

# **Division of Blood Transfusion Services**

**Ministry of Health and Family Welfare**



# Adverse Reactions to Blood Transfusion



# Learning objectives

- To Identify the different types of transfusion reactions
- To investigate and report of transfusion reaction
- Take preventive measures to avoid reactions in future

# Adverse Reactions

- Transfusion reaction
  - Untoward event
  - Varies from mild to life threatening
- Majority of transfusion reactions are uneventful
- 10% of transfusion recipients may suffer from untoward effects



# Types of Transfusion Reactions

- Immune reactions
- Non immune reactions
- Immediate
  - During or within few hours of transfusion
- Delayed
  - Days or weeks after the transfusion

# Immune Transfusion Reactions

Due to :

- Patient Abs against donor Ags or vice versa
  - Red cells
  - White cells
  - Platelets
- Reaction to plasma proteins



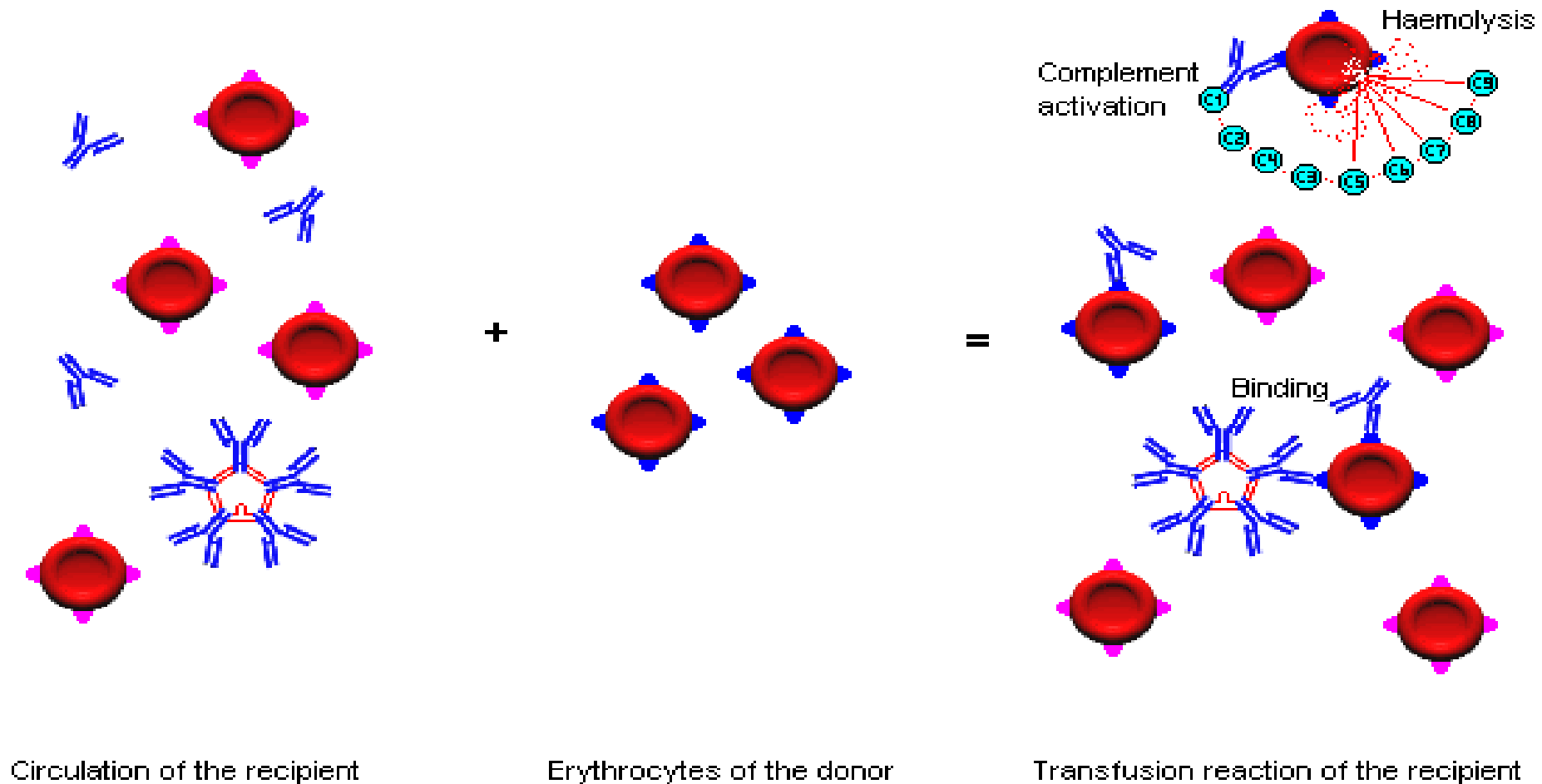
# Immune Reactions

- Haemolytic Transfusion Reactions
  - Acute
  - Delayed
- Febrile Non Haemolytic Transfusion Reactions
- Allergic / Anaphylactic reactions
- Allo-immunization
- TRALI (Transfusion Related Acute Lung Injury)
- TA-GvHD
- PTP (Post Transfusion Purpura)
- Immunomodulation

