Ghana Cerebral Palsy Register (GCPR)

Malnutrition in children with Cerebral Palsy

Session Outline

Topic	Resource person	Time
1. Introduction	GCPR team	15 minutes
2. Malnutrition among children with Cerebral Palsy – the burden, cause and consequence	Israt	15 minutes
3. Screening and identification of malnutrition in a child with Cerebral Palsy	Israt Ella	60 minutes
4. Preventing Undernutrition in children with Cerebral Palsy in Ghana	Israt Benedicta Ella	120 minutes

Cerebral Palsy and Malnutrition – detection, monitoring and prevention in low- and middle-income countries

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PhD, MPH, MS (Nutrition), BSc. (Nutrition)
Coordinator, Global LMIC Cerebral Palsy Register (GLM CPR)
Postdoctoral Research Fellow – Global CP Program, Central Queensland University

Why is nutrition important?

What is Malnutrition?

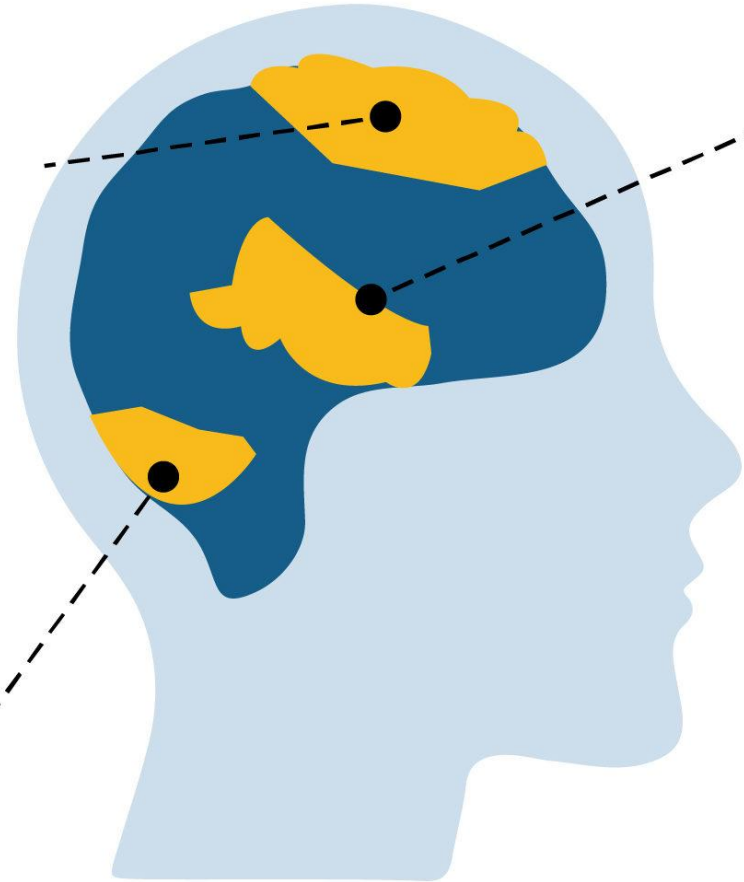
What is Cerebral Palsy?

- Neurodevelopmental disorder
- Permanent but non – progressive
- Affects motor function
- Due to injury to the developing brain
- Most common cause of childhood disability globally

Do children with cerebral palsy become malnourished?

AFFECTED AREAS OF THE BRAIN

Spastic:
Arises from Motor Cortex damage.

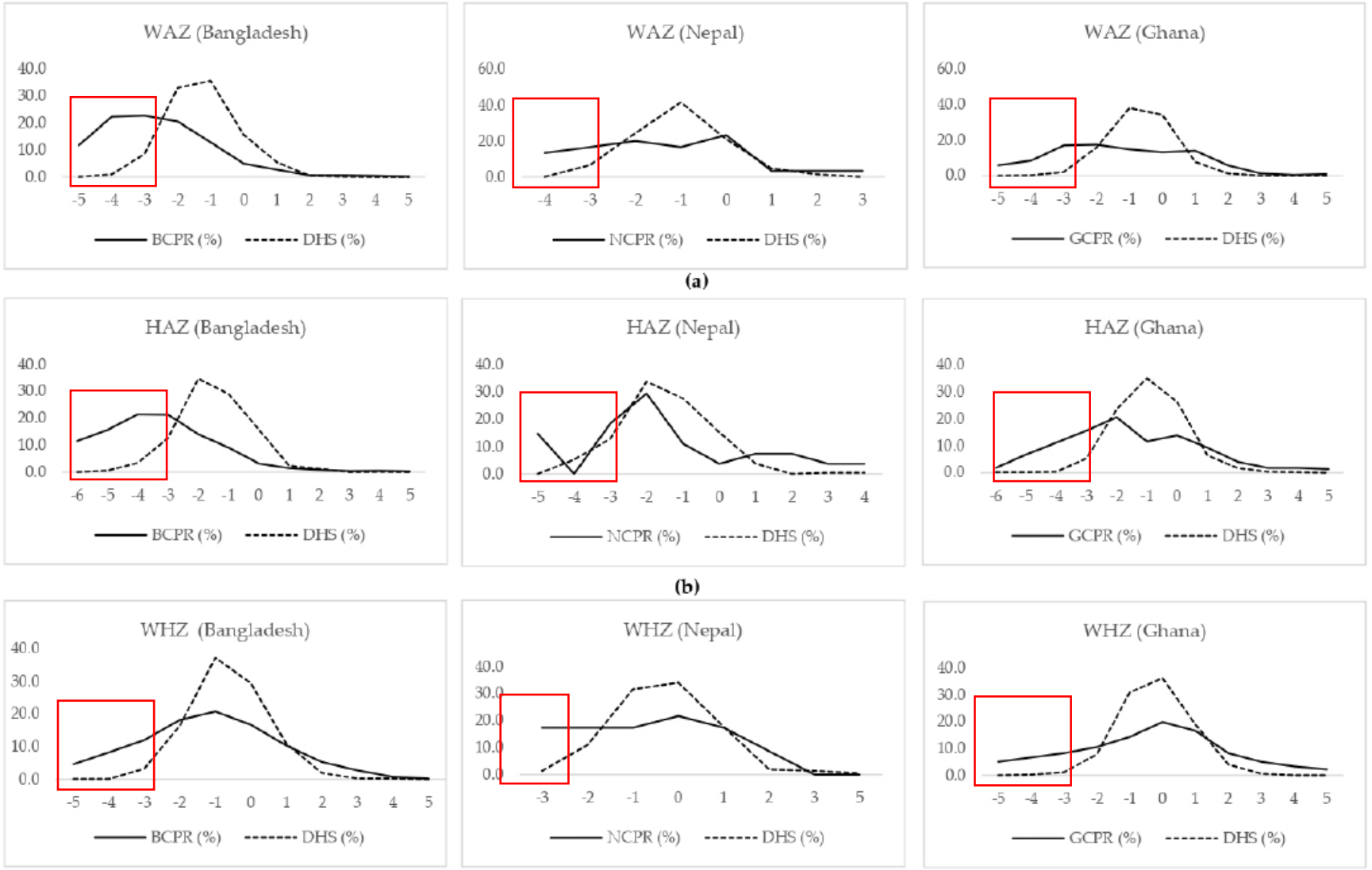


Dyskinetic:
Arises from damage to the Bascal Ganglia.

Mixed Types:
A number of children with CP will have two motor types present.

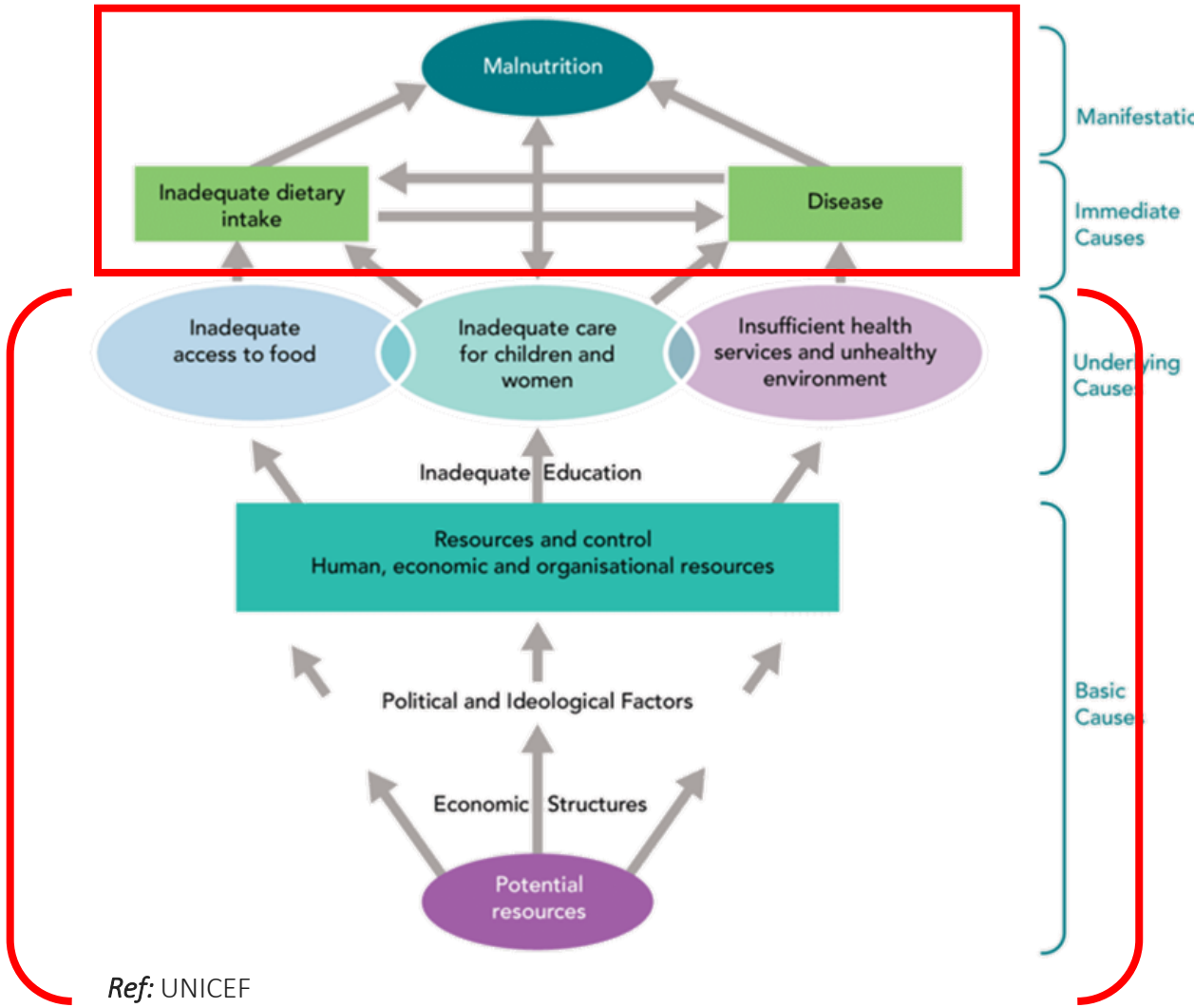
Ataxic
Arises from Cerebellum damage.

Burden of malnutrition among children with CP in LMICs



Ref: Jahan I, Muhit M, Hardianto D, Laryea F, Amponsah SK, Chhetri AB, Smithers-Sheedy H, McIntyre S, Badawi N, Khandaker G. Epidemiology of malnutrition among children with cerebral palsy in low-and middle-income countries: findings from the global LMIC CP register. Nutrients. 2021 Oct 20;13(11):3676.

