

Mental Retardation

Definitions

WHO

- *Impairment* – any loss or abnormality of psychological, physiological, or anatomical structure or function
- *Disability* – any reduction or lack (resulting from impairment) of ability to perform an activity in the manner or within the range considered normal for a human being
- *Handicap* – a disadvantage for the individual, resulting from impairment or disability that limits the fulfillment of a role that is normal for that individual. May be in dimensions of physical independence, mobility, occupation, social integration, economic self-sufficiency, orientation, or other

ICD-10

- *Mental Retardation (MR)* – a condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the developmental period, which contribute to the overall level of intelligence, i.e. cognitive, language, motor, and social abilities

DSM-IV

1. Subaverage intellectual functioning, $IQ < 70$
2. Concurrent deficits in ≥ 2 skills areas:
 - communications
 - self-care
 - home living
 - social/ interpersonal skills
 - use of community resources
 - self-direction
 - academic skills
 - leisure
 - work
 - health and safety
3. onset before age 18

Coding

	IQ range (ICD-10 and DSM-IV)
Mild MR	50-69
Moderate MR	35-49
Severe MR	20-34
Profound MR	<20

Epidemiology

- 2-3 % of the population have an IQ less than 70
- severe impairment has a prevalence of 3.5 per 1000
- more common in males, who have a larger variance in IQ
- of inpatients :
 - 10 % have severe psychiatric disorders
 - 20 % have defects of vision or hearing
 - 20 % have severe speech deficits

Aetiology

Severe impairment

- nearly all cases have gross cerebral pathology at post mortem
- between 33 and 85 % have an organic aetiology diagnosed during life
- 33 % due to Down's syndrome
- 19 % due to other inherited conditions, or associated congenital malformations
- 18 % due to perinatal injury
- 14 % due to infections
- 4 % due to biochemical disorders (inborn error of metabolism)
- 15 % unknown

Mental impairment

- less than 33 % have an organic pathology diagnosed during life
- shows a 9-fold increase in lower social class
- a proven organic aetiology is more likely if the handicapped child is from a higher social class
- social factors therefore play a much larger part in the aetiology of impairment than of severe impairment

Chromosomal abnormalities

Trisomy 13-15, Patau's syndrome

- head and eyes are small
- absent corpus callosum
- cleft lip/ palate
- heart lesions
- polycystic kidneys
- polydactyly
- rarely live longer than 6 months

Trisomy 17-18, Edward's syndrome

- rigid baby with flexed limbs
- mental retardation
- cleft lip/ palate

- low-set malformed ears
- receding chin
- rocker-bottom feet
- umbilical or inguinal hernias
- index finger overlaps the third finger
- more common in females
- mean survival is 10 months

Trisomy 21, Down's syndrome

- 5 % due to translocation
- incidence = 1.8 per 1000 live births (1 per 50 if mother over 45)
- more common in males

1. *History and Examination*

- brachycephaly
- microcephaly
- slanted palpebral fissures
- epicanthic folds
- Brushfield spots
- small ears
- microstomia, resulting in protruding tongue (glossoptosis)
- cataracts
- simian crease on palms (in 33 %)
- wide gap between first and second toes

2. *Complications and Associations*

- congenital heart disease (classically A-V canal defects in 50%)
- duodenal (and other GI) atresia
- Hirschsprung's disease
- poor feeding and uncoordinated sucking
- congenital hypothyroidism
- constipation due to poor fluid intake
- sleep apnoea
- hearing deficits (66 %)
- epilepsy (12 % of those over 40 yrs)
- leukaemia
- Alzheimer's disease (found in 95 % of those over 40 yrs)

Deletion of short arm of 5, 'cri du chat' syndrome

- more common in females
- facial abnormalities
- severe handicap
- spasticity
- characteristic cry
- compatible with adult life

Deletion of short arm of 4, Wolf's syndrome

- severe handicap
- facial abnormalities
- epilepsy

Partial deletion of short arm of 18

- severe handicap
- small size
- facial abnormalities

Partial deletion of long arm of 21

- 'antimongolism'

Sex chromosome abnormalities

- incidence of abnormalities is independent of maternal age
- 10% are mosaics
- the number of extra X chromosome (XXX, XXY) is associated with:
 - smaller brains
 - larger ventricular size
 - ridge count in dermatoglyphics
 - degree of mental handicap

1. XXX :

- a) 1 in 1000 females
- b) slight mental handicap (70%)
- c) some reports of increased rates of schizophrenia
- d) no physical abnormalities

