PROBLEM OF AGEING
Objectives

- To acquire insights into how and why aging occurs
- To understand the normal and abnormal physical and mental health changes associated with aging
- The farmer community can acquire knowledge about maintenance of workplace safety, preservation of good health, and prevention of chronic diseases that compromise healthy aging
Old Age

Memory is short, and braine is dry.
My Almond-tree (gray haires) doth flourish now,
And back, once straight, begins apace to bow.
My grinders now are few, my sight doth faile
My skin is wrinkled, and my cheeks are pale.

No more rejoyce, at musickes pleasant noyse.

Anne Bradstreet (1612-1672)
Definition of Ageing

- Can be defined as a progressive, generalized impairment of function resulting in a loss of adaptative response to a stress and in a growing risk of age-associated disease (Kirkwood, 1996).
Figure 4. Maintaining functional capacity over the life course

Early Life
Growth and development

Adult Life
Maintaining highest possible level of function

Older Age
Maintaining independence and preventing disability

Range of function in individuals

Disability threshold*

Rehabilitation and ensuring the quality of life

Source: Kalache and Kickbusch, 1997

*Changes in the environment can lower the disability threshold, thus decreasing the number of disabled people in a given community.
21st Century Phenomenon of Global Ageing

- 20th century – saw a global phenomenon of longevity – a triumph and a challenge
- Average life expectancy at birth increased by 20 years since 1950 to 66 years
- Is expected to increase another 10 years by 2050
- By 2050, the population of older people will exceed that of children (0-14 yrs)
- Is a social phenomenon without historical precedent
- In 2002, number of persons > 60 years was 605 million; expected
- By 2050, number is expected to reach almost 2 billion
Life Expectancy Rise

![Graph showing the rise in life expectancy over time from 1600 to 2000.](image)

- The graph illustrates a significant increase in life expectancy from approximately 35 years in 1600 to over 80 years in 2000.
- This trend highlights the improvements in healthcare and living conditions over the centuries.

Life expectancy (years)

Year

1600 1650 1700 1750 1800 1850 1900 1950 2000
Living in an ageing world

Source: United Nations medium-variant predictions
Population ageing

- Refers to a decline in the proportion of children and young people and an increase in the proportion of people age 60 and over.
- As populations age, the triangular population pyramid of 2002 will be replaced with a more cylinder-like structure in 2025.
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Impact on Society

- Affect family solidarity and relationships within families
- Equity across generations
- Lifestyles
How Old is ‘Old’?

- We call ourselves 3 years ‘old’ or 80 years ‘old’
- Some say ‘I am running in my 10th year’ or ‘I am running in my 75th year’
- So we can be old at 3 and running at 75!
- Old is a relative term- I call friends my age ‘girls’, while to ‘youngsters’ we are ‘older’ females or even old!
- However, Aging is a Reality- Prepare to Accept Gracefully
Definitions

- Defined as latter part of animate life
- *Old, elderly, senior* citizens- commonly used
- Calendar age is not necessarily synonymous with biological age
- "Successful aging," "productive aging," and "vital aging" commonly used now
- UN – defines 60 +; developed nations 65+
- Gerontology- The scientific study of the biological, psychological, and sociological phenomena associated with old age and aging.
- Geriatrics- treats the clinical problems of later life
Senescence

- In biology, *senescence* is the process of ageing
- **Senescence** is the steady deterioration of cell function following the period of development in youth
- *Cellular senescence*- cells lose the ability to divide in response to DNA damage - cells either senesce, or self-destruct (apoptosis) if the damage is irreparable
- *Organismal senescence* is the aging of whole organisms. Aging ↔ Senescence
- Species have different "rates of aging"- a mouse is elderly at 3 years; humans at 85 yrs
- Apart from species specific genetics, chance events determine the probability of death
Organismal ageing

Is characterized by:

- Declining ability to respond to stress
- Increasing homeostatic imbalance
- Increased risk of disease
- Death is ultimate consequence of ageing
Biological definition

- Pre-Conception - Ovum, Spermatozoon
- Conception - Fertilization
- Pre-birth - Conception - 9 months
- Infancy - Birth - 2 yrs
- Childhood - 3 – 12 yrs
- Adolescence - 13 - 19 yrs
- Early Adulthood - 20 - 39 yrs
- Middle Adulthood - 40 - 64 yrs
- Late Adulthood - 65+ yrs
- Death – Cessation of vital body (somatic) functions
THEORIES OF AGING

- How and Why we age are still not clear

WHY DO WE AGE?