Underlying causes are diverse and often interconnected



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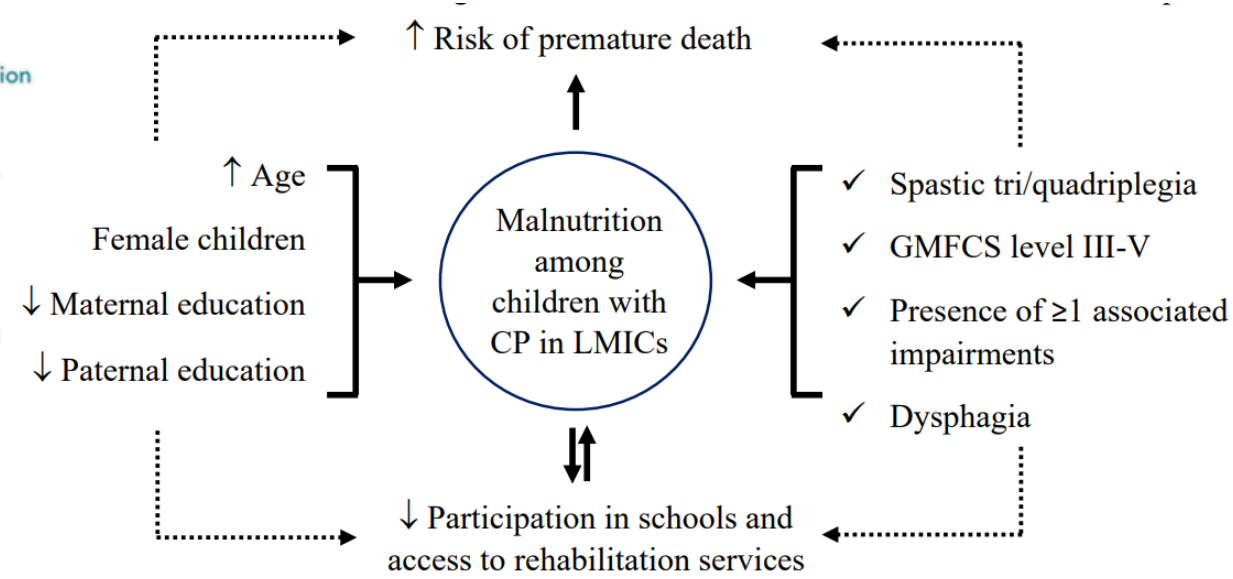

Ref: Jahan I, Akbar D, Khandaker G. The epidemiology, prevention and control of malnutrition among children with cerebral palsy in low- and middle-income countries. PhD thesis. 2022. Central Queensland University, Australia

Malnutrition in Children with CP in Ghana

- 2 in 3 children with CP had undernutrition
- Significant predictors –
- Mothers' education level
- Motor severity level (i.e., gross motor function classification system level)
- Presence of speech impairment
- Presence of epilepsy

African Journal of Disability
ISSN: (Online) 2226-7220, (Print) 2223-9170
AOSIS
Page 1 of 11 Original Research

Nutritional status of children with cerebral palsy in Ghana

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Read online:
Scan this QR code with your smart phone or mobile device to read online.

Background: Limited knowledge on nutritional epidemiology in Ghanaian children with Cerebral Palsy (CP) necessitates a comprehensive investigation for an improved understanding of malnutrition in this population.

Objectives: We aimed to describe the epidemiology of malnutrition among children with CP in Ghana.

Methods: The study used data collected as part of the Ghana CP Register (GCPR). The GCPR is an institution-based surveillance of children with CP aged < 18 years in Ghana. Between October 2018 and April 2020, N = 455 children with CP were registered. Data were collected on (i) weight, length or height, mid-upper-arm-circumference of children with CP; (ii) socio-demographic characteristics; (iii) motor type and topography, gross motor function classification system level (GMFCS); (iv) associated impairments; (v) educational and rehabilitation status for each child. Descriptive and bivariate analyses were performed.

Results: Mean and standard deviation age of the registered children at assessment was 5.9 ± 4.1 years, and 42.1% were female. Two-thirds of the children had ≥ one form of undernutrition (underweight or severely underweight: 38.9%, stunted or severely stunted: 51.2%, thin or severely thin: 23.8%). In the adjusted analysis, low maternal education, GMFCS-IV, speech impairment and epilepsy significantly increased the odds of undernutrition among participating children (aOR: 2.6 [95% CI:1.3–5.4]; 2.2 [95% CI:1.0–4.8]; 2.0 [95% CI:1.1–3.6]; 2.9 [95% CI:1.1–7.5] respectively).

Conclusions: The high malnutrition rate indicates an urgent need for nutrition interventions and translational research to improve nutritional status and prevent adverse outcomes among children with CP in Ghana.

Contribution: Our study contributes important data and a framework to develop guidelines and evidence-based interventions for children with CP in Ghana.

Keywords: malnutrition; stunting; underweight; cerebral palsy; disability; children; Ghana.

Introduction

Nutritional management is complex for children with cerebral palsy (CP) as the motor impairment caused by damage or lesion to the developing brain can adversely affect their food intake, digestion and metabolism (Aggarwal, Chadha & Pathak 2015), thus increasing their risk of malnutrition.

Cerebral palsy is the leading cause of childhood disability globally (Kakooza-Mwesige et al. 2017; Khandaker et al. 2019). Available data suggest that the prevalence of CP is two to three times higher among children in low- and middle-income countries (LMICs) such as Bangladesh and Uganda compared to high-income countries (HICs) such as Australia and Sweden (ACPR 2018; Kakooza-Mwesige et al. 2017; Khandaker et al. 2019). Children with CP in LMICs are susceptible to malnutrition as demonstrated by recent population-based data from Bangladesh, Indonesia,

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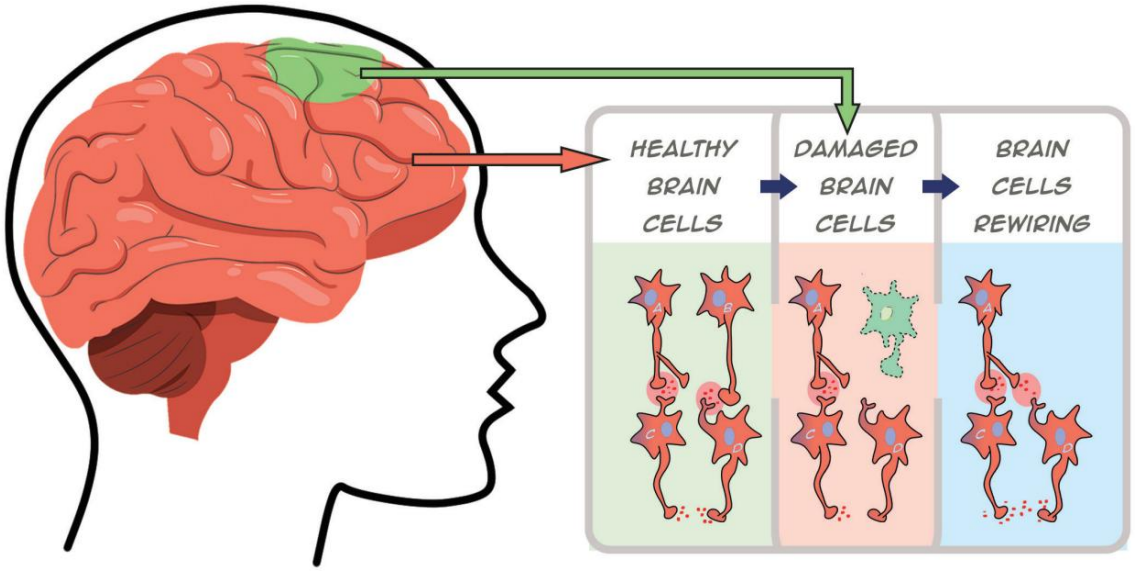
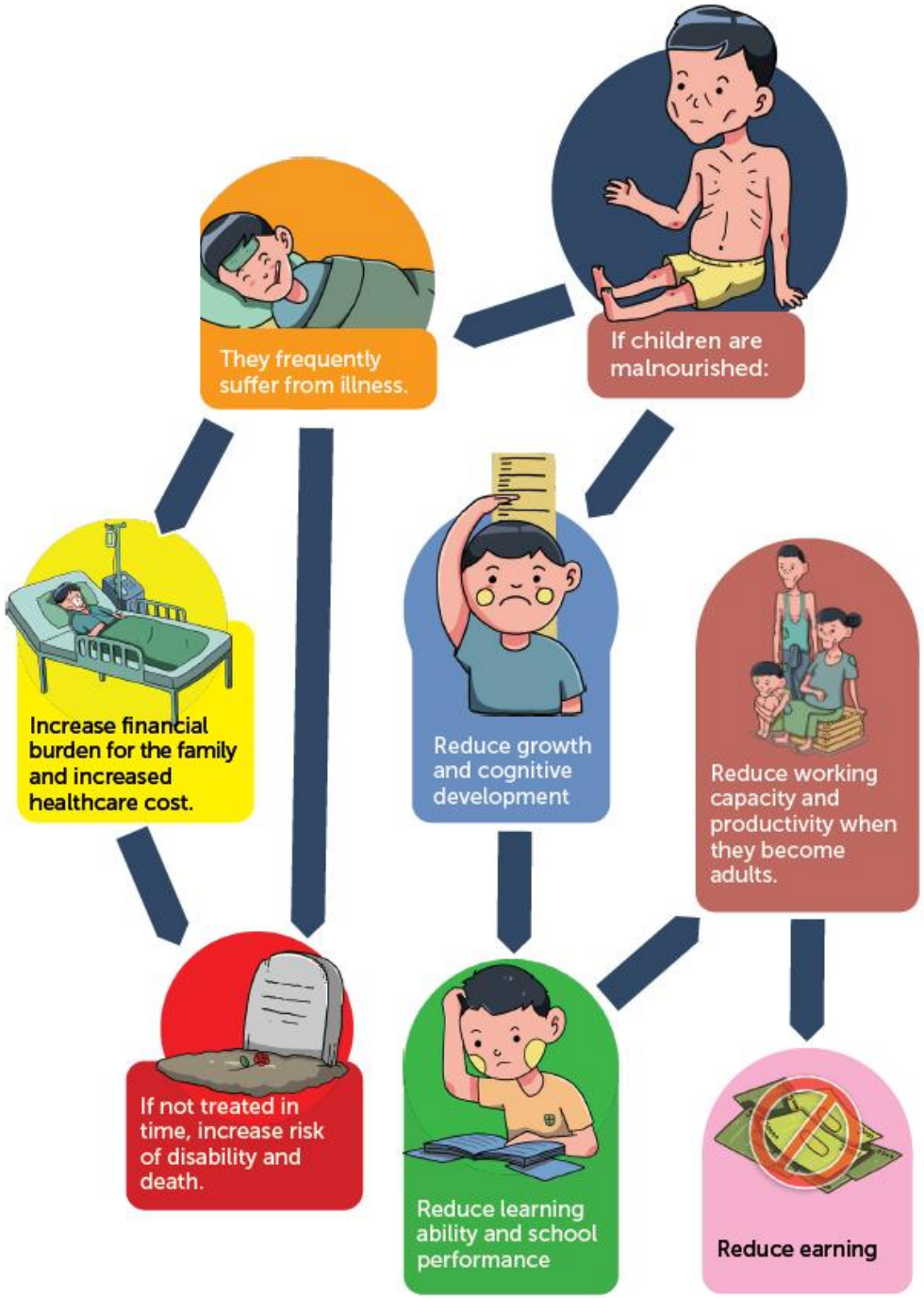
Dates: Received: 17 Sept. 2023 | Accepted: 10 May 2024 | Published: 31 July 2024
How to cite this article: Jahan, I., Sultana, R., Laryea, F., Amponsah, S.K., Danquah, F.I., Muhit, M. et al., 2024, 'Nutritional status of children with cerebral palsy in Ghana', *African Journal of Disability* 13(0), a1335. https://doi.org/10.4102/ajod.v13i0.1335

Why am I telling you this?

