**Clinical Nutrition and dietetics – 4th semester**

**Paper No.: CND 404**

**Name of the paper: Dietary management of diseases – part IV**

**Topic: Sepsis**

**Lecture No.: 4**

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**Introduction:**

Sepsis is a potentially life threatening condition caused by the body’s response to an infection. Generally, the body releases several biomolecules , in to the blood stream to challenge the infection. When the body’s response to these biomolecules is out of balance, sepsis occurs which triggering the relevant changes which are sufficient to damage multiple organs systems of the body. So sepsis is the body’s extreme response to an infection. It is a life threatening medical emergency.

**Definition:**

Sepsis is defined as a dysregulated host response caused by infection and associated with profound regional, microvascular, and hemodynamics, metabolic, endocrine, and immune abnormalities that cause life threatening organ dysfunction. Acute Respiratory Distress Syndrome (ARDS) is classically manifested in sepsis.

Recently this has referred to as cytokine storm or an imbalance between Damage Associated Molecular Patterns (DAMPS) and Pathogen Associated Molecular Pattern (PAMPS). It is referred as persistent inflammation-immuno suppression and catabolism syndrome (PICS).

**First sings of sepsis:**

1. Fever and chills.
2. Very low body temperature.
3. Peeing less than normal.
4. Rapid pulse tachycardia.
5. Rapid breading (Tachypnea).
6. Nausea and vomiting.
7. Diarrhoea.
8. Unusual levels of sweating (Diaphoresis).

**Stages:**

There are 3 stages of sepsis.

1. Sepsis.
2. Severe sepsis.
3. Septic shock – In septic shock the symptoms are

* Dizziness/ feeling of faintness
* Confusion or a drop in allertness
* Slurred speech
* Shortness of breath
* Skin is cold and discoloured
* Loss of consciousness

**Cause:**

1. Sepsis is a specific condition itself, but commonly caused by bacterial infection in the blood which is called Septicemia. Septicemia leads to sepsis. So sepsis may state as life threatening organ dysfunction caused by a dysregulated host response tom infections.
2. Fungal infection induces sepsis.
3. Low immunity.
4. Over reaction of immune system to an infection and starts to damage your body’s own tissues and organs.

**Dietary management:**

1. **Acute phase:** Adequate protein and moderated non-protein calories: In acute phase of sepsis, massive mobilization of the body’s calorie reserve as muscle, glycogen and lipid stores are broken down to generate glucose to provide ATP production. This metabolic response to stress can generate 50-75% of glucose needs during illness and is not suppressed by feeding or intravenous glucose infusion. Calorie needs does not consistently increase in the early phase. In severe case, REE is reduces

In first2 to 5 days, acute phase, the REE in elderly sepsis [patients (mean age 67 years) is about 1850 kcal/day with TEE of about 1920 Kcal/day or TEE is 25 Kcal/kg body weight/day.

In the early acute phase, we should considered feeding less non-protein calories then calorie recovery is increasing. Protein losses increase 4 fold in the first 24 hours of critical illness.

Protein is recommended at the level of 0.6 g/kg/gay and energy supply is 15 kcal/kg/day.

1. **Chronic phase:** after successful resuscitation of the acute phase of sepsis, the patient becomes stabilised. Protein supplied in higher level i.e. 1.2-2.0 g/kg/day and calorie 25-30 kcal/kg/day to reduce further loss of lean body mass.
2. **Recovery phase:**
3. Calorie delivery is gradually increases with implementation of aggressive rehabilitation and exercise interventions. Human having 70 kg body weight following significant weight loss due to sepsis require 5000 kcal/day for 6th months to two years to fully regain the lost muscle mass and weight.
4. TEE is increasing as much as 1.7 times above REE.
5. In the 2nd week following sepsis TEE is 3250 kcal/day or 47 kcal/kg/day.
6. In younger mean age 34 years, this energy needs at 2nd week is 4120 kcal/day or 59 kcal/kg/day.

**Determination of nutrient requirements:**

1. **Energy:** It is about 25-30 kcal/kg body weight/day. Glucose is the primary calorie substance in parenteral nutrition. In our body, the maximum rate of glucose oxidation is approximately 5-7 mg/kg/minute or 7.2 g/kg/day. Carbohydrate should contribute approximately 60-70% energy. Parenteral infusion of dextrose solution is performed with routine monitoring of blood and urine glucose. Fat provides the remainder of energy i.e. 15-40% of calories. Fat not only provides essential fatty acids but also meet elevated energy requirement. Intravenous fat emulsion should be carefully monitored because fatty acid modulates the immuno response.
2. **Protein:** Amino acids are supplied to critically ill patients as part of the total nutrition regiment to support the synthesis of proteins require for defence and recovery, to spare lean body mass and to reduce the amount of endogenous protein catabolism for gluconeogenesis. It attenuates muscle wasting and to boost the neuromuscular revalidation process. The protein delivery should be gradually increasing from 0.8 g/kg to 2.0 g/kg.
3. **Pharmaco nutrition:** The most relevant pharmaco nutrients in septic patients are the amino acids, glutamine and arginine, omega-3-fatty acid, selenium and vitamin C.
4. **Glutamine:** Essential nutrients for enterocytes and immune cells, its main roles are-

* Maintain gut barrier functions.
* Exerts anti-oxidative activity.
* Shows cytoprotective activity.
* Stimulates nucleotide synthesis.
* Preserved neutrophil bacterial cleaning.
* Enhances lymphocytes and macrophage proliferation and secretion.

1. **Arginine:** It contributes protein synthesis, organ perfusion and wound healing.
2. **Selenium:** It has anti-oxidative, antiinflammatory and immuno modulatory properties.
3. **Vitamins:** Vitamin C intake at post operative state should be increased for wound healing. Vitamin K supply should be increased to resist bleeding.
4. **Minerals:** Potassium, phosphorus, sodium and chloride need to be focused as huge loss of K and P take place due to tissue damage. Loss of sodium and chloride may occur due to vomiting, diarrhoea, perspiration, anorexia and diuresis.
5. **ɷ-3 fatty acid:** This is antiinflammatory in type and there by check the pro inflammatory product formation in cells. It has stimulatory effect on immuno system and so controls the infection in surgical patients. Fish oil especially marine fish oil contains high level of ɷ-3 fatty acid. Its requirement in post operative state is 0.1-0.2 g/kg body weight/day but never grater then 20% of total dietary fat intake.