- Many theories, none fully explain aging
- The rate of living theory of aging – rejected
- The oxidative-damage/free-radical hypothesis of aging - topical area
- The evolutionary senescence theory of aging - most accepted
- The reliability theory of aging
- The neuron-endocrine hypothesis of aging
The Rate Of Living Theory Of Aging - rejected by modern scientists

- Ancient philosophers - Death occurs when a finite amount of “vital substance” consumed

The Oxidative-Damage/Free-Radical Hypothesis of Aging

- Mitochondrial ability to repair DNA damage ↓ with age → Decreased cell efficiency
- Too much mitochondrial damage → cell death
- Oxidative damage → free radicals → DNA damage, cross-linking of proteins, formation of age pigments
- Injury caused by free radicals initiates a self-perpetuating cycle in which oxidative damage impairs mitochondrial function, which results in the generation of even greater amounts of oxygen-free radicals.
The Oxidative-Damage/Free-Radical Hypothesis of Aging

Oxidative cell damage
↓
Mitochondrial Damage

Increased Oxygen-free radicals

Self-perpetuating Cycle of Impaired Function
↓
Increased Oxygen-free radicals

-DNA Damage
-Cross-linking proteins
-Mitochondria Damage
-Form age pigments
The Evolutionary Senescence Theory of Aging

- Most widely accepted overall theory
- Species prone to die to predation (e.g. Mice) invest more energy in reproduction than in health maintenance
- Humans, less prone, can allocate more resources to repairing physical damage
- Humans able to reproduce over a longer period of time
- Thomas Kirkwood (1970’s)- disposable soma theory- organisms have to balance the demands of maintaining their body, or soma, cells and reproducing
- States that humans have long life spans because we are much better at repairing our bodies than short-lived animals
- Steven Austad (early 1990s)-provided evidence that perilous environments support early reproduction and short life spans, whereas safer environments favor the opposite
- Most agree that it is currently the best explanation for why we and other organisms age
The Reliability Theory Of Aging

- Applies mathematical theories of reliability to predict systems failure in machines
- Natural selection programs animals to live long enough to reproduce;
- Takes variable lengths of time after reproductive failure for animal’s subsystems to fail and make animal vulnerable to death
- This theory does not explain why certain species live longer than others
- Endorses numerous facets of evolutionary senescence theory of aging
The Neuroendocrine Hypothesis Of Aging

- The neuron-endocrine system – complex system linking brain, nervous system and hormonal glands
- Becomes less functional with age - can lead to HBP, diabetes, and sleep abnormalities
- Effects of hormones on different facets of aging studied extensively
- Some late-life functional changes linked to reduced levels - e.g. menopause
- However, recent evidence reveals the opposite: reduction in some hormones can prolong life
The Physiology of Aging

- Aging is both visible and invisible
- Visible changes occur on surface of the body; invisible affect internal organs to impair function
- Affects all systems to varying extent; if vital functions involved, cause death
- Gerontologists - aging is the cumulative effect of many lifelong influences
- Influenced by heredity, environment, culture, diet, exercise, past illnesses, etc
- Genetic factors chiefly determine variations in aging/lifespan - we exert no control
- However, **we can control** our environmental/lifestyle insults to aging and health

- **Normal aging in the absence of disease is a remarkably benign process**

- Biologic and chronologic ages are not the same

- Most organs gradually lose some function; noticeable only during exertion/stress

- Slower reaction times are common
How are Adolescence and Senescence Different?

