Development in infants and children

Dr Reneva Petersen
Dr Kirsty Donald

Division of Developmental Paediatrics, RXH

DCH Teaching, March 2013
> 200 million children under 5 years of age in developing countries are not developing to their full potential.

Sub-Saharan African countries have the highest percentage of disadvantaged children.

The children will subsequently do poorly in school and are likely to transfer poverty to the next generation.

Estimated loss of human potential is associated with more than a 20% deficit in adult income.

Child development in developing countries
Sally Grantham-McGregor ET AL, Lancet 2007; 369: 60–70
Relations between poverty, stunting, child development and school achievement

Poverty

Primary caretaker
Stress/depression
Low responsivity
Low education

Poor care and home stimulation

Poor school achievement

Nutritional deficiencies / infections

Stunting

Poor cognitive, motor, socio-emotional development

Grantham-McGregor et al
Lancet 369, 2007
South Africa

• 1992- 2002 overall prevalence 1.6-6% (1)
• Children < 18 3.3%
• 12-16 % of American children have developmental or behavioural disorders (2)

1) Sue Philpot, Disability Action Research team
2) PEDIATRICS Vol. 108 No. 1 July 2001
EXAM QUESTIONS

• APPROACH TO CHILD WITH DELAY
• APPROACHES TO COMMON CONDITIONS

• CEREBRAL PALSY
• DOWN’S SYNDROME
• FAS
• BLIND CHILD
• DEAF CHILD
Normal Development

Development occurs with sequential acquisition of skills in four different areas

• Gross Motor
• Fine Motor
• Language
• Psychosocial

*Language development most approximates cognition*
Normal Development Principles

- Development is a continuous process
- The sequence is the same but the rate varies between children
- The sequence is set in each field, but each field is not necessarily parallel
- Development is related to the rate of maturation of the CNS
- No strict line between normal and abnormal
0-1 YEAR

DEVELOPMENT

- GM: Sits at 6/12
crawls at 9/12
Walks 1 yr

- FM: palmar grasp
pincer gr 11/12
holds blocks in each hand

- COMM: first word 1 yr
shakes head for no
waves bye

- PS: finger feeds 11/12
holds bottle

WARNING SIGNS

- Persisting primitive reflexes
- No head control
- Not sitting by 9 months
- Fisting
- Hand Preference before 12 mo
- Head circumference <3P or > 97P
- No visual fixation
- Squint
- No response to sound
- Not vocalizing by 6 months
- Unable to grasp objects by 9 months
1-2 YEARS

GM:
walks, runs, stairs, climbs up furniture, jumps

FM:
build a tower with cubes, scribbles, completes puzzles, hand preference

COMM:
2-3 words Sentences.
identifies body parts

PS:
eats with spoon, undresses

WARNING SIGNS

- Not walking by 18 months
- No pincer grasp
- Unable to understand simple commands by 18-24 months
- No words by 18 months
2-4 YEARS

DEVELOPMENT

• GM: stairs, bicycle, one leg stand
• FM: towers, puzzles, drawing, handedness
• COMM: sentences, body parts, identifies cars + objects, prepositions
• PS: potty trained, washing, dressing, playing in small groups

WARNING SIGNS

- Single words only by 30 months
- Indistinct speech at 42 months
- Echolalia,
- Doesn’t know name by 36 months
- Poor pencil grasp
The Developmental Quotient

Ideally should use a normed test/screen/milestone Sequential assessment yields a better true reflection.

**Developmental age** X 100%
**Chronological Age**

e.g. Chronological Age = 12 months,
   GM=6 months, FM=6 months, Language=4 months, P/S=4 months

• DQ = 5/12 = 47%
Developmental Delay

• Corrected Age:
  At birth: Term – gestational age in wks

  Until 2 years: Chronological age – x wks or months

➢ Developmental Delay vs Deviation
Developmental Delay

• **Definition:**

Failure to attain the appropriate developmental milestones for a child’s corrected age
Developmental Delay

normal progress

rapid progress needed to catch up
Developmental Disability

• Definition:

Difficulty seeing, hearing, walking, writing, conceptualising, communicating or performing any other activity within the normal range of children for their age (World Health Organisation 1980.)
Impairment, Disability and Handicap (Spectrum)

• Impairment:
  An abnormality of body structure/ function ie. the specific pathological event.

