Eating disorders

Evaluation of nutritional status
Eating disorders

• Characteristics
  - morbid
    preoccupation with weight and shape
  - manifest through distorted or chaotic eating behaviour
Classification of ED

- Anorexia nervosa
- Bulimia nervosa
- Eating disorders not otherwise specified (EDNOS)
Anorexia nervosa

- 3rd commonest chronic illness of adolescence
- Characteristics:
  - Self induced weight loss by avoidance of „fattening foods“, self induced purging – vomiting, excessive exercise, use of appetite suppressants, diuretics, laxatives
  - Body image distortion – dread of fatness persists as an intrusive, overvalued idea
  - Low weight
  - Onset early to middle teens
  - Can affect boys
  - Associated with anxiety, obsessive compulsive disorder, depression
- Specific types:
  - Restricting – absence of binge-eating or purging behavior
  - Binge-eating/purging – regular binge-eating and purging behavior
Bulimia nervosa

- Persistent preoccupation with eating – overeating episodes in which large amounts of food are eaten in short periods of time
- Self induced purging
- Often a history of previous AN (with the interval ranging from a few months to several years)
- Normal weight, presents late (late teens)
- Usually affect girls
- Associated with depression, self harm, substance misuse
- Specific types:
  - Purging – self induced vomiting or misuse of laxatives, diuretics,..
  - Nonpurging – fasting or excessive exercise as a compensatory behaviors
EDNOS

• **Atypical anorexia**
  - key symptoms are present, patient doesn't meet all criteria - menstruates, significant weight loss)

• **Atypical bulimia**
  - All of criteria are met except frequency or duration of episodes (less than twice a week or less than three-month duration)

• **Inappropriate compensatory behavior**
  - In individual of normal body weight after eating normal amounts of food

• **Binge-eating disorder**
  - Recurrent binge eating in the absence of compensatory behaviors like those of BN

• **Repeatedly chewing and spitting out large amounts of food without swallowing**
Other types

• **Pica**
  - defined as a compulsive craving for eating, chewing or licking non-food items or foods containing no nutrition
    - such things as chalk, plaster, paint chips, baking soda, starch, glue, rust, ice, coffee grounds, and cigarette ashes.
  - can be associated with, developmental delays, mental deficiencies, psychological disturbances
  - It may sometimes be linked to certain mineral deficiencies

• **Night eating syndrome**
  - consists of morning anorexia, evening hyperphagia (abnormally increased appetite for consumption of food frequently associated with injury to the hypothalamus) and insomnia
  - Attempts at weight reduction in these 2 conditions, (referring to bulimia as well), are usually unsuccessful and may cause the patient unnecessary distress

• **Sleep eating syndrome**
  - Sufferers tend to be overweight and have episodes of recurrent sleep walking, during which time they binge on usually large quantities of food, often high in sugar or fat
  - do not remember these episodes
Epidemiology

= “culture-bound“ syndrome (the influence of social and cultural pathogenesis of ED), tend to occur in certain countries and cultures – industrialised Western countries, absent/very rare in the poor countries of Africa, Asia, Latin America

• Widespread among adolescent girls/young women from industrial Western countries
• Age-group at risk: 12-25 years
• Prevalence
  - AN: 0,3-0,5%
  - BN: 1%
• Shift in the frequency of ED over time
  - 1960s: the most clinical pattern was restrictive-type anorexia
  - 1970s: bulimic forms
• In the past AN affected middle-to-high socio-economic classes
• The last 2 decades it’s widespread among all socio-economic classes
• 90-95% of cases of ED affect women
Etiopathogenesis

- individual, family, socio-cultural and iatrogenic factors interact to predispose, precipitate and perpetuate ED
Predisposing factors

- **Individual**
  - genetics
  - female gender, youth, a history of being overweight and dieting
  - personality traits and psychological problems (obsessive, perfectionist traits, rejection of the adult body and sexuality, fixation on infancy and on infantile forms of dependence and control)

- **Familial**
  - abuse (physical, sexual, emotional)
  - serious negligence
  - „insensitive parenting“
  - poor definition of roles

- **Socio-cultural**
  - dependency on consensus and admiration from others
  - idealisation of slimness
Precipitating factors

- separation and loss
- illness
- traumatic experiences during puberty
- sexual experiences
- situations that threaten one’s self-esteem or self-control
Iatrogenic factors

- medical interventions
- forced feeding of the patient not supported by psychotherapy
Etiopathogenetic hypothesis for ED

- an outlet to express psychic suffering as a vicious circle of restriction - disinhibition - guilt / alarm - restriction
- the interplay of „lack of self-esteem ↔ dislike of body ↔ diet“

![Diagram showing the cycle of strict dieting, tension and cravings, binge eating, purging to avoid weight gain, shame and disgust.][1]
Anorexia nervosa