# Hemolytic Transfusion Reaction

IMMUNOBASE-DIAMED

## Transfusion Reaction





# Haemolytic Transfusion Reactions

- Increased destruction of donor red cells
  - Acute - Intravascular haemolysis
  - ABO incompatibility – due to activation of Complement cascade
  - Delayed - Extravascular haemolysis
  - Rh / minor group incompatibility- IgG/C3d coated cells removed in RES

# Haemolytic Transfusion Reactions (contd...)

- Causes for acute haemolysis
  - Red cell incompatibility – *ABO incompatibility*
  - Accidental heating or freezing of RBC
  - Red cells in contact with water or 5% Dextrose
  - Bacterial contamination
  - Administering red cells through small gauge needle



# ABO incompatible Transfusion Reactions

Mainly due to misidentification of the patient :

- Most occur in emergencies, in ICU, Operation Theaters
- In unconscious & anesthetized patients



# ABO Incompatibility

## Causes

- Clerical errors – commonest cause
  - Misidentification of pt / recipient
  - Wrong samples / blood packs
- Technical errors
  - In Grouping of pt. / donor blood
  - In crossmatching

# Clinical Features

## Symptoms

Chills

Chest / back pain

Headache

Itching

Palpitation

Dyspnoea

Nausea

Vomiting

## Signs

Fever

Rigors

Flushing

Restlessness

Hypotension

Tachycardia

Urticaria

Haemoglobinurea



## Clinical Features...

- Any *febrile transfusion reaction* should be *considered & managed as AHTR* until proved otherwise
- Signs & symptoms may be abolished by drugs
- Patients in coma or under GA - the *early alarming sign* may be
  - Haemoglobinurea
  - Hypotension
  - Uncontrollable bleeding

# Management of AHTR

- Stop transfusion immediately
- Maintain an IV line
- Provide cardio respiratory support
- Maintain BP, HR and airway
- Ensure diuresis
- Collect first urine sample for haemoglobinurea
- Check the patient's identification and the blood pack

# Management of AHTR

- Supportive Therapy –O<sub>2</sub> , Elevate the foot end.
- Treat DIC –Heparin
- Treat Renal Failure - Dopamine , Diuretics
- Treat hyperkaleamia, bicarbonate for acidosis
- Active intervention (hemofiltration, peritoneal dialysis, hemodialysis) *is needed if*

## PATIENT DEVELOPS

- Uraemic stupor
- Pulmonary oedema
- Hyperkalemia
- Rapidly rising blood urea





# Management of AHTR....

- Report the reaction immediately to BTS
- Record
  - Type of reaction
  - Length of time
  - Volume, type & unit number
- Send post transfusion sample of blood & remaining blood pack with filled reaction form to the Blood bank.
- Monitor blood urea & creatinine level
- Coagulation screen to rule out DIC



# Delayed HTR

- Days or weeks after the blood transfusion
- Due to secondary immune response
- Rh or minor blood group antibodies
- Extra vascular haemolysis



# Clinical Features of DHTR

- Gradual red cell destruction
- Occurs 5-10 days after transfusion
- Jaundice appears 5-7 days after transfusion
- Fall in Hemoglobin level
- Prevention –screening for alloantibodies & selection of appropriate red cells.