- Changes of adolescence follow predictable norms - can be graphed
- Aging affects individuals uniquely; norms not established
- Some systems begin aging by age 30 (bones); others much later (mental faculties)
- Senescence should not be viewed as a “disease”
- Cannot put a ‘Time Clock’ on aging
PHYSICAL IMPLICATIONS OF AGING

Skin:
- Exhibits most obvious sign of aging
- Loss of underlying connective tissue, fat and oil glands → wrinkles, sagging skin
- Aging skin appears thinner, paler, and translucent
- Increased sensitivity to heat/cold, bruising, and bedsores
- Develops "age spots" due to deposits of melanin pigment
- Ability to perspire is decreased
- Contributing factors: nutrition; exposure to sun, chemicals/toxins; hormones, and heredity
Reduced Brain, Liver and Kidney Function

Vulnerable to Drug Toxicity

↑ Risk of HBP, Heart Attack, Stroke, Heart Failure

Poor Response to Stress

Slower Healing rate

CVD Changes

↓ Poorer Cell Oxygen
The reduced blood flow results in less strength due to:
- diminished oxygen exchange
- reduced kidney and liver function
- less cellular nourishment

Other problems:
- Intermittent pain in the legs with walking
- Varicose veins
- Prelediction for Blood clots
Changes in Respiratory System

- Maximum lung function decreases with age
- Diminished elasticity of airways and lung tissue
- Reduced ciliary activity → decreased oxygen uptake/exchange
- Muscles of the rib cage atrophy, further reducing the ability to:
  - breathe deeply
  - cough
  - expel carbon dioxide

- Aggravating factors: Smoking, Pollution
- Results in:
  - Lower stamina for work; easily fatigued
  - Shortness of breath
  - Oxygen lack can increase anxiety
  - Susceptibility to pneumonia increased
Skeletal System Changes

- Manifest changes that affect QOL significantly

Osteoporosis is a common condition characterized by:
- progressive loss of bone density
- Increased vulnerability to fractures
- Thinning of vertebrae → loss of height; spontaneous fractures
- Reduction in height occurs by 1 cm (0.4 inches) every 10 years after age 40
- Height loss is even greater after 70 years
- The vertebrae calcify increasing rigidity, making bending difficult
Hormones

Sex Hormones
- Men may exhibit slightly decreased levels of testosterone
- Women have decreased levels of estrogens, progesterone and prolactin after menopause

Insulin
- The normal fasting glucose level rises 6-14 mg/dL every 10 years after age 50
- Probably due to loss in number of insulin receptor sites in cells
- Can lead to diabetes- annual testing recommended

Other Hormones
- Not significantly affected
Immune System

Overall effectiveness decreases, leading to:

- Increased infection risk
- Decreased ability to fight diseases
- Slowed wound healing
- Autoimmune disorders
- Cancers
IMPLICATIONS OF AGING ON MENTAL FACULTIES

The quality, not the longevity, of one's life is what is important. — Martin Luther King Jr. (1929-1968)
CHANGES IN SENSES

TOUCH
Gradual reduction after 50 - injuries, hypothermia

HEARING
30% people over age 65 have impairment

VISION
- Usually need glasses by 55
- Only 15-20% have ↓ driving ability

SMELL
 Decreases after 70 yrs - may affect hygiene

TASTE
Minimal changes

SENSES
Normal acuity ↓ with age
All senses are controlled totally by the brain
Aging increases minimum amount of stimulation before a sensation is perceived
Any compromise in senses has tremendous impact on lifestyle
Hearing and vision changes - dramatic effect on QOL
Many changes can be improved with glasses, hearing aids, and lifestyle modifications
Communication problems common - lead to social isolation and loneliness
Social Behavior & Personality Changes with Age

- Small changes normal - do not significantly change our sense of who the person is.
- Personality and social interaction often change due to neurodegenerative diseases.
- Drastic changes in personality reflect a disease process - difficult for caregivers to cope with/accept.
- "Senility" or "senile" is an out-dated term - now replaced with "Dementia".
- Senility or Dementia should NOT BE EQUATED TO AGING - DEMENTIA IS A DISEASE STATE.
- Dementia – ‘condition where one has a progressive decline in memory and other cognitive functions that results in a change in the ability to conduct one's usual activities’.
- Dementia is characterized by multiple cognitive deficits with memory impairments as an early symptom.
- Diagnosis of dementia - not given in absence of impairment in social functioning/independent living.
Psychological and Social Impact

