SLIDE 1  Technical Seminar - Diarrhoea

During this technical seminar, I'll explain the assessment, classification and management of children with diarrhoea. I'll include the assessment for dehydration and its therapy, as well.

The seminar will also look at the assessment and therapy of children with persistent diarrhoea and dysentery. We'll discuss specific therapies for diarrhoea, which include fluid rehydration for children with dehydration, fluid management and nutritional rehabilitation for those with persistent diarrhoea, and antibiotics for children with dysentery.

SLIDE 2  Diarrhoea — Assessment

Every child with diarrhoea should be assessed for dehydration.

You should ask two questions for every child who has diarrhoea: its duration and the presence of blood in the stools. A duration of diarrhoea greater than or equal to 14 days requires assessment, classification and treatment of persistent diarrhoea.

The presence of blood in the stools requires the assessment, classification and further treatment of dysentery with locally-available, specific and effective antibiotics.

SLIDE 3  Dehydration — Assessment (continued)

The IMCI guidelines have modified the assessment of dehydration (1). Four indicators are now used to classify a child with dehydration: the sensorium; the presence or absence of sunken eyes; whether a child drinks poorly or eagerly; and whether the skin pinch goes back very slowly or slowly.

The sensorium is first assessed: whether the child is lethargic or unconscious or whether the child is restless and irritable. In a child with diarrhoea, abnormal sleepiness or lethargy is
indicative either of severe dehydration or of an associated severe classification of disease. Restlessness is a reflection of increased thirst in a child and indicates some dehydration.

**Sunken eyes** are a sign of dehydration. It is very important during the assessment of sunken eyes to make both a subjective and objective observation. What may be imperceptible to the health worker may be clearly perceptible to the mother. Ask the caretaker whether she or he thinks that the eyes are different, or sunken, from a time when the child did not have diarrhoea.

The assessment of **drinking** is also very important. The child should be offered a drink — “teased,” so to speak — but not actually be allowed to drink the fluid. If the child is given a spoon with water or a cup with ORS, and the child starts drinking, it’s not easy to differentiate between drinking normally and drinking eagerly. But when a child is teased, you can see that the child either refuses to feed, because the child does not wish to, or takes fluids normally. A child with some dehydration will eagerly seek fluids being offered. This behavior helps identify a child as “drinking eagerly.” A child who is unable to feed or who drinks poorly is usually severely ill either due to severe dehydration or another severe classification. In this circumstance, drinking poorly should be clearly differentiated from normal drinking.

The **skin pinch** is often the most difficult assessment in a child with diarrhea disease. The skin of the abdomen should be pinched halfway between the side — lateral margins of the abdomen — and the umbilicus. The skin should be pinched in a longitudinal manner, i.e., with the skin fold in a thoraco-inguinal direction.

We recommend that you pinch the skin between the **thumb and the bent fore-finger**. Once the skin is pinched up, it should be held for a second or two and released by opening the finger and thumb. The skin pinch can then be viewed between the open finger and thumb.
SLIDE 4 Dehydration — Assessment (continued)

There are some common mistakes you should avoid!

1. Pinching either too close to the midline or too far laterally
2. Pinching the skin in an horizontal direction
3. Not pinching the skin long enough
4. Releasing the skin so that the finger and thumb remain in a closed position

When done correctly, it’s quite easy to assess how quickly the skin pinch returns:
- normal — it goes back immediately
- slowly — the fold is visible for less than 2 seconds
- very slowly — the fold is visible for more than 2 seconds.

SLIDE 5 Dehydration — Assessment (continued)

A child with severe dehydration will have at least two of the following four signs: sensorium is abnormally sleepy or lethargic, sunken eyes, drinking poorly or not at all, and a very slow skin pinch.

A child with some signs of dehydration will have two of the following: restlessness or irritability, sunken eyes, drinking eagerly or slow skin pinch.

A child with either one or none of these signs is classified as having no signs of dehydration. Showing one sign of dehydration in each of the two classifications — severe and some dehydration — usually does not occur. If it does, the health worker’s assessment often was wrong, or there was another condition — for example, meningitis or malaria for alteration in sensorium, or visible severe wasting in a child whose skin pinch is very slow — in combination with a single sign of dehydration from diarrhoeal disease.
**SLIDE 6  Dehydration — Assessment (continued)**

Assessing dehydration using the IMCI guidelines differs from the earlier assessment used in the CDD program (2). Assessment has been simplified to check for the presence of two of four possible signs. These signs are unambiguous and make it possible to easily differentiate between the three classifications of dehydration.