Timely intervention is crucial



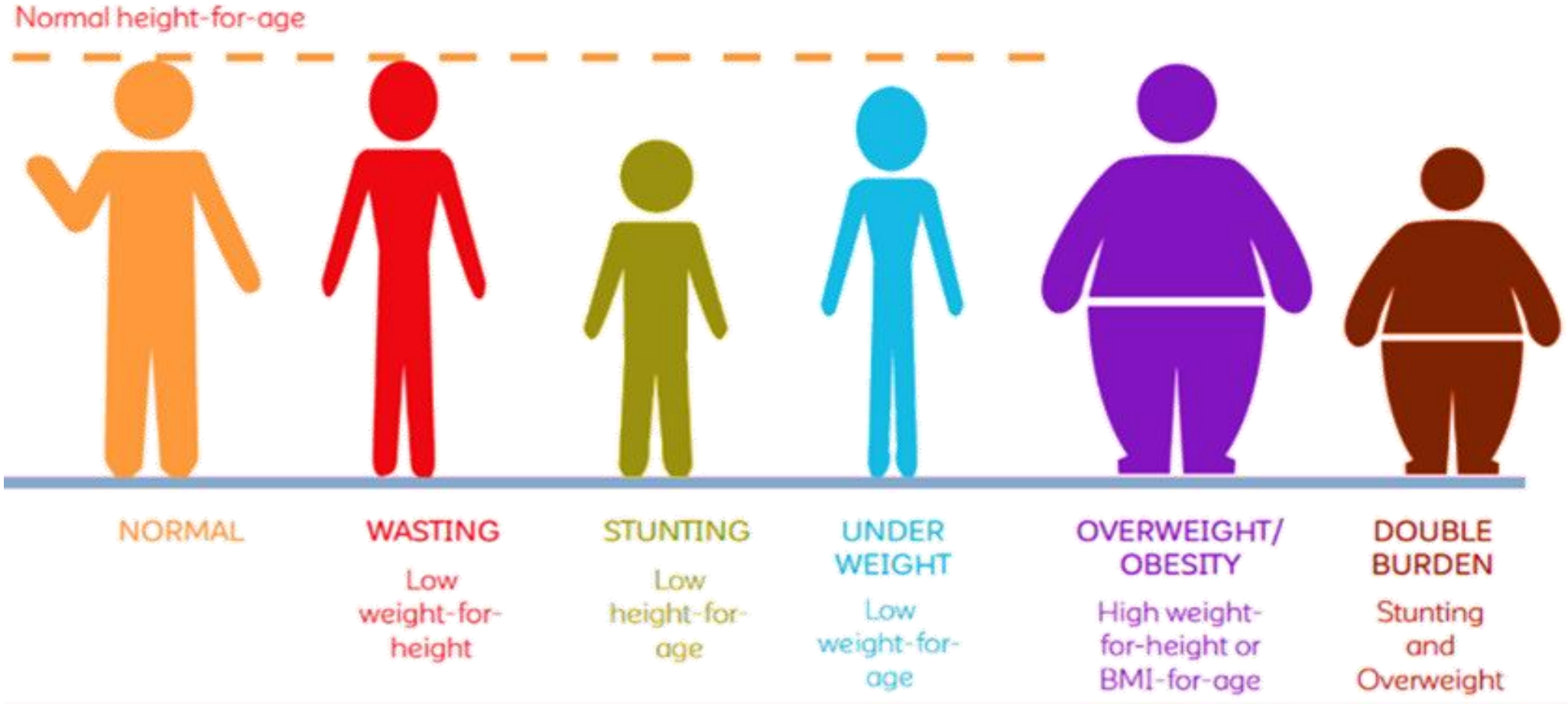


Malnutrition increases the **risk of premature death** in children with CP by **3-4 times**

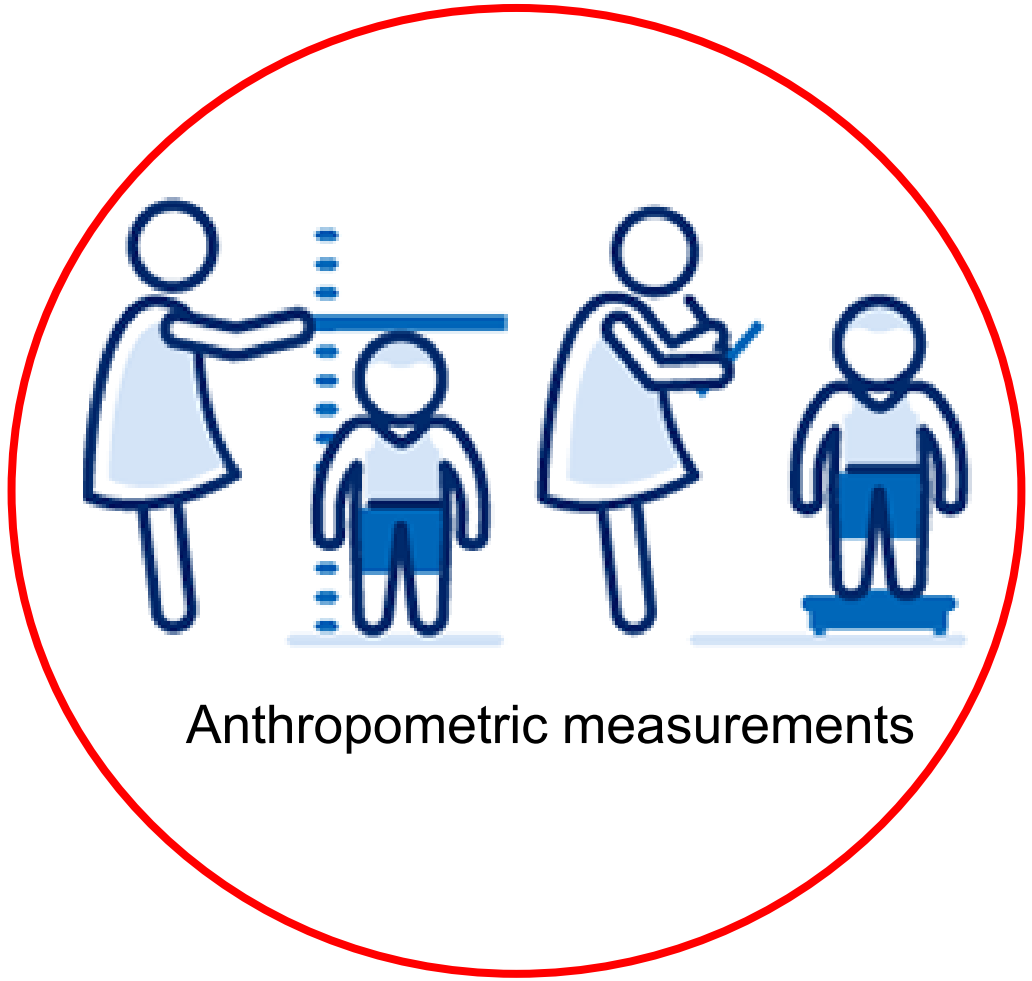

Q/A

Screening and Identification of Malnutrition in a Child

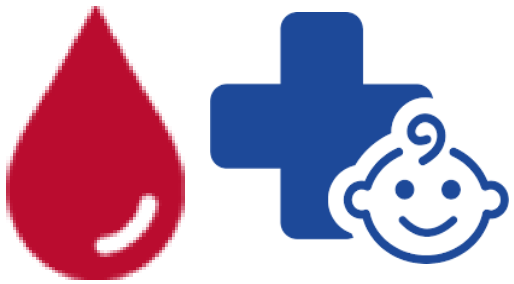
Types of Malnutrition



Different screening methods to identify malnutrition



Anthropometric measurements



Biomarkers/ clinical signs

Dietary assessments

Weight Measurement

if the child can stand independently

- The child should be wearing minimum clothing, no shoes, no belts/jacket, no heavy ornaments etc.

- Take the weight two times and document the average value in note/ record book.

Weight Measurement

If the child cannot stand independently

1. Request the caregiver to take the child in his/her lap and stand on the weighing scale.
2. Record the combined weight of child and caregiver.
3. Now request the mother to stand on weight scale without the child
4. Record weight of the caregiver only
5. Now subtract the ‘weight of caregiver’ from the ‘combined weight of the caregiver and child’

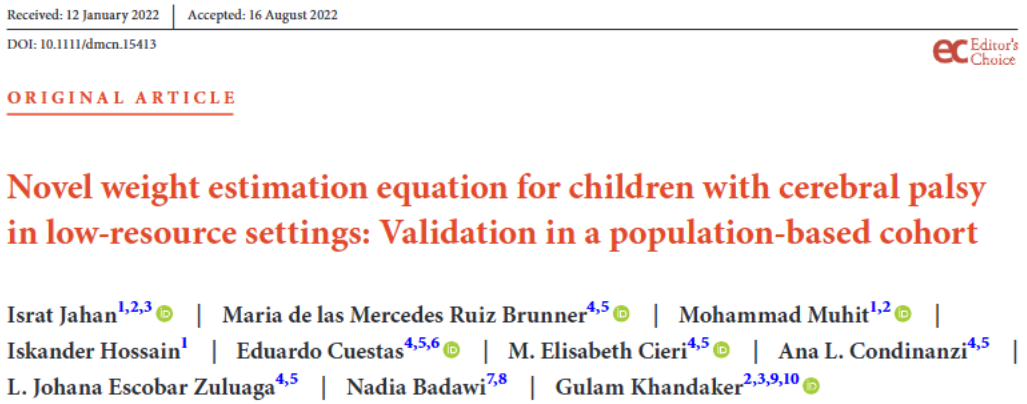
Weight of mother + baby — **Weight of mother** = **Weight of Baby**

Proxy indicator for measuring weight of children with CP

Measuring weight from MUAC

For children with GMFCS levels I to III
Estimated weight = 2.52× MUAC(cm) + 1.19 × age (years) – 32

For children with GMFCS level IV-V
Estimated weight = 2.02× MUAC(cm) + 0.97 × age (years) - 22.5.



Received: 12 January 2022 | Accepted: 16 August 2022
DOI: 10.1111/dmcn.15413

Editor's Choice

ORIGINAL ARTICLE

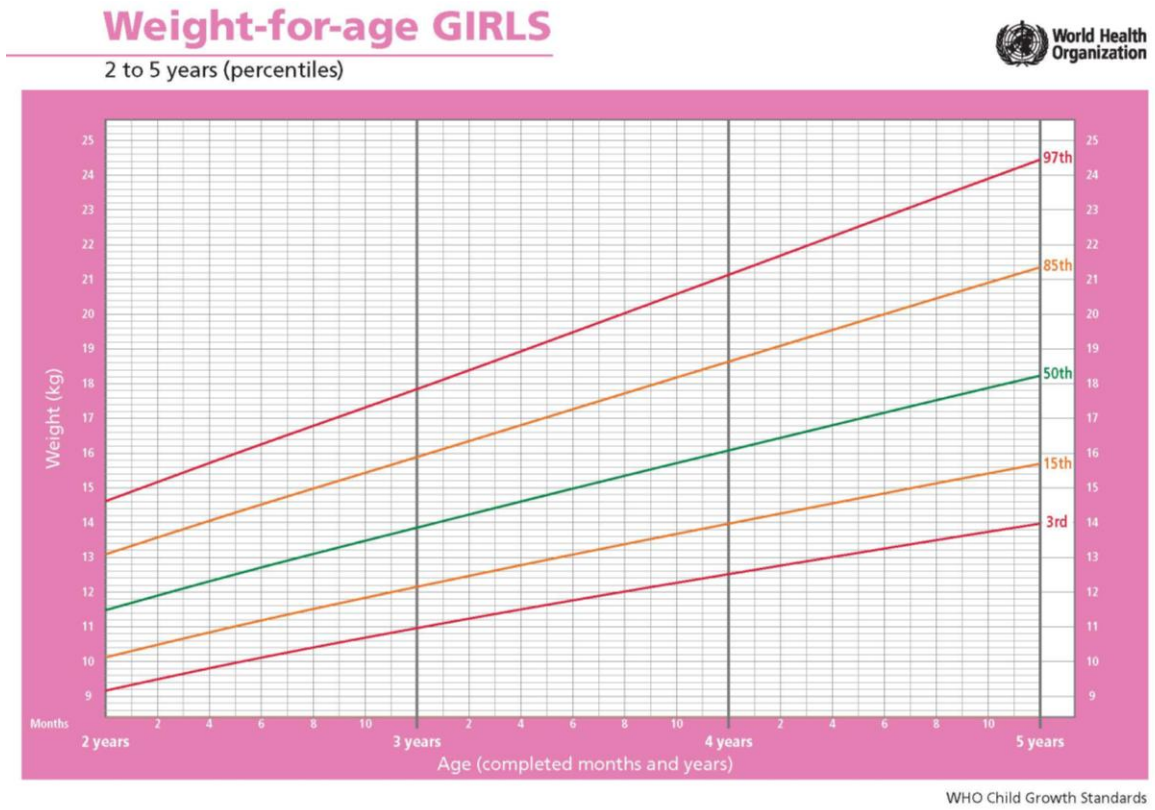
Novel weight estimation equation for children with cerebral palsy in low-resource settings: Validation in a population-based cohort

Israt Jahan[1,2,3] | Maria de las Mercedes Ruiz Brunner[4,5] | Mohammad Muhit[1,2] | Iskander Hossain[1] | Eduardo Cuestas[4,5,6] | M. Elisabeth Cieri[4,5] | Ana L. Condinanzi[4,5] | L. Johana Escobar Zuluaga[4,5] | Nadia Badawi[7,8] | Gulam Khandaker[2,3,9,10]

Limitations: Only applicable for population-level, not for individual level

Is the Child Underweight?