- With a healthy lifestyle, few changes seen that are deleterious to QOL
- In fact, some actions may grow more correct as we age (within limits)

Learning

- The ability to learn continues throughout life
- Often require more time and effort to absorb new information
- Need more effort to organize and understand new information
- Tendency to avoid learning new things not perceived as beneficial
- Reasons – unknown; may be partly attributed to decline in senses as we age
Reaction time

- Information processed at a slower pace
- Reaction to stressful situations is delayed; uncertainty on how to act may manifest
- A + for older people - tend to make fewer mistakes than younger people in decisions taken

Intelligence

- Whether intelligence declines as we age is hotly debated - usually maintained
- Older people perform lower on many standardized intelligence tests
- In formal tests of performance, older people slow down, but make fewer mistakes!
- However, most intelligence tests do not address situations in our daily lives
- Value correctness as we age - answers are more accurate, though response may be slower
- More cautious; less liable to make mistakes in judgment/ action
Stresses

- Older adults must often deal with physical, medical or social stressors
- Stress can precipitate many diseases like diabetes, high BP, anxiety attacks etc
- Common stresses for older people are:
  - diseases or health conditions, possibly chronic (e.g., heart disease, arthritis, cancer)
  - perceived loss of social status after retirement
  - death of a spouse/child/sibling
Loss and grief

- Loss of a spouse is particularly stressful
- In 2003, more than 1 million spouses (mostly women) were widowed
- This number is estimated to increase to 1.5 million every year by 2030
- Loss of sight, hearing, and physical disabilities can induce profound grief and loss
- Retirement/job loss with loss of social status is a major cause
- Most people grieve intensely for 6-12 months after a major loss-
  withdraw from others
- Takes about 1 year to accept the loss and start normal interaction
Memory Decline in Normal Aging

**Definition:** Memory refers to the storage, retention and recall of information including past experiences, knowledge and thoughts.

- Only some types of memory loss are associated with normal aging.
- Other types are typical of disease states.
Types of Memory and Loss

- Working (intermediate term) – loss occurs with normal aging
- Episodic - especially impaired in normal aging e.g. ability to process recent information
- Semantic (e.g. vocabulary) – Improves with age; lost in dementias
- Procedural (long-term memory of skills) - shows No Decline with age; affected by diseases
- Very long-term memory (months to years)- increases upto age 50; maintained until well after 70
- Short-term memory- shows little decline; loss associated with diseases
- Older adults tend to be worse at remembering the source of their information
Abnormal Memory Loss in Aging

- Forgetting things much more often than you used to
- Forgetting how to do things you've done many times before
- Trouble learning new things
- Repeating phrases or stories in the same conversation
- Trouble making choices or handling money
- Not being able to keep track of what happens each day
Normal Cognition

- Executive Functioning include:
  - **Organization**: attention, decision-making, planning, sequencing, problem solving
  - **Regulation**: initiation of action, self-control, self-regulation
  - Language: coherent, sensible
  - Working (immediate) Memory
  - Spatial Memory
- Verbal Memory
Multi-infarct dementia

- **Caused by** a series of strokes in the brain
- Infarcts result in irreversible death of brain tissue
- Location/severity of compromised area governs severity of symptoms/loss of function
- Symptoms – abrupt onset; progress step-wise as strokes recur
- Treatment to prevent further strokes is very important
Figure 8. The determinants of Active Ageing

- Gender
- Health and social services
- Behavioural determinants
- Personal determinants
- Physical environment
- Social determinants
- Economic determinants
Health Protection Strategies

Hand Protection
- Necessary to prevent injuries and exposure to chemicals
- Wear rubber or leather gloves, as needed

Hearing Protection
- To protect from deafness caused by loud noises (e.g. threshers)
- Can use ear inserts/muffs