- conspicuous set of sign and symptoms due to multi-system involvement secondary to protein-energy malnutrition
- reduce caloric intake → shift in metabolic homeostasis – mobilisation of immediately available energy (glycogen, subsequently triglycerides)
- **short duration of food restriction**
  - further change in metabolic homeostasis – energy saving (guarantees the supply of glucose to glucose-dependent tissues)
- **prolonged food restriction**
  - homeostatic mechanisms are not able to compensate – the reserve supply of glucose has been depleted – catabolism of ketone bodies (only source of glucose) → chronic protein deprivation, pathological consequences
Weight loss results in:

- **Electrolyte abnormalities**
  - due to fluid loss and fluid restriction
  - hypokalemia - potassium loss due to self-induced vomiting and diuretic/laxative abuse
    - arrhythmias and EKG abnormalities
  - hypomagnesemia
  - hypophosphatemia (result of oral or parenteral refeeding in AN; vomiting, excessive exercise, laxative/diuretic/antacid use; or binge-eating)
    - + low intracellular Mg + K → respiratory distress, signs of pneumonia, cardiomyopathy, skeletal myopathy, neuropathy
    - during the time of peak bone mass correlated with osteoporosis in AN

- **Cardiovascular effects**
  - ventricular tachyarrhythmia and sudden death (secondary to a myopathy, electrolyte imbalances affecting myocardial conduction)
  - bradycardia, hypotension, orthostatic hypotension, symptoms of dizziness and fainting (result of starvation and dehydration)
  - chronic vomiting/diuretic/laxative use can cause hypovolemia → hyperaldosteron state in an attempt to conserve body fluid
Medical complications

• **Endocrine imbalances**
  - **hypothalamic-pituitary-adrenal axis**
    • hypercortisolemia (starvation increases cortisol output) – predictor of
    • serotonin regulation deficits result in hypercortisolemia – may be
      the elevated cortisol levels in underweight AN
  - **thyroid function**
    • decreased triiodothyronine (T3) – symptoms of fatigue, hypothermia, constipation, bradycardia, hypercholesterolemia
  - **hypothalamic-pituitary-gonadal axis (HPG)**
    • amenorrhea – classic feature of AN, result of caloric restriction and dysfunction of the HPG system (HPA axis, thyroid dysfunction, exercise,.. alter gonadotropin- releasing hormone → lowered levels of LH and FSH
  - **blood sugar metabolism and DM**
    • lower fasting and postprandial glucose levels – hypoglycemia resulting from purging may contribute to consequent binge/purge episodes

• **Dermatologic abnormalities**
  - the face, trunks and limbs are more hairy (**lanugo**)
  - the nails and hair are more fragile
  - **caroteneroderma** – carotene deposition in the tissues and yellowing of the skin because of excess ingestion of carotenoid- rich vegetables
  - **acrocyanosis** – circulatory changes resulting in cold, blue, occasionally sweaty hands/feet
Medical complications

- reduction of muscle mass and subcutaneous fat - reduction in the thickness of the skin - loses its elasticity and hydration

- increased susceptibility to infections

- Gastrointestinal effects
  - bilateral parotid enlargement - associated with chronic malnutrition/excessive salivation secondary to frequent vomiting (may be accompanied by enlargement of the submandibular gland)
  - salivary gland enlargement - due to sialadenosis
  - pancreatic damage (atrophy), inhibited normal insulin release - due to long-term laxative abuse
  - abnormal motility - delayed gastric emptying, constipation, loss of peristalsis, increased transit time, steatorrhea
  - gastric dilatation - result from refeeding in AN

- Nutrient deficiencies
  - PEM - disruption of a small intestinal mucosal absorptive capacity → decreased capacity for zinc absorption
  - Zinc - wide range of biochemical effects seen in ED
    - alteration of prolactin, estrogen, cortisol, opioid feeding system, serotonin metabolism
    - reduced insulin efficiency, testosterone level, leptin concentrations
  - Vitamins B - thiamine, riboflavin, folate, vit.B12
  - Essential FA
Bulimia nervosa

• occasional episodes of „binge eating“ characterised loss of control over food intake – episodes become progressively more frequent, represent a form of expression for states of anxiety, depression and loneliness

• **binge** = ingestion of large quantities of food (up to 20000 cal) over a very short time, with absolute loss of the sensations of hunger/satiation and providing a transitory effect of calm

• following **purging behaviour** – eliminates the food by self-induced vomiting, by drugs – laxatives, slimming pills, diuretics
Medical complications

- **metabolic alkalosis** (secondary to episodes of vomiting, the abuse of laxatives)
- **cardiac arrhytmias**
- **aspiration of the gastric chymus and duodenal contents into the respiratory tract** → aspiration pneumonia, perforation of the stomach or oesophagus due to acid reflux and the pressure developed during vomiting
- **HCl - deleterious effect on both oral soft** (epithelial erosion - mucosal erythema, loss of papillae of the tongue) and **hard tissues** (dental erosion, decrease in the hardness of enamel - more susceptible to mechanical wear)
- **Russell’s sign** - the presence of scar/callus formation over the dorsal surface of the hand - used to stimulate vomiting
- esophagitis, esophageal spasm, tearing, fatal ruptures from constant vomiting
many traits have a heritable component – binge eating, self-induced vomiting, drive for thinness, dietary restraint and disinhibition