We need to plot the child's weight against her age as shown below.



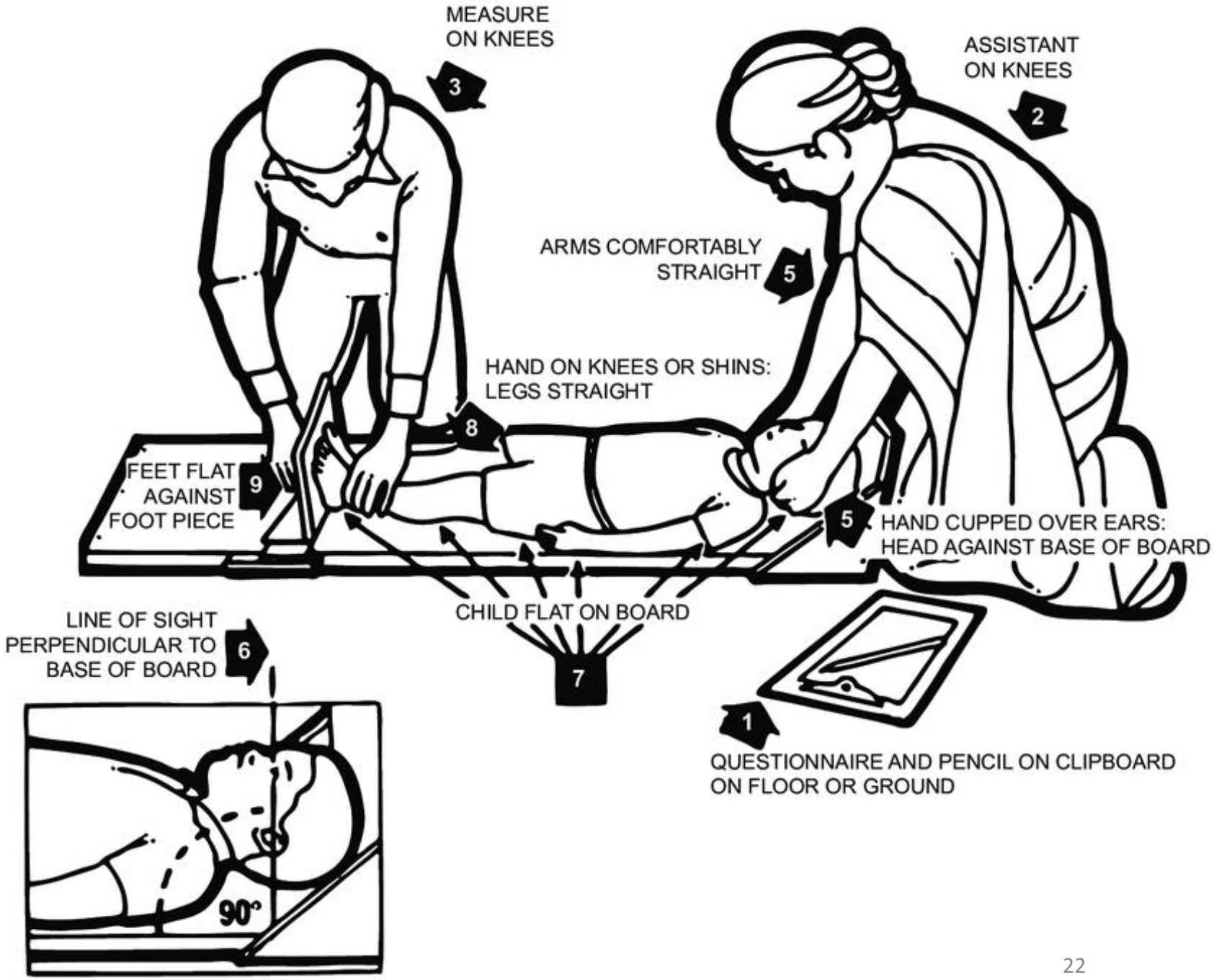
This means the child is gaining weight. If the line reaches to or remains in the **Green** zone, then **Very Good!**

This means the child lost weight or not gaining any weight. It is **Not good!** The child may need intervention to prevent entering the **Yellow/ Red** zone.

This means the child losses weight, which can be dangerous. It is **Very bad!** The child must receive intervention to prevent entering the **Yellow/ Red** zone or any adverse outcome.

Length Measurement

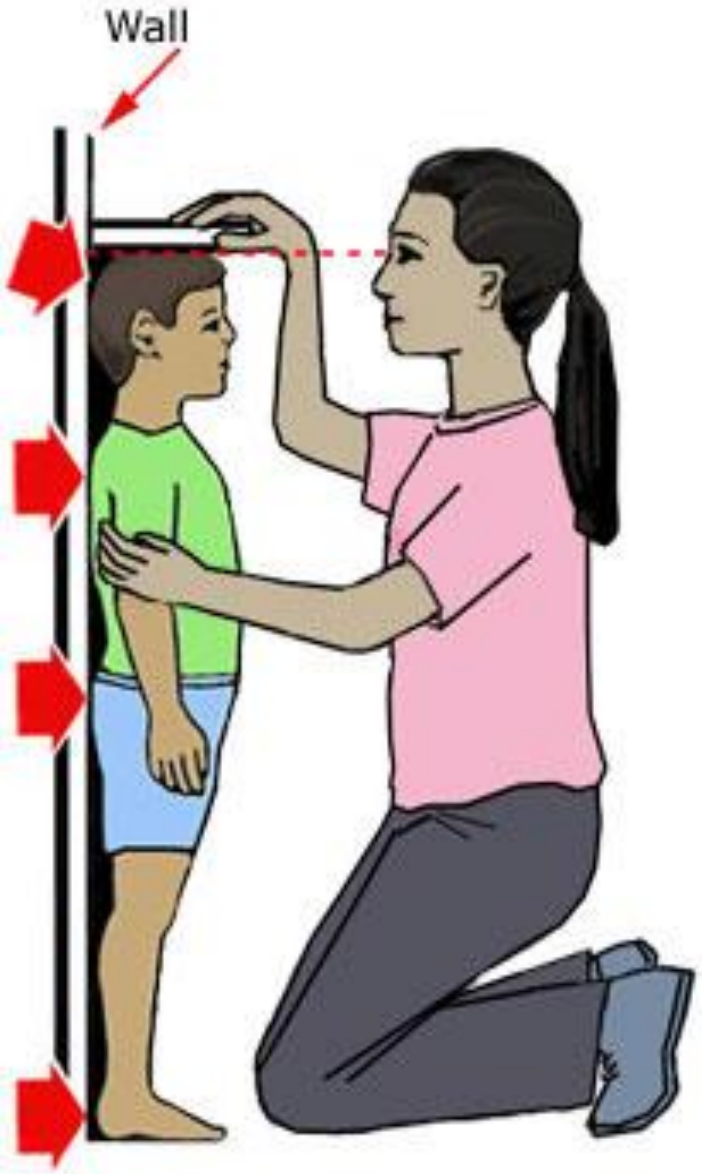
- Length is measured if a child is aged <2 years old.



Height Measurement

If the child can stand independently

1. Place the length/height board on a flat surface.
2. Remove the child's shoes and headwear.
3. Make sure the shoulder blades, buttocks and heels touch the horizontal/ vertical surface of the board. The feet should be flat on the floor, close together and touching the back of the board. The legs and back should be straight, with arms at the sides. The shoulders should be relaxed and touching the board. The head need not touch the board.
4. Record the measurement to the nearest 0.1 cm



Height Measurement

*Children who cannot stand independently due to deformities, there height/length can be measured using **knee height**.*

Steps to measure knee height

1. Request the child to lie in supine position, with both the left knee and the ankle joints flexed at an angle of 90°
2. Place one end (starting from 0) of the measuring tape about two inches behind the kneecap.
3. Measure the distance from this point till bottom of the heel to the nearest of 0.1 cm.

Estimate length/ height from knee height using the following formula: **Hight = (2.69 × knee height) + 24.2**

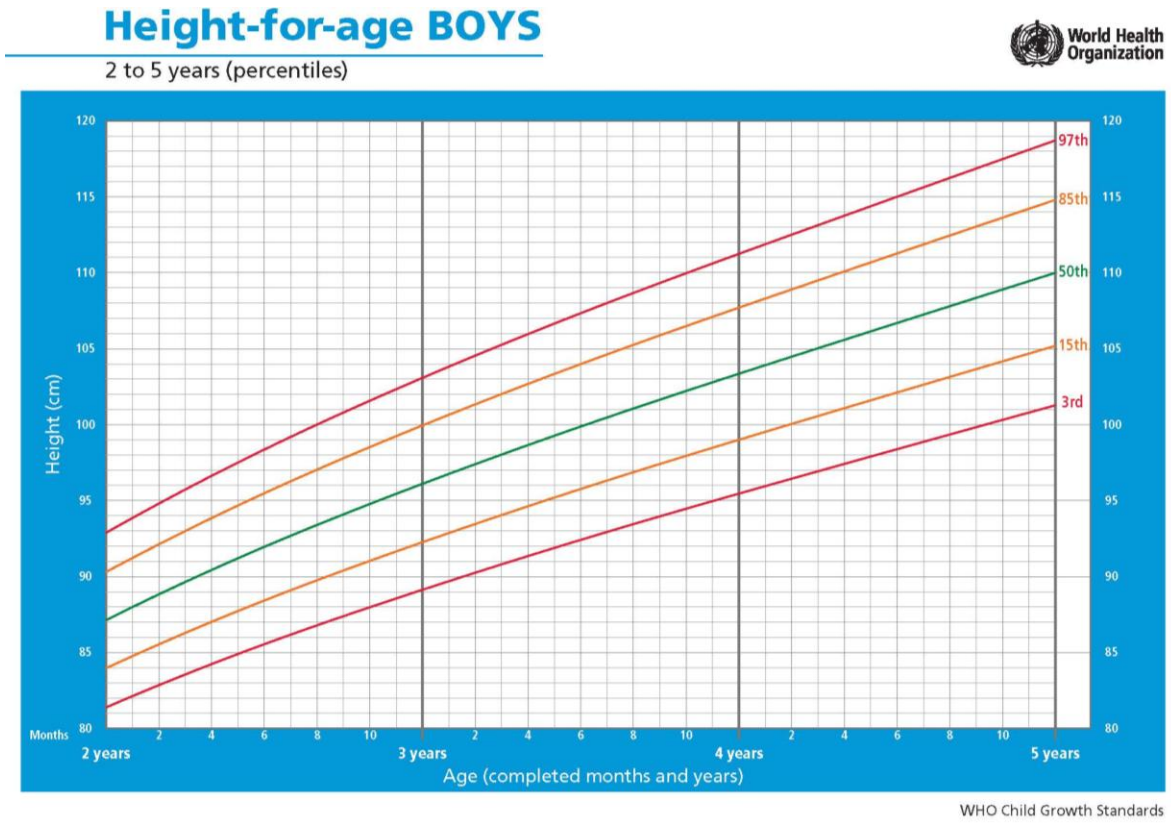
Other proxy indicators for measuring height of children with CP

Segmental measure	*Equation to estimate stature (S) (cm)*	*SE of estimate (cm)*
Children with CP (age: birth –12 years)[4]		
Upper arm length, UAL	$S = (4.35 \times \text{UAL}) + 21.8$	1.7
Tibial length, TL	$S = (3.26 \times \text{TL}) + 30.8$	1.4
Knee height, KH	$S = (2.69 \times \text{KH}) + 24.2$	1.1

Limitations: applicable for children with CP aged 12Y or less

Is the Child Stunted?