• Disability:
  Failure of a function / skill i.e. physical incapacity

• Handicap:
  A disability with substantial or permanent effect on normal growth / functional incapacity
ICF classification : WHO 2001

- Body structure and function
- Activity
- Participation
- Contextual factors : environment personal
Prevalence of Developmental Disabilities

- Common
- Mild disabilities more common than moderate/severe
- Low frequency, high morbidity disorders present earlier, 
  CP, Sensory Impairments, Moderate-Severe Intellectual Disability
- High frequency, low morbidity disorders present at school age 
  ADHD, Learning Disorders
Early detection means early intervention (maximises potential)

- Early detection may reduce or prevent long term disability
- Importance of surveillance and screening
- Most efficient screening is in the context of a continuous relationship with the family.
- NB* Developed vs Developing countries
- Parents are partners in the process
Developmental Screening

• Many tools available

• Best done at PHC level at times of routine visits e.g. immunisations.

• NB* Vision and Hearing

• Limitations to what can and cannot be done
# Developmental Screening

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Vision and Adaptive</th>
<th>Hearing and Communication</th>
<th>Motor Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always Ask</td>
<td>Can your child see?</td>
<td>Can your child hear and communicate as other children?</td>
<td>Does your child do the same things as other children of the same age?</td>
</tr>
<tr>
<td>14 weeks</td>
<td>Baby follows close objects with eyes</td>
<td>Baby responds to sound by stopping sucking, blinking or turning</td>
<td>Child lifts head when held against shoulder</td>
</tr>
<tr>
<td>6 months</td>
<td>Baby recognises familiar faces</td>
<td>Child turns head to look for sound</td>
<td>Child holds a toy in each hand</td>
</tr>
<tr>
<td>9 months</td>
<td>Child’s eyes focus on far objects (from 3m onwards)</td>
<td>Child turns when called</td>
<td>Child sits and plays without support</td>
</tr>
<tr>
<td>18 months</td>
<td>Child looks at small things and pictures</td>
<td>Child points to 3 simple objects</td>
<td>Child walks well</td>
</tr>
<tr>
<td>3 years</td>
<td>Sees small shapes clearly at 6 metres</td>
<td>Child speaks in simple 3 word sentences</td>
<td>Child runs well and climbs on things</td>
</tr>
<tr>
<td>5-6 years</td>
<td>No problem with vision, use a Snellen E chart to check</td>
<td>Speaks in full sentences and interact with children and adults</td>
<td>Hops on one foot, able to draw a stick person</td>
</tr>
</tbody>
</table>

**Refer**

Refer the child to the next level of care if child has not achieved the developmental milestone. Refer motor problem to Occupational Therapist/Physiotherapist and hearing and speech problem to Speech Therapist/Audiologist if you have the services at your facility.
Child Health Surveillance

Primary Prevention
- Immunisation
- Education
- Dental Prophylaxis
- Accident Prevention
- Child Abuse Prevention
- Health Promotion

Secondary Prevention
- Case-finding and Vigilance
- Individual Screening
  - Tests used in screening
    - Examination
    - Laboratory tests
    - Imaging
    - Growth Monitoring
    - Tests for Visual Defects
    - Tests for Hearing Defects
    - Tests for Developmental Delays
    - Tests for Behavioural Disorders
- Assessment

Tertiary Prevention
- Handicapped Child
- Child with Special Needs
- Treatment
Types of Developmental Delay

1. Transient delay/Regression
2. Global delay with slow (forward) progression
3. Global delay with regression
4. Specific developmental delays
The Spectrum

• Global delay +- motor disability
• Intellectual Disability: primary/ secondary
• Predominantly motor disability
• Syndromes
• Language and communication disorders
eg. Autism, PDD, apraxias
• Disorders of Learning and Attention: ADHD, ADD, LD, ODD
• Specific: Visual impairment, hearing impairment
Intellectual Disability