Respiratory Protection
- Helps avoid exposure to allergens and toxic gases
- Two types- air supplying and air purifying respirators
- Air supplying respirators- use in manure pits, silos, where toxic gases released
- Air purifying respirators-commonly used to remove air contaminants
Hippocrates, the Father of Medicine, said nearly 2,400 years ago, "If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."
Healthy Eating

Tips for Older Adults
Recommended daily calorie consumption for people over age 50 are:

For women:
- 1600 calories, if physical activity is low level
- 1800 calories, for moderate levels of activity
- 2000 calories, for an active lifestyle

For men:
- 2000 calories, if physical activity is low level
- 2200-2400 calories, for moderate levels of activity
- 2400-2800 calories, for an active lifestyle
Tips for Healthy Eating

- Do not skip meals
- Use low-fat dairy products and salad dressings
- About 2/3 of a teaspoon of table salt
- Drink plenty of liquids like water, juice, milk, and soup
- Date leftover food, as maybe unable to smell spoilt food
- Choose foods fortified with vitamin B12-adults over 50 have difficulty absorbing adequate amounts of this vitamin
- Limit high-fat and high-sugar snacks
- Use unsaturated vegetable oils like canola, corn, or olive
- Many medications may alter the taste of food
- Learn to read food package labels-The first one listed is present in the food in the largest amount.
Health Risks of Overweight

Overweight predisposes to development of:

- Type 2 Diabetes
- High Blood Pressure/Cholesterol
- Coronary Heart Disease/Stroke
- Some Types Of Cancer
- Osteoarthritis
- Gallstones
- Slow reaction times and avoidance of activity
- May reduce life span
Advantages of Physical Activity

- The more physically active you are, the less likely to gain weight
- Improves your strength, endurance, and flexibility
- Regular physical activity helps avoid obesity, diabetes, heart disease/stroke, arthritis, high BP, and mental disorders
- Reduces functional declines associated with aging
- Lowers stress and boosts your mood and energy
- Meet new friends by joining a class or walking group
- Reduces risk of bone fractures/other injuries
- Improves immunity; recovery from illness is faster
- Enhances QOL- keeps one mentally alert and physically independent
Can I Take Alcohol Safely?

- Yes,
- Drinking a small amount (1-2 units per day) protects against heart disease and stroke

**Recommended Weekly Limits**

- Men: maximum 21 units of alcohol per week
  - Not more than four units in any one day
- Women: 14 units of alcohol per week
  - Not > three units in any one day
Respiratory Health

- Smoking - tenfold increased risk of dying from chronic obstructive lung diseases like emphysema, bronchitis
- About 90% of all deaths from chronic obstructive lung diseases are attributable to cigarette smoking
- Cigarette smoking has many adverse reproductive and early childhood effects, including an increased risk for infertility, preterm delivery, stillbirth, low birth weight, and sudden infant death syndrome (SIDS)
- Postmenopausal women who smoke have lower bone density than women who never smoked
- Women who smoke have an increased risk for hip fracture than never smokers
Steps to Healthy Aging

- Monitoring your own health is a good adage
- Chronic diseases like diabetes, high BP, obesity, etc cause most problems in old age
- Most chronic diseases can be delayed or severity reduced
- Adopt healthy lifestyle behaviors from childhood
- Keep weight at BMI < 26
- Be physically active within limitations
- Eat nutritious foods
- Eat sparingly
- Avoid misuse of alcohol/drugs; abstinence best
- Avoid smoking
- Make a social network
- Save for care in old age
- Regular screening for cancer/diabetes, high BP etc
- Regular medical examinations/dental checks
Be Good To Yourself

- Get adequate sleep
- Maintain contacts with family and friends
- Join a social group
- Surround yourself with people whose company you enjoy
- Volunteer or get active with groups in your community.
- Try a part-time job at a place you would enjoy working for a few hours a week
- Indulge in activities you always yearned to do, but never had the time for when younger!

"The secret of life is enjoying the passage of time.“ James Taylor