We need to plot the child's length/height against her age as shown below.



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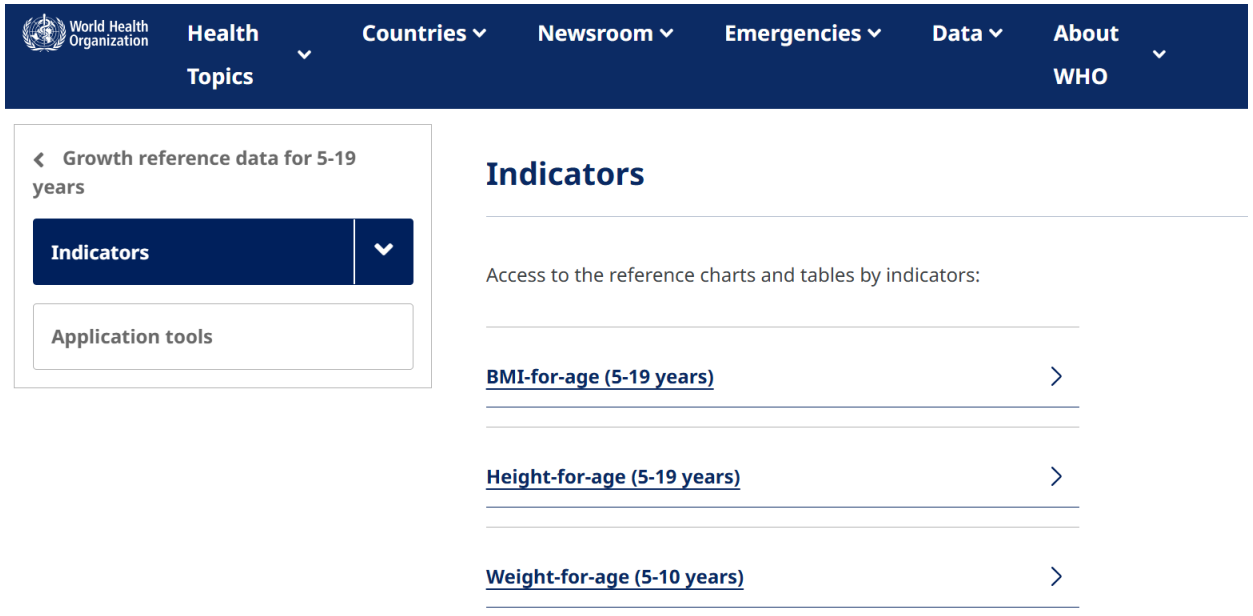
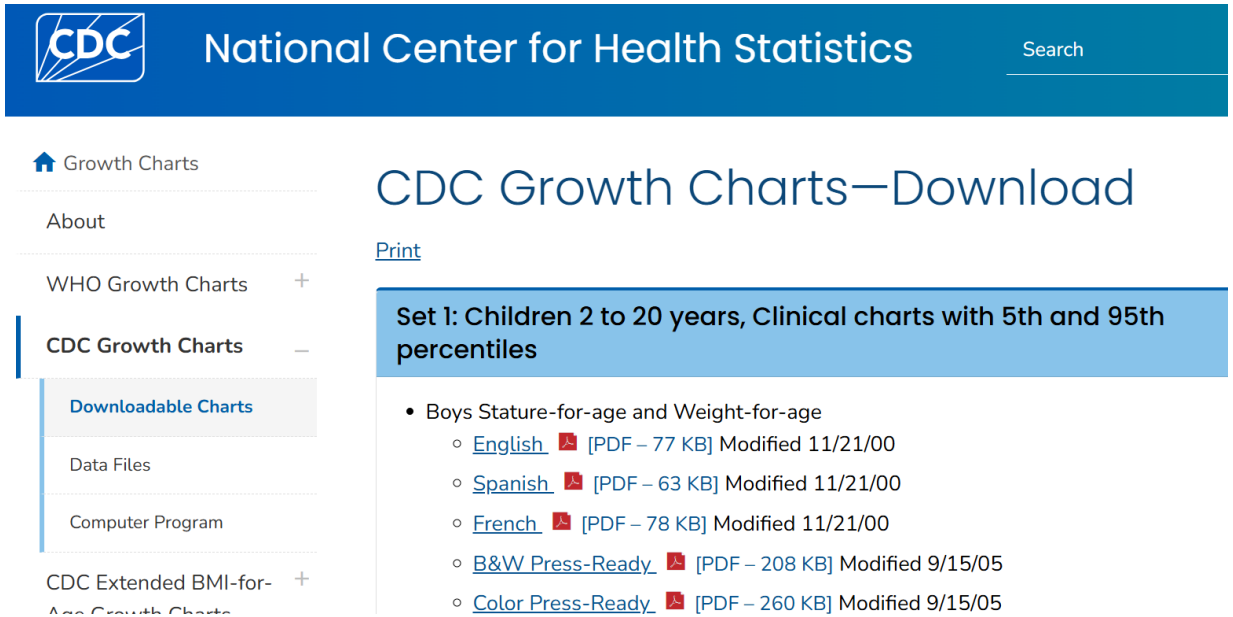
Growth standards for children aged above 5 years





Link: https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators

Link: https://www.cdc.gov/growthcharts/cdc-charts.htm

Growth charts for children with Cerebral Palsy

Mid-Upper Arm Circumference (MUAC)

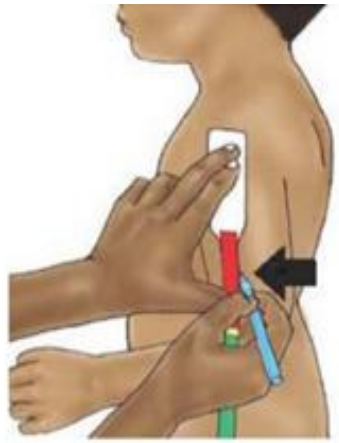
MUAC serve as a useful tool/ indicator for identification of acute malnutrition in children specially those aged less than 5 years.

However, MUAC can be used as screening tool for older children as well.

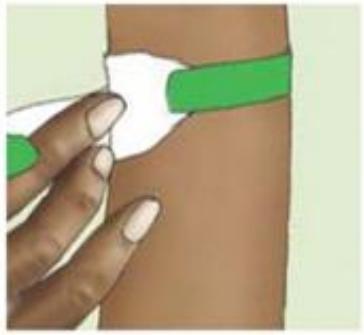
1. Bend the left arm at a 90° angle.

2. Find the top of the shoulder and the tip of the elbow.

3. Keep the tape at eye level and place it at the top of the shoulder. Put your right thumb on the tape where it meets the tip of the elbow (endpoint).



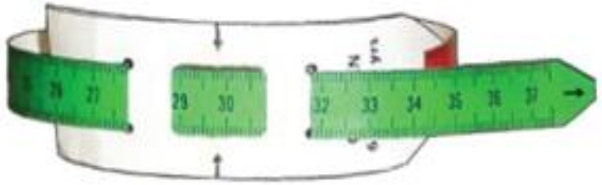
4. Find the middle of the upper arm by carefully folding the endpoint to the top edge of the tape. Place your left thumb on the point where the tape folds (midpoint). Mark the midpoint with a finger or pen.



5. Straighten the arm and wrap the tape around the arm at the midpoint.
6. Place the tape through the window and correct the tape tension.

Too loose

Too tight



7. Read the measurement in cm in the window where the arrows point inward.
8. Record the measurement to the nearest 0.1 cm and note the color.

Is the Child Suffering from Acute Malnutrition?

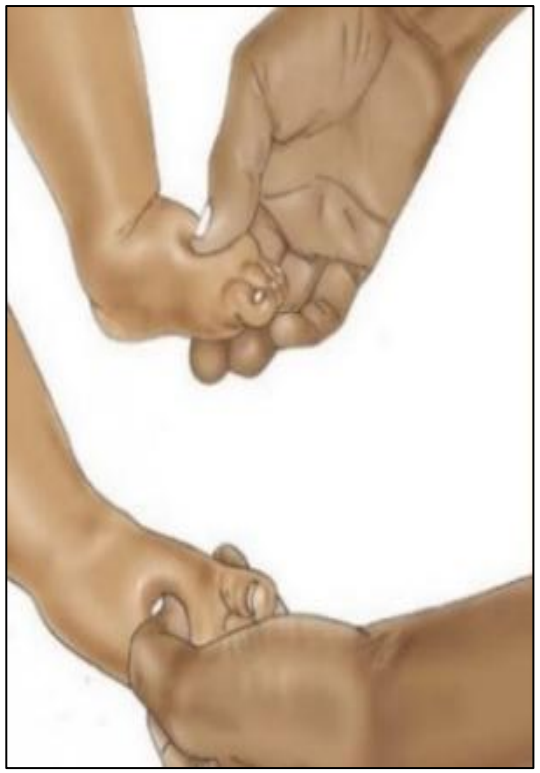
- If a child falls into the yellow zone, it means that the child has moderate acute malnutrition
- If the child falls into the red zone, it means that the child has severe acute malnutrition.

Child's age	MUAC cut-offs		
	Normal	Moderate Acute Malnutrition (MAM)	Severe Acute Malnutrition (SAM)
6mo – 5y	≥12.5 cm	≥11.5 cm to <12.5 cm	<11.5 cm
5y – 9y	≥14.5 cm	≥13.5 to <14.5 cm	<13.5 cm
10y – 14y	≥18.5 cm	≥16.0 to <18.5 cm	<16.0 cm
15y – 17y	≥22.0 cm	≥18.5 to <22.0 cm	<18.5 cm

Assessing Edema

Checking for bilateral pitting oedema among children aged 6 – 59m:

Oedema is a swelling caused by the accumulation of fluid in the body tissues. Oedema is a sign of severe acute malnutrition only if it is in either both feet or both legs.



Grade	Definition
Absent or 0	No bilateral pitting oedema
+	Mild (in both feet or ankles)
++	Moderate (in both feet plus both lower legs, both hands or both lower arms)
+++	Severe (generalised, in both feet, both legs, both hands, both arms and face)

Other Signs of Undernutrition

1. Reduced appetite
2. Feeling tired/ weaker all the time,
3. Frequent illness, long recovery time, and poor wound healing,
4. Lethargic, low mood, sadness, depression, irritability,
5. Loose/ wrinkled skin (marasmus), shiny and edematous (kwashiorkor), dry skin etc.,
6. Dull, sparse, brittle hair,
7. Dry eyes, pale eyes, infection in eyes,
8. Lesions at the corner of mouth, swollen, cracked lips, sore throat, bleeding gums,
9. Abnormality in teeth and nails, etc.


