	NO	23.69	NO	0.71	NO	146
arjunan	55	M	24	NO	YES	2	NO	1	NO	11,600	156000	2.3	YES	45.9	NO	1.1	NO	148
devaraj	60	M	26	YES	YES	2	NO	1	NO	9,000	100000	0.6	NO	45.6	NO	0.4	NO	145
David	37	M	25	YES	NO	2	NO	2	YES	11,400	55,000	0.5	NO	24.2	NO	0.75	NO	145.2
Kumar	65	M	26	NO	NO	3	YES	1	NO	12,500	90000	0.5	NO	45.3	NO	0.3	NO	147

RECIPIENT DETAILS

RECIPIENT NAME	AGE	SEX	BMI	CIRRHOSIS	MELD	PRE OP EVENTS OF COMPLICATIONS (SBP/HRS)	DM - YES/ NO	PRE OP CULTURE STATUS	COLD ISCHEMIA TIME	WARM ISCHEMIA TIME	PRIMARY GRAFT FAILURE	ACUTE REJECTION	VASCULAR COMPLICATIONS	POST OP CULTURE POSITIVITY STATUS	RETRANSPLANTATION
Fathima	42	F	23	YES	15	NO	NO	NIL	300	80	NO	NO	NO	YES	NO
Samandhi	40	F	22	YES	22	NO	YES	NIL	420	110	NO	NO	NO	YES	NO
Ravichandran	43	M	23	YES	13	YES	NO	NIL	310	110	NO	NO	NO	NO	NO
Chandrasekar	51	M	27	YES	15	NO	YES	NIL	450	90	NO	NO	NO	YES	NO
Sarathy	35	M	28	YES	16	NO	NO	NIL	320	70	NO	NO	NO	NO	NO
Dhanasekar	51	M	26	YES	22	NO	NO	NIL	310	80	NO	NO	NO	NO	NO
kadanandha	45	M	25	NO	17	YES	YES	NIL	420	65	NO	NO	NO	YES	NO
Manickam	59	M	28	YES	12	NO	NO	NIL	360	70	NO	NO	NO	NO	NO
Velu	50	M	22	YES	16	NO	YES	NIL	410	90	NO	NO	NO	YES	NO
Moorthy	55	M	25	YES	19	NO	NO	NIL	500	100	NO	NO	NO	YES	NO
Vijayaraghavan	50	M	29	YES	19	NO	NO	NIL	480	100	NO	NO	NO	YES	NO
Vijayakumar	35	M	26	YES	19	NO	NO	NIL	480	90	NO	NO	NO	YES	NO
Periyasamy	48	M	26	NO	17	YES	YES	NIL	420	90	NO	NO	NO	YES	NO
Nataraj	35	M	23	NO	19	NO	NO	CONS	450	65	NO	NO	NO	YES	NO
Raju	60	M	26	YES	20	NO	YES	NIL	480	90	NO	NO	NO	YES	NO
Paranthaman	55	M	23	YES	22	YES	NO	NIL	390	90	NO	NO	NO	YES	NO
Deivasigamani	50	M	28	YES	23	YES	YES	NIL	400	90	NO	NO	NO	YES	NO
Balamanoharan	55	M	27	YES	19	YES	NO	blood - micrococci	450	100	NO	NO	NO	YES	NO
ponvedha muthu	59	M	25	YES	17	NO	NO	NIL	300	120	NO	NO	NO	NO	NO
Ramesh	48	M	24	YES	21	YES	NO	NIL	400	100	NO	NO	NO	YES	NO
Mani	42	M	24	YES	19	YES	YES	NIL	300	90	NO	NO	NO	NO	NO
Jenifer charles	47	M	24	YES	19	NO	NO	NIL	320	80	NO	NO	yes	NO	NO
Madhavi	47	F	29	NO	19	NO	NO	NIL	320	80	NO	NO	NO	NO	NO
valluvamani	48	M	22	YES	19	YES	NO	NIL	450	100	NO	NO	NO	YES	NO
Rangaraj	40	M	23	YES	20	NO	NO	NIL	320	100	NO	NO	NO	NO	NO
Seran	51	M	27	YES	25	YES	NO	NIL	300	90	NO	NO	NO	NO	NO
Govindan	42	M	25	YES	16	NO	NO	NIL	310	90	NO	NO	NO	NO	NO
Damodharan	64	M	23	YES	21	NO	NO	URINE - KLEB	450	85	NO	NO	NO	YES	NO
Velu	61	M	26	YES	16	YES	YES	NIL	315	70	NO	NO	NO	NO	NO
jayagandhi	40	F	25	YES	19	NO	YES	NIL	300	80	NO	NO	NO	NO	NO
Balchander	26	M	21	YES	24	NO	NO	NIL	360	90	NO	NO	NO	NO	NO
Kalaiarasi	16	F	26	NO	21	NO	NO	NIL	300	90	NO	NO	NO	NO	NO
Srinivasan	65	M	26	YES	25	YES	NO		350	100	NO	NO	NO	NO	NO

