***Fatty Liver***

**Definition:** It is a disease condition in which liver content of neutral lipids exceeds normal range due to imbalance between fat eflux out of and influx into the liver.

Normally liver contains 5% of its weight total lipids, 70% of them is phospholipids and the remaining 30% is neutral lipids.

**May reach 20-40% of liver weight & compresion on liver cells lead to cirrhosis & liver cell failur**

**Causes:**

1. **Raised level of free fatty acid in plasma:**
2. **Over-feeding of fats :** This leads to increased circulating chylomicrons that is taken up by liver or acted upon by lipoprotein lipase that release their fatty acids which can be taken up by the liver for reesterification, synthesis of triacylglycerols .
3. **Over-feeding of carbohydrates (dietary type):** Surplus carbohydrate supply is converted into fatty acids and triacylglycerols and secreted as VLDL from the liver to go to adipose tissue.

 This leads to high blood level of VLDL and triacylglycerols.

1. **Over-mobilization of fat from adipose tissue to liver :**

carbohydrate-free diet, starvation & diabetes mellitus.

Over-lipolysis in adipose tissue depletes its lipid content and prevents it from reesterifying free fatty acids due to absence of **glycerol kinase.**

The liver control blood free fatty acid concentration by reesterifying them into triacylglycerols.

1. **Block in VLDL SYNTHESIS:**

**1-Under-mobilization of fat from the liver to the plasma (pathological type):** It is due to absence or deficiency of factors required by the liver to synthesizes VLDL and/or secretes it.

These include deficient apolipoproteins and lipotropic factors

**2-Liver poisons (toxic type):** It is caused by damage to liver cells by toxins such **carbon tetrachloride** and **orotic acid** (both inhibit apolipoprotein synthesis), **ethionine** (depletes methionine and ATP).

**3-**

**4-**

**C)Alchohlism:**

Ethyl alcohol causes:

- increased triacylglycerols and cholesterol synthesis,

 -inhibit fatty acid oxidation

 -lipid secretion from the liver

-and there may be multiple essential nutrients deficiency.

***Lipotropic factors***

**Lipotropic factors:**

**Definition:** They are nutritional factors that facilitate mobilization of fat from the liver and prevent fatty liver (particularly the pathological type).

They include:

1. **Essential polyunsaturated fatty acids.** They are required for synthesis of phospholipids and cholesterol esters.
2. **Vitamin B complex.** :

-**B12 and folate** are very essential in transmethylation, e.g., ethanolamine into choline.

- **pantothenic acid** leads to formation of CoASH required for fatty acid activation.

- **B6** needed for polyunsaturated fatty acids and CoASH metabolism.

- vitamen E

1. **Choline, inositol and methionine.** They are required for synthesis of phospholipids.
2. **essential amino acids** are required for synthesis of apolipoproteins. **Casein** is lipotropic due to its high biological value and high content of **methionine.**

- carnitine

1. **Growth hormone, estrogens and certain androgens.**

 ***Anti-Lipotropic factors***