Q/A

Practical Session

Prevention and Control/Management of Malnutrition among Children with Cerebral Palsy

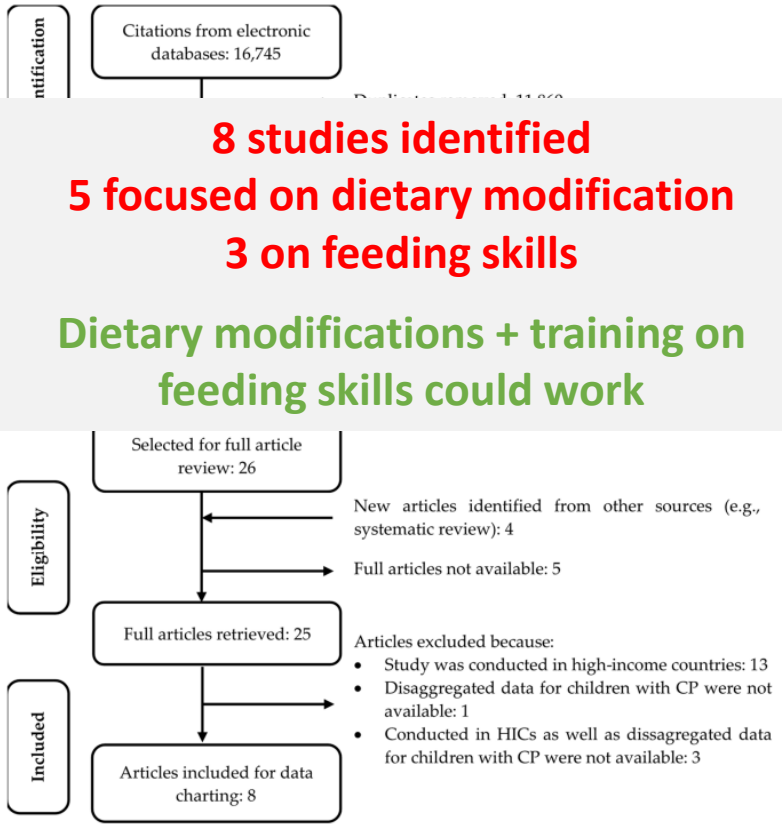
Current evidence - nutrition intervention for children with CP in LMICs

nutrients MDPI

Review

Nutrition Interventions for Children with Cerebral Palsy in Low- and Middle-Income Countries: A Scoping Review

Israt Jahan [1,2,3], Risad Sultana [1,2], Mohammad Muhit [1,2], Delwar Akbar [4], Tasneem Karim [1,2,5,6], Mahmudul Hassan Al Imam [1,2,3,7], Manik Chandra Das [1,2], Hayley Smithers-Sheedy [6], Sarah McIntyre [6], Nadia Badawi [6,8] and Gulam Khandaker [3,5,7,*]



8 studies identified
5 focused on dietary modification
3 on feeding skills

Dietary modifications + training on feeding skills could work

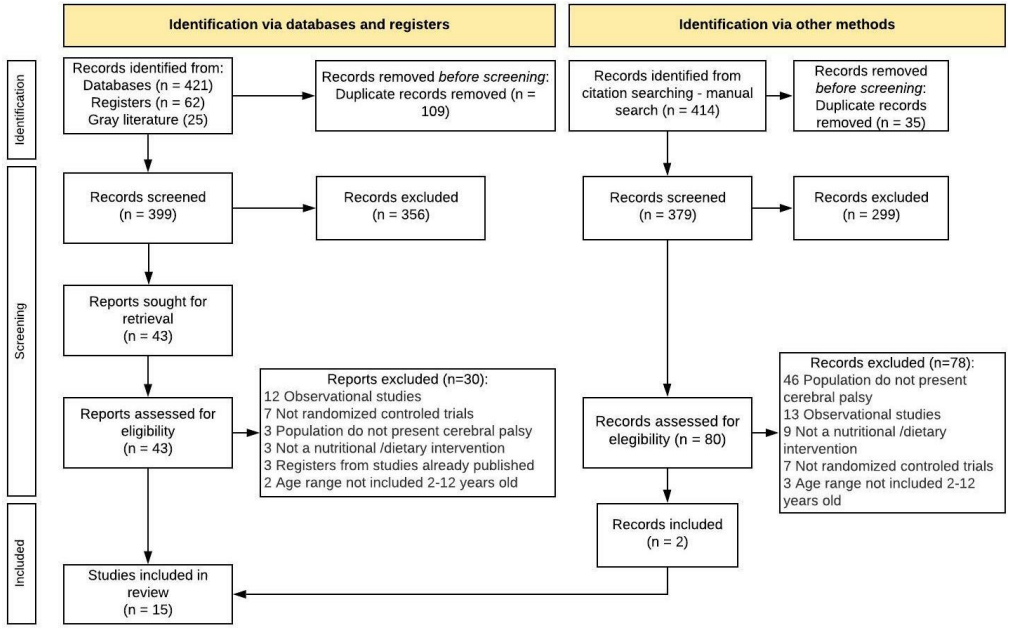
PLOS ONE

OPEN ACCESS PEER-REVIEWED
RESEARCH ARTICLE

Dietary and nutritional interventions in children with cerebral palsy: A systematic literature review

Fernanda Rebelo, Isabela Rodrigues Mansur, Teresa Cristina Miglioli, Maria Dalva Baker Meio, Saint Clair Gomes Junior

Published: July 22, 2022 • https://doi.org/10.1371/journal.pone.0271993

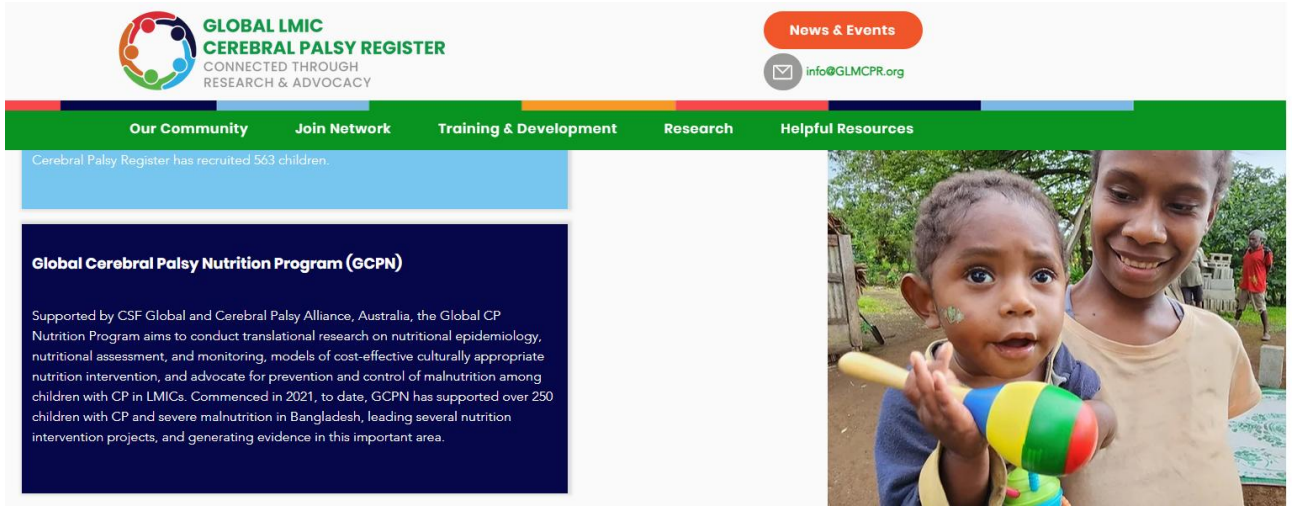


1 study from LMIC

Educational intervention improves feeding skills

Global Cerebral Palsy Nutrition Program (GCPN)

- A GLM CPR initiative
- Timeline: 2022-2026
- Funded by the Cerebral Palsy Alliance Research Foundation, Australia



Components

1	2	3	4
Nutritional epidemiology	Standardized growth monitoring	Low-cost, culturally appropriate nutrition interventions	Capacity building, advocacy, and awareness

Preventing **U**ndernutrition through **S**ocial **H**ealth intervention and **T**eleconsultation **I**n children with **C**erebral **P**alsy (**PUSHTI-CP)**

Basic principles for dietary modifications

Adaption of the available guidelines from HICs

Recommendations for Nutritional Management of Children with Neurological Impairment (NI)

ESPGHAN

Dietetic Management of Children with Neurological Impairments (NI)

ESPGHAN

OPEN

European Journal of Clinical Nutrition (2013) **67,** S13–S16

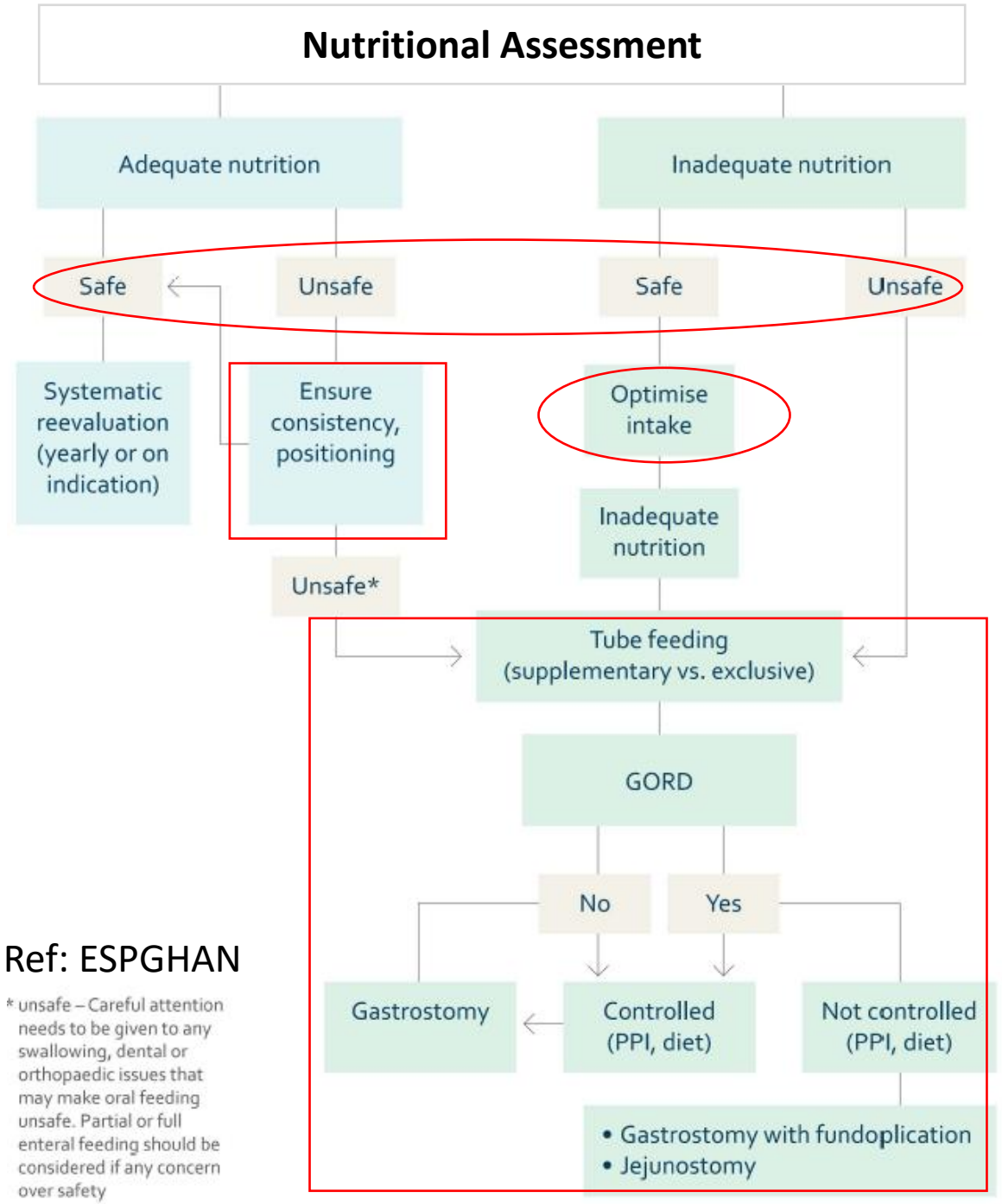
www.nature.com/ejcn

REVIEW

Nutritional management of children with cerebral palsy

KL Bell[1,2] and L Samson-Fang[3]

Guidelines from HICs



Ref: ESPGHAN

* unsafe – Careful attention needs to be given to any swallowing, dental or orthopaedic issues that may make oral feeding unsafe. Partial or full enteral feeding should be considered if any concern over safety

Checklist

- ☐ Is the child undernourished?
- ☐ Are there signs of micronutrient deficiencies?
- ☐ Does the child fall ill frequently?
- ☐ Is the child’s food intake adequate?
- ☐ Does the child have difficulties with eating, drinking, or swallowing?
- ☐ Are there any co-morbidities?
- ☐ Does the child have any gastrointestinal symptoms?
- ☐ How is the child’s hydration status?
- ☐ What is the child’s bone health status?
- ☐ Is there access to adequate feeding support and caregiver assistance?