AN were has been linked to chromosome 1p34

BN to chromosome 10 – this position is also a known locus for obesity

candidate genes
  - encoding proteins implicated in the regulation of feeding and body composition
  - involved in neurotransmitter pathways regulating behaviour
  - implicated in the serotonergic neurotransmission

serotonin genes, BDNF, uncoupling proteins, agouti-related protein gene, MC4R, estrogen receptor,...
Serotonin alterations in ED

- AN and BN commonly associated with neuroendocrine, disturbances and comorbid psychiatric symptoms (depression, anxiety, obsessionality) – malnutrition exaggregates these symptoms
- significant reduction of cerebrospinal fluid concentrations of 5-HT metabolites
- abnormal hormonal response to 5-HT specific challenges in acutely ill AN
- dysregulation of serotonergic processes in BN
  - dietary depletion of tryptophan linked to increased food intake and mood irritability
- disturbances of 5-HT neuronal modulation predates the onset of an ED, contributes to premorbid anxious, obsessionial and perfectionistic childhood traits
  - pubertal-related female gonadal steroids/age-related changes may exacerbate 5-HT dysregulation
  - stress/cultural and societal pressures contribute by activating these systems
5-HT$_{2A}$ receptor

- implicated in the regulation of feeding, mood, anxiety and antidepressant action
- alterations in 5- HT$_{2A}$ activity in the left parietal region in AN – contribution to body image-distorsions as a central feature of the illness???
5-HT$_{1A}$ receptor

- alterations in 5-HT1A receptor may play a role in anxiety, mood and impulse control, feeding behaviour, SSRI response
- increased activity of the 5-HT1a receptor may only be found in individuals with bulimic-type symptoms
5-HT transporter (5HTT)

- some studies of a functional polymorphism in the promoter region of the 5-HTT gene have found increased frequency of the short allele in BN - 5-HT reuptake

http://www.nationaleatingdisorders.org/research-efforts/index.php
Determination of body

• **BIA**
  - method measures body composition by sending a small, harmless electrical current through the body
  - The current passes freely through the fluids contained in muscle tissue, but encounters difficulty/resistance when it passes through fat tissue. This resistance of the fat tissue to the current is termed 'bioelectrical impedance', and is accurately measured by body fat scales. When set against a person's height, gender and weight, the scales can then compute their body fat percentage.  
  - Adipose tissue has a high impedance  
  - Muscle’s higher water content should be reflected in a lower impedance (higher conductance)  
  - Measure fluid levels in body segments
Bioelectrical impedance

- Impedance has two components:
  - resistance (R) and reactance (Xc)
- Fat is excellent resistor – majority of the current is stopped at the membranes of the adipose tissue
- The path of least resistance would be any body component high in water content (blood, extracellular fluid, muscle)
- Current with a frequency higher than 50kHz is able to pass through cell membranes → measurement of impedance of substances inside of cells, as well as outside of cells → frequency higher than 50kHz is essential in effectively assessing body composition
BIA conditions

- Factors that affect impedance:
  - Hydration – increased conductivity and reduce impedance → a low and inaccurate percent body fat
  - Distribution of water
  - Orientation of tissues

- BIA testing conditions
  - 8-12 hours after exercise or drinking alcohol
  - At least 2 hours after drinking and eating
  - Within 5 minutes lying down
BIA testing procedures

- Tetrapolar (4 electrodes) – 2 inject the current, 2 sense the emerging current
- Current of 500 μA at a single frequency of 50kHz or more
- Most common device
  - The subject lay on his back, the arms not touching their trunk, ankles at least 20 cm apart
  - Remove any metallic objects from their person
  - Skin cleaned with alcohol (wrist and top of the foot)
  - Value obtained from measurement – resistance (ohm) – represents over 95% of the impedance value
- Scale-type device
  - 4 metal contact points which act as electrodes
  - Effectively measures the subject’s lower body composition
Estimation of TBW, FFM and FM

- Lukaski & Bolonchuk's formula for total body water (TBW) – intracellular and extracellular
  \[ TBW = 0.372(S^2/R) + 3.05(Sex) + 0.142(W) - 0.069(age) \]
  - \( S \) = Height in centimetres
  - \( R \) = Resistance
  - \( W \) = Weight in Kg
  - Sex Male =1 Female = 0
  - Age in years

- Fat-free mass (FFM)
  \[ FFM = \frac{TBW}{0.73} \]
  - 0.73 (hydration constant of the FFM)

- Percent body fat
  \[ FM = \text{weight} - \text{FFM} \]
  %Fat = \( \frac{FM}{\text{body weight}} \times 100 \)
Body fat percentage

- Weight and levels of hydration is affected by eating habits, life-style and the amount of exercise.
- The reading may be lower than normal if you measure your body fat just after a bath or exercising.
- The reading may be higher than normal if you have just woken up or eaten a meal.
- There is less fluctuation in a person's body weight and hydration levels between the late afternoon and the early evening (two hours after eating lunch and before the evening meal).
Thanks for your attention.

"My, you really do have a serious eating disorder."