# Non Haemolytic Febrile Transfusion Reactions

- Due to
  - Abs in recipient against Ags of donor platelets or WBC
    - HLA Antigens
    - Granulocyte specific Antigens
    - Platelet specific Antigens
  - Presence of cytokines in blood components
- More common in multi-transfused patients



# Clinical Features of FNHTR

- Fever
- Chills
- Rigors
- Nausea
- Vomiting
- Hypotension
- Shock

# Management of FNHTR

- If mild :—
  - Slow down the infusion
  - Use Antipyretics
- If severe : —
  - Stop transfusion
  - Antipyretics and symptomatic treatment
- Usually reactions are self limiting
- Can be prevented by
  - Leucoreduced / leucodepleted blood components
  - Antipyretic cover /warm pt/ slow transfusion



# Allergic / Anaphylactic Reactions

- Mainly due to plasma proteins
- Severity is variable
  - Mild – urticaria
  - Severe – anaphylactoid
    - Due to IgA deficiency
  - Occurs within minutes of commencing transfusion
- Common in patients with repeated plasma component therapy

# Clinical Features

- Mild – urticaria
- Severe / Anaphylactoid
- Cough
- Respiratory distress
- Bronchospasm
- Nausea, vomiting, diarrhea
- Circulatory collapse
- Hypotension & shock



# IgA Deficiency

- Commonest isolated immunodeficiency
- Incidence is 1 : 1000
- Anti IgA – reacting with transfused IgA
- Anaphylactic reaction
- Dramatic reaction with few ml of blood
- Can result in death, unless managed promptly



# Management

- Mild – slow down rate of transfusion & administer antihistamine
- Severe - Stop the transfusion
- Adrenaline – 0.5ml IM (1 : 1000)
- Antihistamine
- Treat hypotension
- Steroids – Hydrocortisone
- Prevention
  - Transfuse at slow rate
  - Use Washed blood
  - Blood from IgA deficient donor (1 in 600)
  - Autologous blood transfusion



# Transfusion Related Acute Lung Injury - TRALI

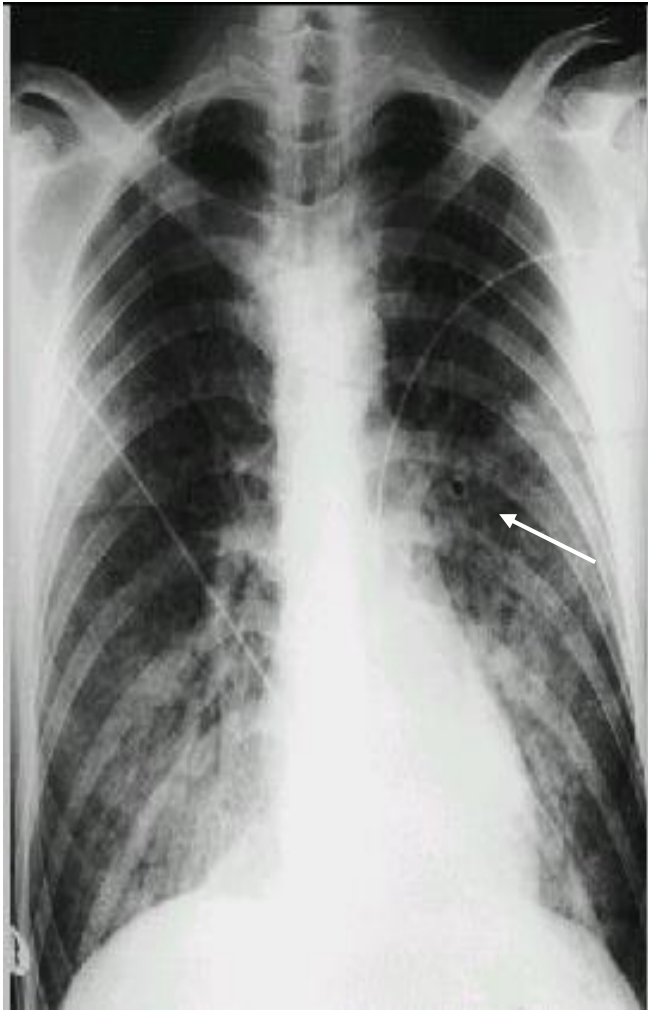
- Not rare but under diagnosed
- Presents as pulmonary oedema
- Within 1-4 hrs of starting transfusion
- Due to reaction between donor leucoagglutinins with recipient leucocytes
- Aggregates of recipient leucocytes trapped in pulmonary circulation
- Vascular damage & change in vascular permeability causes oedema



# Clinical Features

- Acute respiratory distress
- Fever with chills
- Non productive cough
- Chest pain
- Bilateral pulmonary oedema
- Chest X-ray – bilateral pulmonary infiltrates in hilar region
- Cyanosis
- Hypotension

# X ray Chest in TRALI



## Physiologic/Radiographic Features

- $\text{PaO}_2/\text{FiO}_2 < 300$  ALI,  $< 200$  ARDS
- Bilateral infiltrates consistent with pulmonary edema.
- No clinical evidence of left atrial hypertension,  $\text{Pawp} < 18$  mm Hg.
- $\downarrow$  Lung compliance /  $\uparrow$  Airway pressure
- Positive pressure ventilation via endotracheal tube.