BMI – Body Mass Index, DM – Diabetes Mellitus, MELD – Model for End stage Liver Disease, TC –Total WBCCount

COMPARISON DETAILS OF ALL DONOR'S AND RECIPIENT'S CHARECTERISTICS

DONOR	CULTURE POSITIVITY	ORGANISMS	RECIPIENT	CULTURE POSITIVITY	SAME ORGANISM	SAME SENSITIVITY	INFECTION IN BOTH	MORBIDITITY	MORTALITY	DURATION OF HOSPITAL STAY
Karthick	NO	NO	Fathima	YES	NO	NO	NO	NO	NO	13
Suganya	YES	GP	Samandhi	YES	YES	YES	YES	YES	YES	Mortality
PALANIVEL	NO	NO	Ravichandran	NO	NO	NO	NO	NO	NO	12
Jayabharathi	NO	NO	Chandrasekar	YES	NO	NO	NO	NO	NO	15
Parthiban	NO	NO	Sarathy	NO	NO	NO	NO	NO	NO	12
Kuppan	NO	NO	Dhanasekar	NO	NO	NO	NO	NO	NO	10
Perumal	NO	NO	kadanandha	YES	NO	NO	NO	NO	NO	10
Prabakaran	NO	NO	Manickam	NO	NO	NO	NO	NO	NO	15
Gaja	NO	NO	Velu	YES	NO	NO	NO	NO	NO	13
Kasinathan	YES	GN	Moorthy	YES	NO	NO	YES	YES	YES	Mortality
Thadi themothi	YES	GP,GN	Vijayaraghavan	YES	NO	NO	YES	YES	NO	24
Mohan	NO	NO	Vijayakumar	YES	NO	NO	NO	NO	NO	10
Deysingh	YES	GN	Periyasamy	YES	NO	NO	YES	YES	NO	23
Jothi	YES	GN,GN	Nataraj	YES	YES	NO	YES	YES	NO	21
Annamalai	NO	NO	Raju	YES	NO	NO	NO	YES	YES	Mortality
Sekar	NO	NO	Paranthaman	YES	NO	NO	NO	NO	NO	10
Ragavan	YES	GN	Deivasigamani	YES	NO	NO	YES	YES	NO	23
Shankar	YES	GN,GN	Balamanoharan	YES	NO	NO	YES	NO	NO	12
Arun	NO	NO	Ponvedamoorthy	NO	NO	NO	NO	NO	NO	11
Sivaprakasam	YES	GN	Ramesh	YES	YES	YES	YES	YES	NO	24
Gurulingam	YES	GN,GN	Mani	NO	NO	NO	NO	NO	NO	12
Mani kandan	YES	GN	Jenifer charles	NO	NO	NO	YES	NO	NO	Mortality
Mani kandan	YES	GN,GN	Madhan	NO	NO	NO	NO	NO	NO	10
Siva doss	NO	NO	valluvamani	YES	NO	NO	NO	NO	NO	12
Jagan	NO	NO	Rangaraj	NO	NO	NO	NO	NO	NO	13
Jagadesan	YES	GN	Seran	NO	NO	NO	NO	NO	NO	10
pari	YES	GP	Govindan	NO	NO	NO	NO	NO	NO	10
Ram babu	NO	NO	Damodharan	YES	NO	NO	NO	YES	NO	18
srinivasan	NO	NO	velu	NO	NO	NO	NO	NO	NO	10
arjunan	NO	NO	jayagandhi	NO	NO	NO	NO	NO	NO	13
devaraj	NO	NO	Balchander	NO	NO	NO	NO	NO	NO	11
David	YES	GN	Kalaiarasi	NO	NO	NO	NO	YES	YES	11
Kumar	NO	NO	Srinivasan	NO	NO	NO	NO	NO	NO	12

GP- Gram positive , GN- Gram negative.

