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Body fluids

Body fluids are liquids originating from inside the bodies of living humans. They include fluids that are excreted or secreted from the body. The composition of tissue fluid depends upon the exchanges between the cells in the biological tissue and the blood.

Variables influencing on fluid intake

- Personal conditions
- Climate
- Habits
- Level of physical activity
- Temperature / infection / sepsis
- Surgical procedure
- Fasting before operation

Composition of body fluid

. **Organic substances include** Glucose ,Amino acids ,Fatty acids ,Hormones ,Enzymes.



● Inorganic substances

- Sodium
- Potassium
- Calcium
- Magnesium
- Chloride
- Phosphate
- Sulphate

The body fluid composition of tissue varies by

- Tissue type.
- Gender: males have more lean tissue and therefore more body fluid.
- Age.

Movement of fluids due to:

- 1) Hydrostatic pressure: It is physiological processes that regulate fluids intake & output as well as movement of water & substances dissolved in it between the body compartments.
- 2) Osmotic Pressure: The pressure exerted by the flow of water through a semi-permeable membrane separating two solutions with different conc. of solute.

Water Balance: Water balance exists when water intake equals water output.

Regulation of fluid volume in body: -

- Antidiuretic Hormone .
- Renin/angiotensin/aldosterone system.



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- Baroreceptors in carotid arteries and aorta.
- Stretch receptors in atrium and juxtaglomerular apparatus.
- Cortisol.

Hypervolemia :Is an abnormal increase in the volume of fluid in the blood, particularly the blood plasma.

Causes:

1/ **Excessive sodium and/or fluid intake:** •

2/ **Sodium and water retention:** • Heart failure • Liver cirrhosis • Nephrotic syndrome • Corticosteroid • Hyperaldosteronism • Low protein

3/ **Fluid shift into the intravascular space:**

The signs and symptoms of hypervolemia include: **Hypertension. Dyspnea.**

Hypovolemia :is a deficit of bodily fluids.

Causes:

1/ **Kidney:** Loss of body sodium and consequent intravascular water (due to impaired reabsorption of salt and water in the tubules of the kidneys.

- Osmotic diuresis: the increase in urine production due to an excess of osmotic (glucose) and urea load in the tubules of the kidneys.
- Overuse of pharmacologic diuretics.
- Impaired response to hormones controlling salt and water balance.
- Impaired kidney function due to tubular injury or other diseases .

2/ **Loss of bodily fluids due to:**



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- Gastrointestinal losses; e.g. vomiting and diarrhea
- Skin losses; e.g. excessive sweating and burns
- Respiratory losses; e.g. hyperventilation (breathing fast) .

Anesthesia, surgery and fluid balance

There are two main components to the stress response to surgery:

-The neuroendocrine response.

-Cytokine response.

The neuroendocrine response is stimulated initially by painful afferent neural stimuli reaching the CNS and central baroreceptors which cause increased ADH activity.

It may be diminished by dense neural blockade from anesthesia.

The most important response to anesthesia and surgery in the perioperative period is sodium and water retention. In general, the tendency to retain water is directly related to the magnitude of surgery.

Fluid losses - Patient undergoing anesthesia and surgery

- Before operation

respiratory losses

loss to sweat

urine output

-Central venous pressure CVP can be used to assess the adequacy of a patient's vascular volume and ventricular filling.

Decreased CVP



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- Hypovolemia

Increased CVP

- Hypervolemia
- Right ventricle insufficiency
- Pulmonary artery emboli
- Heart tamponade

Diabetic ketoacidosis (DKA)

is a life threatening medical emergency. It is characterised by hyperglycaemia, dehydration, metabolic acidosis and ketonuria.

The criteria for the diagnosis of DKA includes

- 1-a blood sugar >14.0 mmol/l.
- 2- presence of urinary or plasma ketones.

Pathophysiology Dka

Is Due to an **insulin deficiency**, together with an excess of the counter-regulatory hormones, **glucagon, growth hormone and the catecholamines**. The **absence of insulin results in poor glucose utilization by peripheral tissues**.

Glucagon, growth hormone and the catecholamines increase triglyceride breakdown into free fatty acids and promote glucose production from hepatic gluconeogenesis. The Ketones, acetoacetate and β hydroxybutyrate are formed by the beta oxidation of the free fatty acids.

Metabolic acidosis is caused by the production of H⁺ ions by the dissociation of ketoacids. The accumulation of ketoacids leads to an elevated anion gap. This is a key feature of DKA. Initially as the blood sugar rises there is a shift of fluid from the intracellular to the extracellular compartment with subsequent dilution .