
جَـامعة
المَـنارة
MANARA UNIVERSITY

Geriatric 1

Introduction

What is Aging?

Aging is a multidimensional process and refers to the process of "…accruing maturity with the passage of time.“

It begins with conception and continues throughout life until death occurs.

Aging is progressive, ubiquitous and inevitable to all living things.

Normal aging and diseases associated with aging are two separate entities.

- Normal aging refers to those normal deteriorative processes that all human beings will experience if they livelong enough, such as decreased bone mass, osteoarthritis, and lens cataracts.
- Diseases that are associated with aging, but not caused by aging and does not occur in all persons (i.e. probabilistic aging) include dementia, hypothyroidism, stroke, and congestive heart failure; while they are common they are not inevitable to all persons, and not all seniors will have them.

Homeostenosis is the concept where normal aging decreases the body's ability to withstand stress and challenges.

Our functional capacity and ability to respond to stress progressively declines beginning as far back as the third decade.

Each system’s decline is independent of changes in other organ systems, and is influenced by genetics, diet, environment and personal habits.

The senior population has grown about twice as fast as the overall population since the early 1980s.

DEBUNKING MYTHS ABOUT AGING

Myth 1: To be old is to be sick and a burden on others.

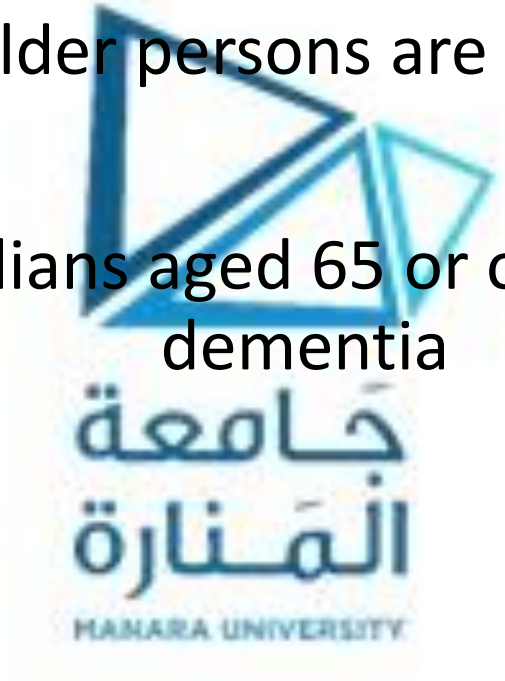
in 1997, **78%** said their health was either good (38%), very good (28%), or excellent (12%), while only **16%** reported their health was fair and just **6%** described it as poor.

Myth 2: Older peoples contribute nothing to society.

1. participate in informal volunteer activities outside their home
2. full or part time paid work
3. household or personal assistance to others
4. helped out with child care
5. helped with shopping, transportation or financial activities
6. provided emotional support

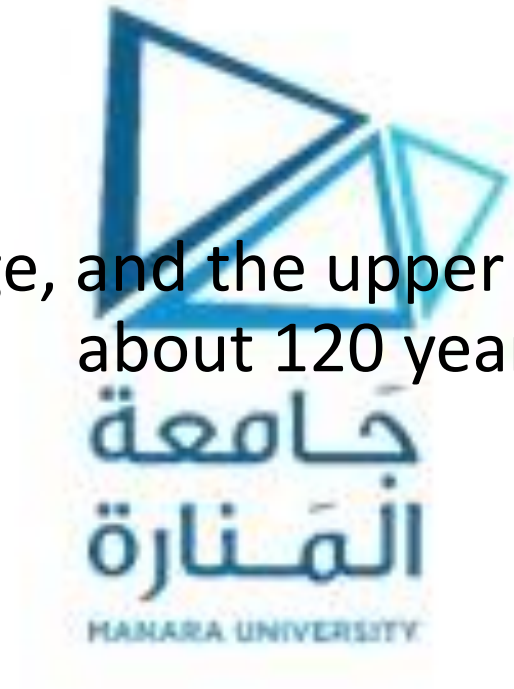
Myth 3: The majority of older persons are senile or demented

just 8.0% of all Canadians aged 65 or over meet the criteria for dementia



Biological Theories of Aging

No one knows why we age, and the upper limits of the human life span, about 120 years



hypotheses for why we age

DNA damage theories: Various cellular mechanisms constantly repair ongoing occurring DNA damage (i.e. caused by radiation, mutation). The repair efficiency is positively correlated with life span, and decreases with age.