DONORS WITH INFECTIONS.

DONOR NAME	AGE	SEX	BMI	ALCOHOLIC	DIABETICS	ICU STAY (DAYS)	>2DAYS	No OF INOTROPES	TOTAL WBC COUNT	PLATELETS COUNT	TOTAL BILIRUBIN	LIVER ENZYMES	BLOOD UREA	SERUM CREATININE	SERUM Na+
Suganya	21	F	23.5	NO	NO	5	YES	3	18300	45000	1.2	300	63.1	1.5	156.8
Kasinathan	40	M	26.4	NO	NO	6	YES	2	11,400	96,000	0.9	360	44.85	0.88	144.4
Thadi themothi	20	F	24	NO	NO	2	NO	3	15000	86000	1	105	50.2	0.78	149.3
Deysingh	32	M	26.4	NO	NO	2	NO	2	16,000	103000	2.5	140	50.78	1.19	145
Jothi	60	M	23.6	NO	YES	4	YES	2	6,700	128000	1	100	74.36	1.78	148.6
Ragavan	50	M	25.4	YES	YES	3	YES	2	16,000	80000	2.6	160	63.2	1.3	149
Shankar	38	M	28.9	NO	NO	3	YES	2	23,600	161000	0.74	200	73.89	3.23	132.3
Sivaprakasam	35	M	26.1	NO	NO	3	YES	2	22,200	205000	0.54	45	36.46	1.09	155.6
Gurulingam	48	M	27	YES	NO	2	NO	3	10,800	104000	0.44	180	54.1	1.57	163.4
Mani kandan	21	M	23.5	YES	NO	8	YES	2	30,000	111000	0.6	50	23.54	0.73	155.7
Mani kandan	19	M	23.9	NO	NO	3	YES	3	16,100	31,000	2.6	180	58.83	2.04	138
Jagadesan	26	M	25.8	NO	NO	3	YES	2	12,200	143000	0.51	60	35.65	1.13	147.9
Pari	39	M	27.3	YES	NO	3	YES	2	14,000	190000	1.15	310	44.87	2.16	139.3
David	37	M	24.7	YES	NO	2	NO	2	11,400	55,000	0.5	1400	24.2	0.75	145.2

BMI – Body Mass Index

RECIPIENTS WITH DONOR INFECTIONS:

RECIPIENT NAME	AGE	SEX	BMI	CIRRHOSIS	MELD	PRE OP EVENTS OF COMPLICATIONS (SBP/HRS)	DM YES/ NO	PRE OP CULTURE STATUS	COLD ISCHEMIA TIME	WARM ISCHEMIA TIME	PRIMARY GRAFT FAILURE	ACUTE REJECTION	VASCULAR COMPLICATIONS	POST OP CULTURE POSITIVITY STATUS
Samandhi	40	F	22	YES	22	NO	YES	NIL	420	110	NO	NO	NO	YES
Moorthy	55	M	24.6	YES	19	NO	NO	NIL	500	100	NO	NO	NO	YES
Vijayaraghavan	50	M	29.3	YES	19	NO	NO	NIL	480	100	NO	NO	NO	YES
Periyasamy	48	M	26.1	NO	17	YES	YES	NIL	420	90	NO	NO	NO	YES
Nataraj	35	M	23.4	NO	19	NO	NO	CONS	450	65	NO	NO	NO	YES
Deivasigamani	50	M	28.3	YES	23	YES	YES	NIL	400	90	NO	NO	NO	YES
Balamanoharan	55	M	27.4	YES	19	YES	NO	blood - micrococci	450	100	NO	NO	NO	YES
Ramesh	48	M	23.6	YES	21	YES	NO	NIL	400	100	NO	NO	NO	YES
Mani	42	M	24.1	YES	19	YES	YES	NIL	300	90	NO	NO	NO	NO
Jenifer charles	47	M	24.3	YES	19	NO	NO	NIL	320	80	NO	NO	yes	NO
Madhavi	47	F	29	NO	19	NO	NO	NIL	320	80	NO	NO	NO	NO
Seran	51	M	26.7	YES	25	YES	NO	NIL	300	90	NO	NO	NO	NO
Govindan	42	M	24.5	YES	16	NO	NO	NIL	310	90	NO	NO	NO	NO
Kalaiarasi	16	F	26.4	NO	21	NO	NO	NIL	300	90	NO	NO	NO	NO