Basic Principles – First 1000 days

Breastmilk

- Initiation: first hr of birth
- Exclusive breastfeeding: 6 months (180 days)
- Continuation till 2 years

Diverse and nutrient-dense foods

To meet the minimum dietary diversty, 5 of 8 food groups are required.

Animal-source foods, fruits and vegetables

Fortified foods or vitamins and mineral supplements
(as needed)

Avoid giving drinks or food with low nutrient value

Avoid adding sugars to home prepared foods and beverages

Key recommendations

1. DIETARY INTAKE

- **Oral feeding** is preferred; trial period depends on child's age and severity of malnutrition. ***Enteral feeding to be used if total oral feeding time exceeds 3 hours per day***
- Diet composition should be discussed with dietitians to modify textures and ensure safe and efficient food intake.
- **Energy** requirement: Same as children without CP. However, may differ according to impairment, mobility and other factors. Recommended practice -
    - Regular infant formula for <12 months of age,
    - Standard (1.0kcal/mL) polymeric age-appropriate formula including fibre for children >1 year
    - Additional 20% increase in energy intake may be required for 'catch up' growth.
    - High-energy density formula (1.5 kcal/mL) containing fibre for cases of poor volume tolerance, provided hydration is carefully monitored.

Cont.

- **Protein** requirement: similar to a child without CP
    - Would differ for tube-fed children.
    - For severely undernourished children, additional protein (2.0g.kg-1.day-1).
- **Fibre** requirement: should be normal e.g age plus 5 g/day in children older than 2 years.
- **Micronutrient:** Similar to children without CP
- **Hydration:** Should be carefully monitored as body composition is altered in children with CP.

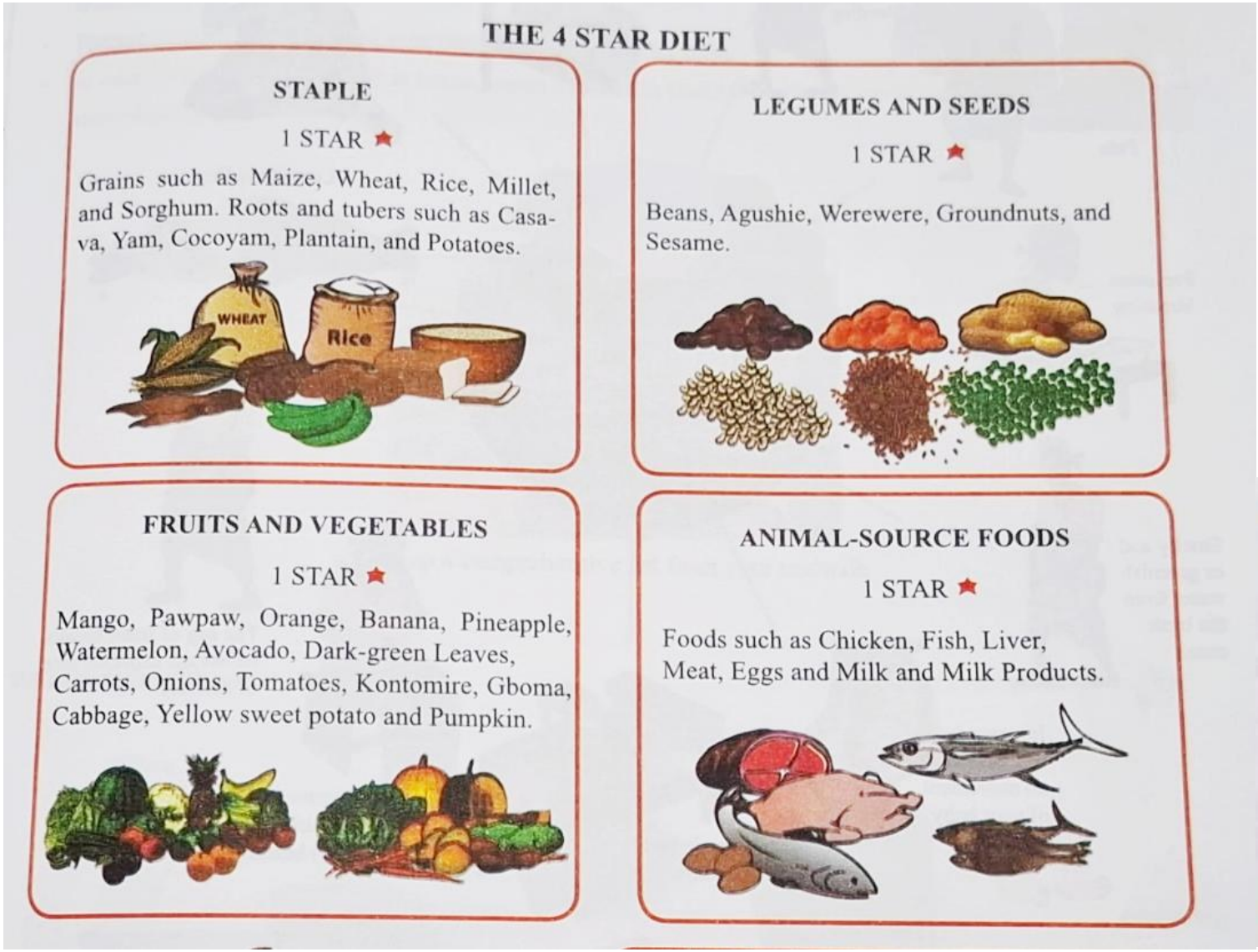
2. FEED SAFETY

3. MANAGEMENT OF COMPLICATIONS

Key to remember when planning a menu

- Q = Quality [e.g., dietary diversity]
- Q = Quantity [e.g., portion size and consistency/thickness]
- F = Frequency

Food Groups and Balanced Diet



Child should be fed at 4 STAR foods every day

- Oil and fat such as oil seeds, palm oil, fortified vegetable oil and butter added to vegetables and other foods will improve the absorption of some vitamins and provide extra energy.
- You should use Iodized Salt.
- You should drink lots of water and fresh juice as much as possible.

Commonly consumed food items here -

1.Porridge (corn) with milk and sugar

2. Rice and stew (tomatoes, beans, Coco yam leaves)

3. Banku and Okro soup

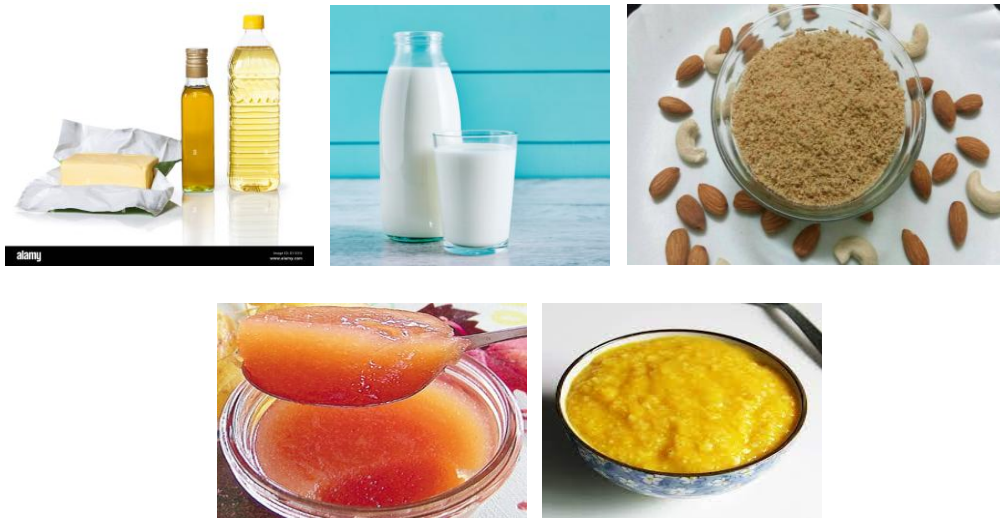
4. Apesie (boiled yam or plantain) and stew

5. TZ (cassava flour) with green leafy vegetables soup

How do we make these commonly consumed food 4 STAR?

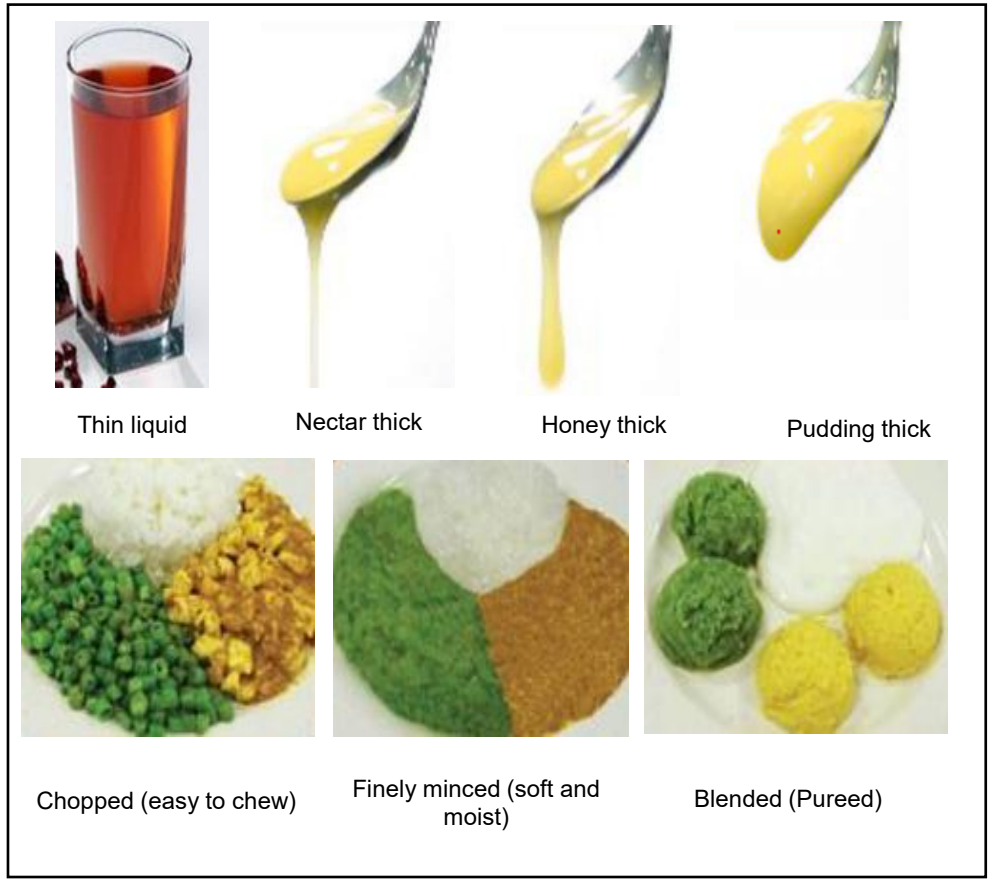
A few Tips to Increase Nutrient Density -

- Add oil, butter, ghee in pureed food
- Add egg, full-fat milk/milk powder and milk products,
- Increase consistency of the cooked food,
- Add powdered nuts and seeds,
- Add dried fruit paste,
- Add starch or powdered mixed cereals/ lentils/ legumes, etc.



Food Consistency or Texture

- Start with food of a smooth consistency – not too runny, not too solid.
- Liquids can be difficult to handle as they travel very quickly and can go down the wrong way, onto the lungs therefore should be fed carefully.
- Gradually increase the food consistency
- Make foods a bit moister and softer if the child has difficulties with chewing, swallowing/ drinking
- Do not offer mixed textured food at once (e.g., lumpy soups, fish bone etc.) as it can be difficult for them to manage.