2. XXY (*Klinefelter's syndrome*) :

- a) 1 in 500 men (the commonest of the sex chromosome abnormalities)
- b) over-represented in the prison population
- c) presents at adolescence with :
 - i) tall
 - ii) lack of male secondary sexual characteristics
 - iii) gynaecomastia
 - iv) slightly reduced IQ
- d) associations :
 - i) hypothyroidism
 - ii) diabetes
 - iii) asthma

3. XYY :

- a) 1 in 700 men
- b) tall stature
- c) mild learning disability, which may contribute to an increased rate of behavioural problems

- d) original studies (Witkin *et al.* 1976) showed more criminal behaviour of non-violent sort than normal controls but this study was flawed, and the findings have not been reproduced
4. *XO (Turner's syndrome) :*
- a) dull normal IQ
 - b) short stature
 - c) wide carrying angle
 - d) inverted, widely-spaced nipples
 - e) hyperconvex fingernails
 - f) ptosis
 - g) nystagmus
 - h) webbed neck (in 50 %)
 - i) coarctation of the aorta (in 35 %)
 - j) left heart defects
 - k) lymphoedema of the legs
 - l) gonadal agenesis infertility

Klinefelter's syndrome

Aetiology

- results from the presence of at least one additional X chromosome in the nucleus of the male
- the usual karyotype is 47 XXY
- mosaics can arise

Clinical features

- taller by 4cm
- small testes
- variable degree of androgen deficiency, manifest as gynaecomastia or scanty beard growth
- azoospermia or oligospermia are invariable and irreversible
- urinary gonadotrophin levels are raised

Psychiatric features

- intelligence is often low - the greater the number of X chromosomes, the more severe the mental retardation
 - average IQ is about 90
 - may be due to impaired cerebral maturation consequent on the genetic defect
- personality and behaviour are abnormal
 - lack drive and initiative
 - generally indolent, insecure, and dependent
 - impaired tolerance of frustration, with explosive irritability and outbursts of aggression
 - marital instability and poor social relationships
 - alcoholism is seen in 6 % }questionable

- criminal behaviour in 12 % }
- probable excess of psychotic illness
 - 6 % have a schizophrenic diagnosis
 - 7 % have a paranoid psychosis
- EEG is frequently abnormal:
 - slowed α frequencies
 - slow wave dysrhythmias
 - paroxysmal features
- epilepsy is more common
- increased incidence of sexual problems
 - reduced libido and potency is low

Turner's syndrome

Aetiology

- XO karyotype
- associated with oestrogen deficiency and failure of sexual maturation

Clinical features

- primary amenorrhoea
- short stature
- skeletal abnormalities :
 - cubitus valgus
 - arching of the palate
 - small jaw
- fish-like mouth
- ptosis
- nystagmus
- hyperconvex fingernails
- low set ears
- short, webbed neck (50 %)
- congenital renal abnormalities
- coarctation of the aorta (35 %)

Psychiatric features

- previously thought that patients had mild mental retardation
- verbal intelligence is normally distributed
- lower performance intelligence
- inferior scores on tests of perceptual organization when compared to verbal comprehension
- poor visuospatial ability
- in 25 % of patients, mosaicism occurs and IQ is then higher than normal
- feminine sexual identification and interests are usual
 - libido is often low
- psychiatric illness :

- gross psychopathology is rare
- neurotic traits may emerge
- many patients are shy, and awkward and have a higher degree of interpersonal difficulties
- no increased incidence of antisocial behaviour or of psychotic illness

Fragile X syndrome

- described by Martin and Bell (1943)
 - 2nd most common cause of MR in males
 - female carriers have physical stigma and reduced IQ
 - thought to account for 6 % of severe MR, 10 % of mild MR males
 - diagnosis confirmed on fragility test of X chromosome in folate-deficient medium
 - chromosome analysis for fragile site (Q 27-28) is available
1. *Clinical features* :
 - a) MR
 - b) floppy ears
 - c) prognathism
 - d) macro-orchidism
 - e) hypertelorism
 - f) blue eyes
 - g) single palmar crease
 2. *Associations* :
 - a) autism – 20 % of autistics have fragile X abnormality
 - b) suggested link with ADDH