BMI – Body Mass Index, DM – Diabetes Mellitus, MELD – Model for End stage Liver Disease, TC – Total Count

COMPARISON OF INFECTED DONORS AND THEIR RECIPIENTS:

DONOR	CULTURE POSITIVITY	RECIPIENT	CULTURE POSITIVITY	INFECTION IN BOTH	SAME ORGANISM	SAME SENSITIVITY	MORBIDITITY	MORTALITY	DURATION OF HOSPITAL STAY
Suganya	YES	Samandhi	YES	YES	YES	YES	YES	YES	Mortality
Kasinathan	YES	Moorthy	YES	YES	NO	NO	YES	YES	Mortality
Thadi themothi	YES	Vijayaraghavan	YES	YES	NO	NO	YES	NO	24
Deysingh	YES	Periyasamy	YES	YES	NO	NO	YES	NO	23
Jothi	YES	Nataraj	YES	YES	YES	NO	YES	NO	21
Ragavan	YES	Deivasigamani	YES	YES	NO	NO	YES	NO	23
Shankar	YES	Balamanoharan	YES	YES	NO	NO	NO	NO	12
Sivaprakasam	YES	Ramesh	YES	YES	YES	YES	YES	NO	24
Gurulingam	YES	Mani	NO	NO	NO	NO	NO	NO	12
Mani kandan	YES	Jenifer charles	NO	YES	NO	NO	NO	NO	Mortality
Mani kandan	YES	Madhan	NO	NO	NO	NO	NO	NO	10
Jagadesan	YES	Seran	NO	NO	NO	NO	NO	NO	10
pari	YES	Govindan	NO	NO	NO	NO	NO	NO	10
David	YES	Kalaiarasi	NO	NO	NO	NO	YES	YES	11

DONORS WITHOUT INFECTIONS.

DONOR NAME	AGE	SEX	BMI	ALCOHOLIC	CO MORBIDITIES	DURATION OF ICU STAY	NO OF INOTROPES	TC	PLATELETS	T. BILIRUBIN	LIVER ENZYMES	BLOOD UREA	S.CREATININE	S. NA+
Karthick	24	M	26.1	YES	NO	3	1	4500	123000	0.7	48	45.9	0.8	136.4
Palanivel	35	M	25.3	YES	NO	5	1	7500	160000	0.7	66	47.3	0.8	142.1
Jayabharathi	23	F	21.6	NO	NO	5	1	8600	146000	0.8	42	47.9	0.8	136
Parthiban	46	M	25.6	NO	NO	2	1	14000	150000	1.2	250	52.3	1.2	156
Kuppan	45	M	24.3	YES	NO	2	1	9600	145000	1	70	41	0.9	138
Perumal	30	M	24.9	NO	NO	3	1	7400	12300	1.1	58	47.2	0.8	144
Prabakaran	29	M	25.7	YES	NO	9	1	8900	140000	0.89	100	46.3	0.8	142
Gaja	50	M	26.8	YES	YES	4	2	10000	136000	1	80	36.2	1.1	150
Mohan	25	M	23.5	NO	NO	8	1	6700	120000	0.8	84	42.3	0.45	140
Annamalai	36	M	25.4	YES	NO	2	1	2,700	57,000	0.94	320	61.4	2	152.1
Sekar	24	M	23.4	NO	NO	2	1	10,600	113000	0.99	280	60.12	1.07	164.3
Siva doss	19	M	25.4	NO	NO	5	1	10,560	12600	0.5	60	45.6	1	150
Arun	22	M	25.4	NO	NO	3	1	12,800	84000	2.1	200	56.2	1.3	146
Jagan	28	M	26.3	NO	NO	3	1	8,900	120000	1.2	55	48.2	0.9	147
Ram babu	36	M	28	YES	NO	3	2	7,700	101000	0.45	48	44.5	0.97	151.7
srinivasan	23	M	24.1	NO	NO	3	1	4,200	64,000	0.54	96	23.69	0.71	146
arjunan	55	M	23.6	NO	YES	2	1	11,600	156000	2.3	190	45.9	1.1	148
devaraj	60	M	25.7	YES	YES	2	1	9,000	100000	0.6	68	45.6	0.4	145
Kumar	65	M	25.6	NO	NO	3	1	2,920	90000	0.5	76	45.3	0.3	147

BMI – Body Mass Index, DM – Diabetes Mellitus, MELD – Model for End stage Liver Disease, TC – Total Count, S.Na – Serum sodium.