• Prevalence: 3 per 100 population (80% mild)

• Most common genetic cause

• Other causes: Region specific
Trisomy 21
Trisomy 21

- Most common genetic cause of Developmental Disability worldwide
- Incidence 1 in 700 births
- One third of all moderate/severe Intellectual Disability
- Diagnosis: antenatal, clinically at birth or soon after
- NB* Developmental & Genetic followup
Fetal Alcohol Spectrum Disorder

- Prevalence in W. Cape +- 80/1000 high risk populations
- Most children have borderline/mild intellectual disability
- High co-morbidity with neurobehavioural manifestations esp. ADHD
- Other associations esp. cardiac.
• Specific pattern of facial features
• Pre and/or post natal growth deficit
• Evidence of CNS dysfunction
• Positive history of maternal drinking
Cerebral Palsy

• Definition:
  An Umbrella term for a group of non progressive but often changing motor impairment syndromes caused by anomalies or lesions to the developing brain. The lesion neither resolves or progresses

• Prevalence: +- 2/1000 in developed countries
PROPOSED CLASSIFICATION

• **Motor abnormalities:**
  a) nature and type (DOMINANT MOTOR ABN)
  b) functional motor abilities (extent of limitation
  /severity measured by objective functional scales)

• **Associated impairments:**
  (seizures, hearing or visual imp, cognitive and attentional def,
  emotional and behavioural etc)

• Anatomic distribution and radiological findings

• Causation and timing
Early Signs of CP

- Delay/ deviant motor development
- Abnormal posture/tone
- Irritability/lethargy, feeding difficulties
- Gross and fine motor delay
- NB* All high risk neonates need sequential follow up
Approach to the child who presents with delay

- The History
- Identify the child at risk for disability
- Examination: head circumference, dysmorphism, skin, focal neurological signs, Hearing, Vision,
- Management: Practical

WHEN TO REFER & WHY
Pitfalls in Developmental Diagnosis

• Lack of knowledge of normal
• No definition of the range of normal
• Failure to account for all factors
• Failure to assess all areas
• Undue importance to specific areas
• Disregard for history, examination, appropriate investigations, and interpretation.
Language delay

Deafness
Intellectual disability
Autism
  • social communication
  • language
  • repetitive/restrictive interests

Bilingualism
Psychosocial Deprivation
Acquired aphasia
Cerebral Palsy
Maturation delay
CDG: R1200/month
How do you know if you qualify?

You must:

• be a parent, primary caregiver or a foster parent appointed by the court

• be a South African citizen or permanent resident (or official refugee status)

• *Not earn* more than R144 000 per year (R12 000 per month) if you are single. Your combined income should not be above R288 000 per year (R24 000 per month) if you are married
The child must:

• Be younger than 18 years
• Not be cared for permanently in a state institution
• Have a severe disability and need full-time and special care.
• Both you and the child must live in South Africa.
What We Can do

• Say how far a child has developed in relation to age
• See the rate of development
• Diagnose severe mental subnormality
• Assess muscle tone and diagnose CP
• Diagnose severe deafness or visual impairment
• Diagnose neurological abnormalities in infancy
What we cannot do

• Make early accurate predictions about an infant’s potential unless grossly abnormal

• This holds true for diagnosis too – e.g. mild CP/ mild Intellectual Disability.

• If delayed and no microcephaly, cannot be sure not delayed maturation (late starter)

• Cannot exclude possible later LD in normal infants
Guidelines for referral

• Know guidelines for referral

• Paediatrician

• Specialist Neurodevelopmental Service/ Paed Neurology /Multidisciplinary team

• Allied professions: Physio, Speech therapy, OT

• NB* Early intervention.
Guidelines for referral

- Warning signs
- Head circumference < 3rd centile.
- Evidence of a motor disorder
- Loss of previously attained milestones
- The child looks abnormal
- There is doubt about normality
- The parents are concerned
Thank you