Genetic abnormalities

Tuberous Sclerosis

- defect of chromosome 9
 - autosomal dominant, with variable penetrance
1. *Clinical features* :
 - a) cutaneous lesions :
 - i) *adenoma sebaceum* (erythematous papules or nodules on the cheeks or within the folds of the mouth or nose)
 - ii) *periungual fibromas* occur as pink, firm, claw-like tumours arising from and around the nail folds
 - iii) *Shagreen patches* are firm, plaque-like tumours which commonly arise over the lumbosacral region
 - iv) areas of *macular hypopigmentation* occur in ovoid or leaf-like shapes over the trunk and back and are best examined with Wood's light
 - b) multiple cortical tubers
 - c) lung cysts
 2. *Associations* :

- a) mental retardation
- b) seizures (most are infantile spasms)

Apert's syndrome

- autosomal dominant, with poor penetrance
- 1. *Clinical features* :
 - a) mental handicap
 - b) tower skull
 - c) protuberant eyes
 - d) abnormalities of fingers and toes

Craniofacial dysostosis

- autosomal dominant with poor penetrance
- low incidence of handicap

First-arch syndromes

1. *Berry-Franceschetti syndrome*
 - a) autosomal dominant
 - b) mandibulofacial dysostosis
 - c) sheep-like face
 - d) deafness
 - e) variable degree of handicap
2. *Hallerman-Strieff syndrome*
 - a) mandibulo-oculofacial dyscephaly
 - b) severe subnormality
 - c) facial abnormalities

Hypertelorism

- may be autosomal dominant or recessive
- severe handicap is usual

True microcephaly

- autosomal recessive
- 1 in 1000 live births
- males more commonly affected
- severe handicap
- short stature
- epilepsy is common

Virchow-Seckel dwarf

- autosomal recessive
- small stature

- facial and skeletal abnormalities
- mild or moderate handicap

Ataxia telangectasia, Louis-Bar syndrome

- autosomal recessive
- gradual mental retardation after age 3, with development of facial telangiectasia, cafe au lait spots and cerebellar and extrapyramidal signs
- deficiency of IgA leads to infections and lymphocytic neoplasia

Lawrence-Moon-Biedl syndrome

- autosomal recessive
- **severe handicap**
- **obesity**
- hypogenitalism
- **polydactyly**
- retinitis pigmentosa

Marinesco-Sjögren syndrome

- autosomal recessive
- severe handicap
- microcephaly
- cataracts
- cerebellar signs
- skeletal abnormalities

X-linked disorders linked with subnormality

1. X-linked hydrocephalus
2. X-linked spastic paraplegia
3. Menkes' 'kinky hair' syndrome
4. Lesch-Nyhan syndrome
5. Lowe's syndrome
6. Pseudo-pseudohypoparathyroidism (Albright's syndrome)
7. Diffuse cerebral sclerosis
8. Mucopolysaccharidosis type 2 (Hunter's syndrome)
9. Nephrogenic diabetes insipidus
10. Hyperammonia syndrome

Possibly genetic disorders

1. *de Lange syndrome* :
 - a) severe mental handicap
 - b) characteristic facial and skeletal abnormalities
 - c) dwarfism
 - d) excessive body hair

2. *Sturge-Weber syndrome* :
 - a) facial angiomatous naevus, with corresponding intracranial abnormality
 - b) leads to contralateral hemiparesis, handicap, and epilepsy
3. *Prader-Willi syndrome* :
 - a) gross obesity
 - b) hypogonadism
 - c) mild to severe handicap
 - d) ataxia
 - e) diabetes
 - f) outbursts of anger
 - g) may be a hypothalamic disorder

Inborn errors of metabolism

- most are autosomal recessive, except Hunter's and Lesch-Nyhan syndromes, and nephrogenic diabetes insipidus, which are X-linked

Disorders of protein metabolism

1. *Phenylketonuria*
 - a) the commonest inborn metabolic error
 - b) 1 in 12000 live births
 - c) due to *phenylalanine hydroxylase* deficiency
 - d) Clinical features :
 - i) fair hair
 - ii) blue-eyes
 - iii) prone to eczema
 - iv) may be epileptic
 - v) severely handicapped if untreated
 - e) treated with phenylalanine-free diet
2. *Homocystinuria*
 - a) methionine is metabolised to homocystine and thence cystathione
 - b) deficiency of *cystathionine-synthetase*
 - i) two molecules of homocysteine join to form one molecule of homocystine
 - c) leads to raised homocystine and methionine
 - d) Clinical features :
 - i) fair hair and skin
 - ii) eye and skeletal abnormalities
 - iii) poor peripheral circulation
 - iv) liver degeneration
 - v) epilepsy
 - vi) mental deterioration
 - e) treated with methionine-free diet
3. *Argininosuccinic aciduria*
 - a) deficiency of *argininosuccinase* leading to raised argininosuccinic acid and ammonia
 - b) Clinical features :