Oxidative damage / Free radicals: Life span is inversely proportional to the extent of oxidative damage caused by unstable & reactive chemical compounds and directly proportional to antioxidant activity.

Error catastrophe: Faulty DNA/RNA transcriptional and/or RNA translational processes produce ineffective or toxic proteins.

Programmed Aging: Cells are programmed with a specific, finite number of divisions, & cell death occurs when this number is achieved.

Telomeres (proteins that act like plastic ends of shoelaces to seal the ends of chromosomes, shorten with each division; once the telomere is gone, the end begins to "fray"). This has been suggested as the biological “clock” for aging

Apotosis: Programmed cell death induced by extracellular signals or “gerontogenes” that tag a cell for removal by phagocytosis.

Cross Link Theory: Chemical bonds form between and within molecules and affect function (e.g. cross-linking in collagen causes loss of elasticity in blood vessels).

“Wear-and-tear”: Ordinary insults and injuries of daily living accommodate and decrease the organism's efficiency to subvital levels.

Immunological Theories: Damage to the immune-system makes the body vulnerable to disease. B and T cells are less effective and less numerous as we age.

Neuro-endocrine Theories: Failure of cells with specific integrative functions (in the pituitary, thyroid, adrenal, pancreas, and gonadal glands) brings about gradual homeostatic failure

Age versus Cancer theory: Aging may be a side effect of the natural safeguards that protect us from cancer.

Life Expectancy

life expectancy has increased by an average of seven years for men, and 13 years for women since 1920.

The reasons for this increase in the industrialized nations are mostly related to improvements in public health (including sanitation and infection control), and decreases in infant mortality.

Women outlive men, and twice as many women as men live to age 80. Reasons for this include male employment hazards (job related accidents, exposure to carcinogens), lifestyle choices (more male smokers and heavy consumers of ETOH), and the protective effects of estrogen from cardiovascular disease (MI, strokes).

As a result of this discrepancy, many elderly women are widowed (52%) and live alone (40%), while more older men are married (78%) and live with a partner (85%) who is their caregiver.

If person has no mortal disease:

- At age 65, life expectancy is ~15 years (male=14.2 years, female=18.6 years).
- At age 75, life expectancy is ~10 years.
- At age 85, life expectancy is ~5 years.
- And if they live to age 95, they may have another 2-3 years of life remaining.

Normal Age-Related Physiologic Changes & Their Consequences:

Many normal changes can lead to clear clinical consequences (i.e. arterial stiffening leading to hypertension, absence of estrogen in post-menopausal females accelerating bone loss).

Not all these changes with aging are necessessarily bad; for example, autoimmune disease may “burn out” in later life.

But older adults are more likely to die because of a pneumonia (decreased immune system, decreased respiratory function and reserve)

General

- **Temperature regulation**: Tendency to hypothermia:
  - o Decreased subcutaneous fat, decreased sweating, decreased shivering, decreased awareness to cold, less autonomic vasoconstriction, decreased metabolic rate, decreased heat generated in response to eating
  - o Medical conditions: drugs, hypothyroidism, malnutrition, hypothalamic and Central Nervous System (CNS) dysfunction, dementia, Parkinson's Disease, stroke.
  - o Extrinsic factors; poverty (unable to afford heating oil),

- **Fluid Homeostasis**: tendency to dehydration:
  - o Reduced Total Body Water.
  - o blunted thirst sensation, less drinking response, lower renal plasma flow, urine concentrating ability reduced.

Aging Changes in Specific Organ Systems:

Oral Cavity

- 40% of those >65 are edentulous, mostly because of neglect rather than any natural age related process
- Risk of caries increases with age as a result of gingival recession and loss of jaw bone density

Voice

- Ossification of the laryngeal cartilages causes stiffness; prevents vocal cords coming together while speaking, resulting in a weaker, breathy voice.
- In males, the vocal cords become thin and atrophied with age, resulting in a higher pitched conversational voice.
- In females, loss of hormonal influence leads to vocal cords becoming more edematous after menopause, resulting in a lower pitched voice.