RECIPIENTS WITHOUT DONOR INFECTIONS.

RECIPIENT NAME	AGE	SEX	BMI	CIRRHOSIS	MELD	PRE OP EVENTS OF COMPLICATIONS (SBP/HRS/HE)	DM - YES/ NO	PRE OP CULTURE STATUS	COLD ISCHEMIA TIME	WARM ISCHEMIA TIME	POST OP CULTURE POSITIVITY STATUS
Fathima	42	F	23	YES	15	NO	NO	NIL	300	80	YES
Ravichandran	43	M	23	YES	13	YES	NO	NIL	310	110	NO
Chandrasekar	51	M	27	YES	15	NO	YES	NIL	450	90	YES
Sarathy	35	M	28	YES	16	NO	NO	NIL	320	70	NO
Dhanasekar	51	M	26.3	YES	22	NO	NO	NIL	310	80	NO
kadanandha	45	M	25.2	NO	17	YES	YES	insignificant	420	65	YES
Manickam	59	M	28	YES	12	NO	NO	NIL	360	70	NO
Velu	50	M	22.3	YES	16	NO	YES	NIL	410	90	YES
Vijayakumar	35	M	25.6	YES	19	NO	NO	NIL	480	90	YES
Raju	60	M	25.8	YES	20	NO	YES	NIL	480	90	YES
Paranthaman	55	M	23.1	YES	22	YES	NO	NIL	390	90	YES
ponvedha muthu	59	M	24.8	YES	17	NO	NO	NIL	300	120	NO
valluvamani	48	M	22.1	YES	19	YES	NO	NIL	450	100	YES
Rangaraj	40	M	22.7	YES	20	NO	NO	NIL	320	100	NO
Damodharan	64	M	23.1	YES	21	NO	NO	insignificant	450	85	YES
Velu	61	M	26.3	YES	16	YES	YES	NIL	315	70	NO
jayagandhi	40	F	24.9	YES	19	NO	YES	NIL	300	80	NO
Balachander	26	M	21.2	YES	24	NO	NO	NIL	360	90	NO
Srinivasan	65	M	25.6	YES	25	YES	NO		350	100	NO

BMI – Body Mass Index, DM – Diabetes Mellitus, MELD – Model for End stage Liver Disease, HE-Hepatic encephalopathy, BP – Spontaneous bacterial peritonitis, HRS-Hepato renal syndrome

COMPARIING RECIPIENTS TO DONORS WITHOUT INFECTIONS:

DONORS	DONOR CULTURE POSITIVITY	RECIPIENTS	RECIPIENT CULTURE POSITIVITY	MORBIDITITY	MORTALITY	DURATION OF HOSPITAL STAY
Karthick	NO	Fathima	YES	NO	NO	13
Palanivel	NO	Ravichandran	NO	NO	NO	12
Jayabharathi	NO	Chandrasekar	YES	NO	NO	15
Parthiban	NO	Sarathy	NO	NO	NO	12
Kuppan	NO	Dhanasekar	NO	NO	NO	10
Perumal	NO	kadanandha	YES	NO	NO	10
Prabakaran	NO	Manickam	NO	NO	NO	15
Gaja	NO	Velu	YES	NO	NO	13
Mohan	NO	Vijayakumar	YES	NO	NO	10
Annamalai	NO	Raju	YES	YES	YES	Mortality
Sekar	NO	Paranthaman	YES	NO	NO	10
Arun	NO	Ponvedamoorthy	NO	NO	NO	11
Siva doss	NO	valluvamani	YES	NO	NO	12
Jagan	NO	Rangaraj	NO	NO	NO	13
Ram babu	NO	Damodharan	YES	YES	NO	18
srinivasan	NO	velu	NO	NO	NO	10
arjunan	NO	jayagandhi	NO	NO	NO	13
devaraj	NO	Balchander	NO	NO	NO	11
Kumar	NO	Srinivasan	NO	NO	NO	12

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