- i) short brittle hair
 - ii) epilepsy
 - iii) chorea
 - iv) variable handicap
- 4. *Maple syrup disease*
 - a) deficiency of *ketoacid decarboxylase* leading to abnormalities of branched chain amino acids
 - b) Clinical features :
 - i) epilepsy
 - ii) spasticity
 - iii) paralysis
 - iv) early death if untreated
 - c) treated with diet low in leucine, isoleucine, and valine
- 5. *Hartnup disease*
 - a) deficiency of transport of amino acids across gut and renal membranes
 - b) leads to low absorption of tryptophan, and abnormal amino acids in the urine
 - c) Clinical features :
 - i) handicap
 - ii) confusion
 - iii) ataxia
 - iv) photosensitive skin
 - v) pellagra
 - d) some improvement is seen with high protein and nicotinamide diet

Disorders of carbohydrate metabolism

- 1. *Galactosaemia*
 - a) deficiency of *phosphogalactose-uridyl transferase*
 - b) autosomal recessive
 - c) Clinical features :
 - i) vomiting, lethargy, and jaundice in neonatal period
 - ii) leads to handicap and early death if untreated
 - d) treated with galactose-free diet
- 2. *Idiopathic hypoglycaemia*
 - a) leucine ingestion leads to hypoglycaemia and raised insulin levels
 - b) epilepsy and handicap occur unless treated early with leucine-free diet

Disorders of lipid metabolism and connective tissue

- 1. *Tay-Sachs disease*
 - a) see 'Metabolic, Biochemic and Endocrine Disorders'
- 2. *Niemann-Pick disease*
 - a) see 'Metabolic, Biochemic and Endocrine Disorders'
- 3. *Gaucher's disease*
 - a) see 'Metabolic, Biochemic and Endocrine Disorders'
- 4. *Refsum's disease*

- a) deficiency of *phytanic acid oxidase*, with loss of myelin
- b) onset in childhood
- c) Clinical features :
 - i) mental deterioration
 - ii) visual and auditory loss
 - iii) cerebellar signs
 - iv) weakness
- d) treated with phytanic acid-free diet and vitamin A

Mucopolysaccharidoses

- 1. Type 1 : Hurler's syndrome
 - a) gargoylism
 - b) progressive mental and physical deterioration
 - c) corneal clouding
- 2. Type 2 : Hunter's syndrome
 - a) X-linked recessive
 - b) gargoylism
 - c) deterioration is slower than Hurler's and there is no corneal clouding
- 3. Type 3 : Sanfilippo's syndrome
 - a) mild physical signs but severe mental deterioration

Other metabolic disorders

- 1. *Congenital hypothyroidism (cretinism)*
 - a) Clinical features :
 - i) lethargy
 - ii) large tongue
 - iii) feeding problems
 - iv) puffy skin
 - v) protuberant abdomen (often with umbilical hernia)
 - vi) mental handicap
- 2. *Infantile hyperuricaemia (Lesch-Nyhan syndrome)*
 - a) X-linked recessive
 - b) disturbance of purine metabolism leads to hyperuricaemia
 - c) Clinical features :
 - i) spasticity
 - ii) choreoathetosis
 - iii) self-mutilation
 - iv) severe mental handicap
 - v) early death
 - d) partially treatable with ALLOPURINOL
- 3. *Nephrogenic diabetes insipidus*
 - a) X-linked recessive
 - b) renal tubules do not respond to ADH
 - c) Clinical features :
 - i) dehydration
 - ii) epilepsy
 - iii) mental handicap

- d) treated with large fluid intake, ETHNACRYNIC ACID, and POTASSIUM CHLORATE

Rett's syndrome

- affects females only
- onset 7-24 months
- Clinical features :
 - loss of acquired hand skills and speech
 - stereotypies
 - lack of social interaction
 - later development of ataxia, apraxia, kyphoscoliosis, seizures
 - severe mental retardation