Eyes

- Presbyopia (loss of lens accommodation) due to hardening & thickening of the lens and decrease in muscle tone.
- Decreased visual acuity because of narrowed pupil, fewer rods so poorer night vision; there is also the need for more light to reach the retina (on average, an older person needs 4x more light than a younger person); additional problems with depth and color perception
- Flattening of the corneal surface (with diminished refraction) and clouding of lens.

Ears

- Presbyacusis: high sound frequencies lost and impaired speech discrimination
- More prone to excess cerumen (ear wax) occlusion of ear canal, which becomes narrower and more tortuous.

Respiratory

- Age related changes resemble emphysema:
- Loss of elastic
- Early airway closure.
- Decreased arterial P02 (-4 mm/decade)
- Decreased flow rates, FEV1 (forced expiratory volume in 1 second), and Vital Capacity
- Stiffer chest wall &weak muscles
- Increased dead space

Endocrine

- Progressive decline in carbohydrate tolerance and increasing insulin resistance
- Decreased hormones.
- Increase in follicle-stimulating hormone (FSH), leutinizing hormone (LH), and norepinephrine.
- In women, decreased estrogen (post menopause) & prolactin
- In men, decreased testosterone in some (so-called andropause)

Cardiovascular

- Arterial wall stiffening (true and “pseudohypertension”)
- Increased L atrial size.
- Reduced LV compliance caused by: increased myocyte size, increased LV mass, and increased posterior wall thickness (infiltration with lipids, collagen, fat, amyloid)
- Cardiac output decreases at rest/exertion; maximal HR decreases (predicted max is 220-age in years).

Gastrointestinal

- Reduced Lower Esophageal Sphincter (LES) tone
- Decreased acid production (leading to decreased emptying, less calcium absorption, and differential medication absorption)
- Reduced intrinsic factor
- Decreased liver mass and blood flow leading to reduced oxidative metabolism of some drugs and protein synthesis
- Increased transit time
- Increased rectal resting tone, decreased contracting pressure

Genital/Sexual

"Everything slows down!"

- Male

- Female

Hematologic & Immune systems

- T cell: numbers decrease, delayed hypersensitivity reaction decreased, fewer natural killer and suppressor cells.
- B-cell: numbers stable, but make fewer antibodies.

Renal

- Smaller kidneys (cortical renal mass decreases ~20%)
- Renal blood flow decreases
- Glomerular Filtration Rate (GFR) progressively decreases; average decline is 50% from age 20-80, but those 80+ show little decline.
- More prone to develop syndrome of inappropriate antidiuretic hormone secretion SIADH

Musculoskeletal

- Weight decreases, body fat increases, height decreases (in women especially)
- Sarcopenia (up to 80% decrease in skeletal muscle mass and quality in non active seniors)
- Osteopenia (decrease jn bone mass)
- Total body calcium and potassium stores decreases

Dermatological

- Flattening of the dermal-epidermal junction, leading to more thin and fragile skin susceptible to tearing and sheer forces.
- Dermal atrophy, and progressive loss of elastic tissue subcutaneous fat leading to lines and wrinkling, and problems with thermal regulation.
- Loss of melanocytes, and retreat of the dermal plexus leading to pallor and increased vulnerability to sun damage and skin cancer
- Hair graying and hair loss.

Neurolological

- Decrease in brain mass and selected loss of cortical neurons (1% per year loss after age 60)
- 20% decrease in cerebral blood flow from age 30 to 70
- Decreased smell and taste perception
- Reduced perception of acute pain
- Impaired postural reflexes
- Increased reaction time (up to 30% longer)
- Alterations of neurotransmitter levels:
- Increased MAO levels (Monoamine oxidase A (MAO-A) is an enzyme that metabolizes monoamines, such as serotonin, norepinephrine, and dopamine).
- Decreased dopamine (and binding sites), norepinephrine, and a slight decline in GABA levels

Sleep:

- Less sleep required, but sleep latency increased
- Increased night awakenings and sleep fragmentation.
- Changes in brain electricity in sleeping.