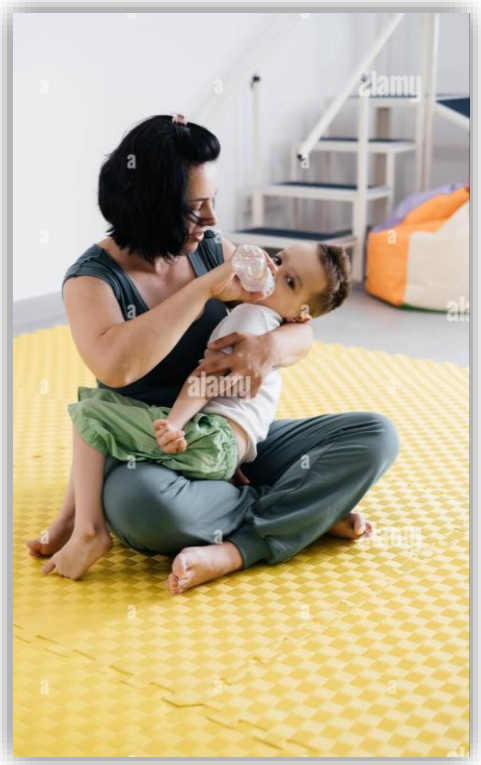
If children are fed with thin liquid/ pureed food, it is very important to modify the quality of the diet to ensure adequate energy and nutrient intake.

Feeding Frequency and Feeding Amount

- **6-8** months should receive at least **2 meals** a day in addition to breastfeeding,
- **9-11** months should receive at least **3-4 meals** a day in addition to breastfeeding,
- 12-23 months should receive at least **4-5 meals** a day in addition to breastfeeding.
- 2 year and above should be fed 4-**5 meals** (3 main and 2 snacks) each day.

Child should be fed small feeds and frequent meals of a balanced diet with extra fat or oil in it

Hydration



Standard Water Intake by Weight (ml/kg)

- Infants and children up to 10 kg: 100 ml per kg body weight per day
- Children 11–20 kg: 1000 ml for first 10 kg + 50 ml per kg for each additional kg above 10
- Children over 20 kg: 1500 ml for first 20 kg + 20 ml per kg for each additional kg above 20 kg
- Maximum: 2400 ml per day, unless otherwise indicated for higher needs

Example Calculations

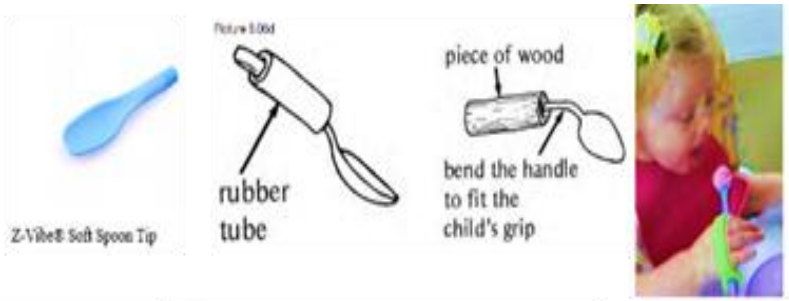
Weight	Daily Water Requirement
8 kg	800 ml (8 × 100)
15 kg	1000 ml (for first 10 kg) + 250 ml (5 × 50) = 1250 ml
25 kg	1500 ml (for first 20 kg) + 100 ml (5 × 20) = 1600 ml

Basic Principles – Feeding Position

- The child's body is upright in a sturdy seat. For children with hypotonia head and neck control is compromised which may complicate sit in upright position. There are adaptive chairs available to help child sit
- The head is upright, not leaning back or flopping sideways and slightly forward with chin tucked in.
- Arms are forward and rest comfortably.
- Triple flexion of lower limbs (sitting with hips, knees and ankles at 90°)
- Arms resting on a table or tray with a cut-out when fed in a wheelchair
- Feet resting on a firm surface.

Basic Principles – Feeding Utensils

- Small spoons (teaspoon) should be used to feed the child. If there is a strong bite, it's safer to use a strong plastic spoon. Correct way to feed using a spoon:
  - give food from the front and straight – place gently on the lower lip so that the child can feel it.
  - do not drag up the spoon over the top lip when taken out.
- Flexi cups/ nose cut out cups can be used to overcome difficulties with drinking.



Flexi cup to change the shape Allows to drink with little or not head/neck movement

Rolled Edge Bowl Plastic High Wall Plate

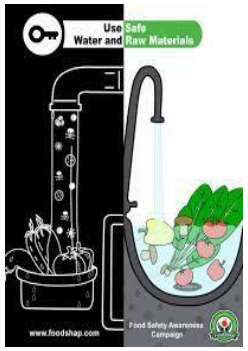
- Feeding by hand may be appropriate, if the child can manage a more solid consistency.
- Child should be fed with positive verbal encouragement and should NEVER force feed.

Basic Principles - Keeping Food Safe and Clean

Keep utensils and kitchen clean

Maintain personal hygiene

Wash raw vegetables and fruits before consumption and cutting



Use safe water and raw Materials

Avoid peeling some fruits and vegetables e.g., apple, carrot, potato cucumber etc.)

Separate raw and cooked foods

Cut vegetables in large pieces

Cook thoroughly

Keep food in cool places and covered

Feeding Difficulties and Digestive issues

Common symptoms:

- Choaking and aspiration
- Issues with swallowing or sucking
- Constipation
- Incontinence
- Vomiting

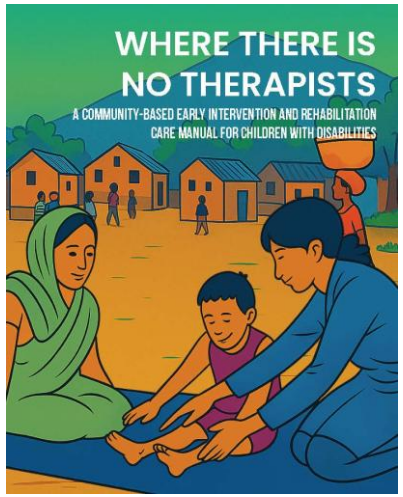
Dietary Management for constipation

- Excessive cow's milk intake may exacerbate constipation in some children as it has inadequate dietary fiber
- Excess intake of dietary fiber and fluid is NOT a solution for constipation management. There is no need to increase fluid intake beyond daily maintenance fluid requirements
- Children should be offered a balanced diet with the recommended amount of dietary fibers
- Dairy products such as yoghurt are good source of probiotics which helps emptying bowels by softening stools. This also improves general gut health,
- Fried foods, spicy foods and food containing high fat should be avoided as they delay digestion process.

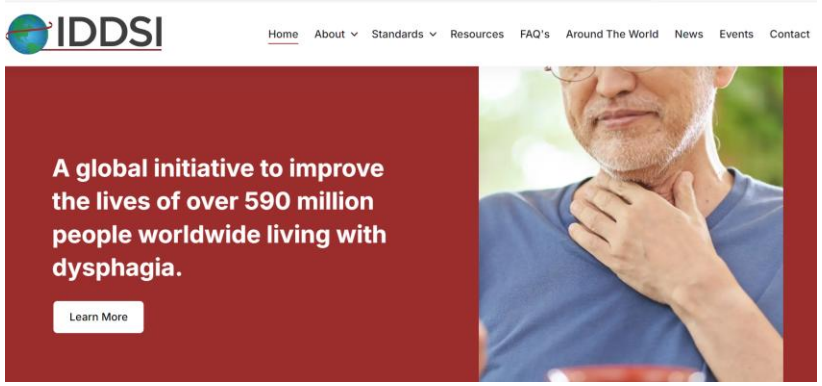
Toilet Training

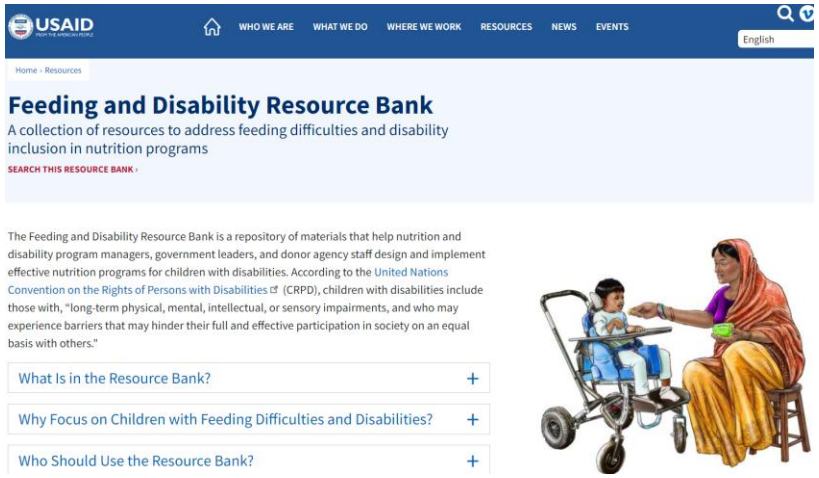
- Children should be encouraged to exercise more
- Trying to maintain a good toilet position may be useful for children who has difficulties in passing a stool or suffering from constipation
- Children should be encouraged not to put off going to the toilet when feeling the urge as delaying a bowel movement can contribute to constipation
- Allow a child plenty of time to sit on the toilet; a good time for this maybe after breakfast or lunch, when the child's bowels are most active.

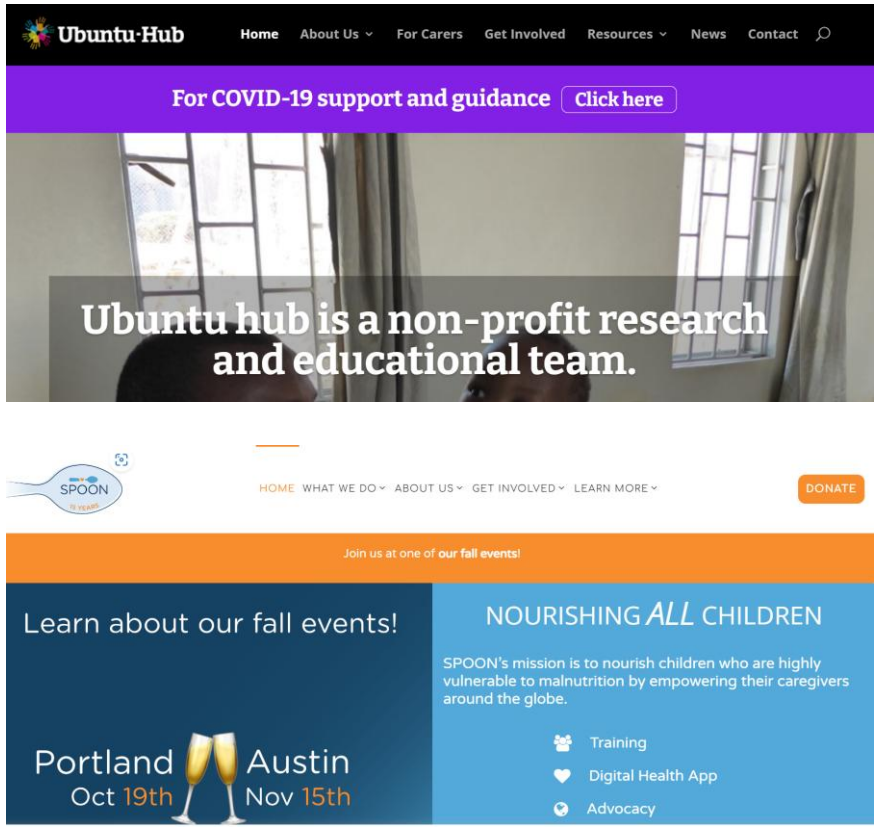
Knees higher than hips
Lean forwards and put elbows on your knees
Bulge out your abdomen
Straighten your spine



Global LMIC CP Register (GLM CPR) Website:
https://www.glmcpr.org







Useful resources


Q/A

Thank you!