Non-genetic causes of MR

1. *Nutritional/ toxic :*
 - a) placental insufficiency
 - b) malnutrition
 - c) infantile hypglycaemia
 - d) fetal alcohol syndrome
 - e) lead encephalopathy
2. *Anoxia :*
 - a) perinatal
 - b) in infancy
3. *Infection :*
 - a) Maternal -
 - i) rubella at up to 16 weeks of pregnancy – leads to microcephaly, eye, ear, and head abnormalities, and subnormality
 - ii) cytomegalovirus
 - iii) syphilis
 - iv) toxoplasmosis
 - v) listeria
 - b) Child -
 - i) encephalitis
 - ii) meningitis
4. *Trauma :*
 - a) non-accidental injury
 - b) accidental injury
 - c) birth trauma
5. *Rhesus factor incompatibility*

Psychiatric disorder in the mentally handicapped

- of 302 MR adults (Lund, 1985) :
 - 27 % had a psychiatric disorder
 - 11 % had behavioural disorder
 - 5 % psychosis of 'uncertain type'
 - 4 % dementia
 - 4 % autism
 - 2 % neurosis
 - < 2 % schizophrenia
 - < 2 % affective disorders
- prevalence of psychiatric disorder is proportional to the severity of MR

Schizophrenia

- 3-6 % of handicapped inpatients suffer from schizophrenia
- characterized by childish behaviour and stereotypies, poverty of thought, perplexity and 'confusion', loss of drive, and ill-formed hallucinations and delusions

Bipolar Affective disorder

- 1-6 % of handicapped in- or outpatients
- depression is characterized by agitation or withdrawal, apathy, somatic complaints and compulsive behaviour
- mania presents as episodic excitation and overactivity

Neurotic disorders

- hysterical symptoms tend to be more common than in normal controls

Epilepsy

- 30 % of severely handicapped
- Hypsarrhythmia, Lennox-Gastaut syndrome and West's syndrome are associated
- incidence generally reduces with age but may develop later in autism, Down's syndrome and progressive disorders (e.g. lipidoses)

Assessment

- impossible to assess at less than 6 months
- medical assessment includes :
 - full general and neurological examination
 - full blood count and film. U&E etc.
 - TFTs
 - amino acid chromatography of blood and urine
 - calcium levels
 - lead levels
 - syphilis serology
 - skull radiograph
 - EEG
 - chromosomal analysis

Educational services

- are the responsibility of the LEA, no matter how handicapped the child is, if under 19 years

Residential services

- In a population of 100,000 there will be :
 - 100 severely handicapped children under 16 – 70 % live at home, 20 % live in hospital, and 10 % need residential care
 - 375 severely handicapped adults – 12 % live at home and 88 % live in hospitals or hostels
- 20 residential places per 100,000 population for adults are required (Royal College of Psychiatrists, 1992)
- inpatient units are needed for :
 - severe behavioural problems
 - severe epilepsy
 - severe physical handicap
 - major psychiatric illness
- 50 % of the adult severely handicapped are regarded as employable

Prevention

- Royal College of Psychiatrists, Guidelines, 1993)

Primary

- avoid development of condition
- genetic counselling
- environmental manipulation

Secondary

- early detection and treatment of condition (e.g. Guthrie testing for phenylketonuria, testing for congenital hypothyroidism)

Tertiary

- avoidance of additional disability by good care and early intervention

1. *Genetic counselling :*

- a) unknown cause – 30 % risk of recurrence
- b) balanced translocation – mother has 20 % risk, father 5 %
- c) autosomal dominant – 50 % risk
- d) autosomal recessive – 25 % risk
- e) X-linked – 50 % of sons are affected, and 50 % of daughters are carriers

- f) neural tube defects – 5 % risk if 1 child affected; 12 % if 2 children affected
- 2. *Amniocentesis* :
 - a) can detect Down's syndrome, open neural tube defects, and certain biochemical abnormalities
 - b) offered if parents have an affected child, a positive family history, or the mother is over 35
- 3. *Prenatal screening* :
 - a) for PKU, galactosaemia, Tay-Sachs disease
 - b) Rhesus negative screening
 - c) Kernicterus is prevented by use of anti-D antibody, amniocentesis and exchange transfusion
- 4. Neonatal blood sample for PKU and other metabolic disorders
- 5. Rubella immunization for all adolescent girls
- 6. Maternal syphilis screening and treatment
- 7. Improved obstetric care
- 8. Folate supplement in pregnancy to prevent NTDs
- 9. Prevention of malnutrition
- 10. Improved social and educational standards
- 11. Avoidance of maternal drug and alcohol abuse
- 12. Detection and early treatment of psychiatric disturbance in MR
- 13. Support for family
- 14. Bereavement counselling for MR individuals after loss of parent, etc.