# Management - TRALI

- No specific treatment
- Largely supportive
- Respiratory support with O<sub>2</sub>
- Most cases require mechanical ventilation
- Steroids
- Clinical staff who administer transfusions must be aware to diagnose & manage promptly

# Transfusion Associate -Graft vs. Host Disease (TA-GVHD)

- Rare & potentially fatal complication-Mortality rate -  $> 90\%$
- In severely immunocompromised pts
- Pts with immature immunological system (premature infants)
- Impaired immunological system (thymic aplasia)
- In immunocompetent patients, when donor is homozygous for one of the patients' HLA haplotypes ( certain communities/ blood relatives)



# Transfusion Associated Graft vs. Host Disease (TA-GVHD)

- Due to successful engraftment of allogeneic T lymphocytes & their precursors
- Donor lymphocytes engrafted in recipient & multiply
- Engrafted lymphocytes react with host tissues
- Transfusion Associated GVHD, has not been observed in patients with AIDS.
- Occurs 4-30 days after transfusion





- Fever
- Diffuse erythematous skin rash
- Maculopapular eruption
- Formation of bullae
- Nausea
- Vomiting
- Watery / bloody diarrhoea
- Hepatitis
- Pancytopenia





# TA - GvHD

## Diagnosis

- Detection of donor DNA by PCR

## How to prevent ?

- Use irradiated blood/blood components ( leucodepletion does not prevent TA-GVHD)

# Post Transfusion Purpura -PTP

- Marked thrombocytopenia 5-10 days after transfusion.
- More common in multiparous women
- Due to platelet specific alloantibodies-HPA 1a,1b, 3a and 5b
- Antibodies destroy transfused platelets as well as patient's own platelets
- Thrombocytopenia : severe but self-limiting
- Platelet transfusion : not effective
- Therapeutic Plasma Exchange or Intravenous Immunoglobulins are helpful



# Non immune transfusion reactions

- Circulatory overload
  - Heart failure, pulmonary oedema
- Iron overload
  - Iron deposit in tissues
- Hyperkalaemia
  - Haemolysed blood
- TTI (Transfusion Transmissible Infections)
- Septicemia



# Transfusion Transmissible Infections

- HIV I & II
- HBV (HAV)
- HCV
- Syphilis
- Malaria
- Cytomegalovirus
- HTLV I & II

## Emerging agents

- Nv CJD (new variant Creutzfeldt–Jakob disease)
- Hepatitis F & G
- TTV & Sen V
- West Nile Virus
- SARS
- Bird FLU



# Bacterial Contamination & Septic Shock

- Due to contamination of blood components especially platelets at
  - collection
  - processing
  - Storage in blood bank or ward
- Bacteremia in donor
- Endotoxines



# Clinical Features

- High grade fever
- Nausea, vomiting
- Abdominal cramps
- Shock
- DIC



# Management

- Stop transfusion immediately
- Examine blood pack for any visible change
  - Haemolysis, clots, discoloration
- Start intravenous line
- Broad-spectrum antibiotics
- Dopamine
- Blood cultures from blood pack, tubing, recipient

# Prevention

- Aseptic collection, processing
- Proper storage and transportation
- Start transfusion within half an hour after receiving.
- Complete Red cell transfusion within 4 hrs
- Avoid unnecessary blood warming
- Change transfusion set every 24 hrs



# Precautions to Avoid Transfusion Reactions

- Avoidance of clerical errors
- Proper identification of patient.
- Correctly labeled samples
- Proper identification of the recipient and the blood pack
- Careful & close observation of the patient while transfusion
- **Avoid unnecessary blood transfusion**



# Transfusion of Blood ???

## Therapeutic Benefits of blood component transfusion

- o Improve oxygen carrying capacity
- o Ensure haemostasis
- o Enhance resistance against infection



## Risks of transfusion

- o Immunological risk
- o Infection risk
- o Procedural risk

*Prescribe only when the benefits clearly outweigh risks*

# Blood Transfusion is an Essential Part of Modern Health Care

*However,*

- *It always carries potential risks for the recipient, and should be prescribed only for conditions with significant potential for morbidity or mortality, that cannot be prevented or managed effectively by other means.*
- WHO – Recommendations, 2001



# Learning outcomes

- Differentiate the clinical signs & symptoms of acute and delayed transfusion reaction
- Rapid management of transfusion reaction may save patient's life specially in acute reaction
- Understand the procedures to follow in the event of suspected transfusion reaction