The term “floppy” is no longer a part of the assessment since it does not add any specificity to the three clearly distinguishable states of sensorium — normal, irritable, lethargic.

Assessment of tears has been excluded because it is sometimes difficult to assess tears in a child who is not crying and it does not add any further sensitivity to the assessment.

The assessment of dryness of the mouth and tongue meant introducing a finger into a child’s mouth, which, besides being unhygienic in a breastfed baby, was also fraught with the danger that the toothed child would bite the examiner’s finger!

Finally, there was no additional increase in sensitivity using an assessment of “very sunken” versus “sunken” eyes. Differentiating between the two was often difficult and, indeed, health workers would often miss this sign. The current IMCI guidelines for assessing sunken eyes, however, allows for taking the caretaker’s opinion into account when a health worker, not knowing the child, could miss sunken eyes.

Conversely, the time taken for the skin fold to go back to normal is easily quantifiable and the correct assessment is done using the abdomen for the pinch and assessing the amount of time the pinch takes to return to normal.

**SLIDE 7  Dehydration — Classification**

The previous star signs from the CDD guidelines, which were essential for classifying a child into one or the other category, have been dropped.
While accurate, the star signs made assessment much more complicated since a star sign was needed to classify dehydration, regardless of how many other signs of dehydration were present.

Now, we can rely on a simple assessment of four signs that are easily quantifiable and unambiguous. The presence of two or more signs allows for the easy differentiation between no, some, and severe dehydration.

**SLIDE 8  Home Fluids for Diarrhoea - Selection**

When discussing fluid therapy, we usually focus on home fluids (3). Since the formula and composition of oral rehydration solution are standard, and the method for its delivery has been standardized, as has the use of intravenous fluids, ORS will not be discussed in this technical seminar. However, health workers have to recommend home fluids based on the particular circumstance of the family and culturally-acceptable alternatives.

The choice of home fluids should be based primarily on safety. Since these fluids will be given at home and are not monitored for composition, they should be:

- **safe even when given in large quantities**;
- **easy to prepare**;
- **an acceptable color and palatability**; and
- **effective** in preventing dehydration since the primary aim of home fluids is to replace ongoing fluid loss and to prevent dehydration.

**SLIDE 9  Home Fluids for Diarrhoea – Selection (continued)**

Ideal home fluids are those that contain both salt and nutrients (3). Home fluids ideally should contain **sodium**, **potassium**, **chloride**, and **bicarbonate** as these are lost when fluid is lost. Furthermore, since the child with diarrhoea often does not eat very much, it is essential that **calories be**
replenished. Thus, ORS solution and salted soups or drinks would meet these criteria.

**SLIDE 10  Home Fluids for Diarrhoea – Selection (continued)**

Many fluids that do not contain salt are also acceptable.

Examples are unsalted soups, water in which cereal has been cooked, yogurt-based drinks, green coconut water, unsweetened fruit juice, weak tea or plain clean water. Most of these except weak tea and clean water will contain some nutrients as well.

**SLIDE 11  Home fluids for Diarrhoea - Fluids to Avoid**

Development of hypernatremia is a major concern in the prevention and correction of dehydration (4). **Hypernatremic dehydration** can occur when a child with diarrhoea receives fluids that contain **high quantities of sodium**. In hot climates, high temperatures cause sweating which further concentrates intravascular sodium. Since hypernatremic dehydration is associated with seizures and cerebral edema, and can result in permanent brain damage, this is a very serious complication.

**Fluids containing sodium**, such as most soft drinks and some **sweetened fruit drinks**, should be discouraged. Sweetened tea may contain very high quantities of glucose and its excretion is associated with a loss of potassium and further sodium retention which may aggravate hypernatremia.

Finally, fluids that contain **stimulants or have a diuretic effect**, such as caffeine-containing drinks like coffee and tea, or those that have a **purgatory effect**, such as some medicinal teas or infusions, should be avoided. The latter are often included in traditional herbal remedies or traditional remedies for diarrhoea and should be discouraged.
Dysentery usually caused by *Salmonella* or *Shigella* species requires specific antibiotic treatment (5).

Antibiotics are most effective for *Shigella* species, especially *Shigella dysenteriae* type one, or Sd1, and for *Salmonella* in the infant under one year of age.

In these situations, antibiotic use shortens the duration of illness and reduces the risk of parenteral spread of these invasive microorganisms into the bloodstream and other sites. The correct choice of antibiotic, however, is very important!

Using antibiotics to which the bacteria are resistant could progress the disease.

The resulting complications are: extensive mucosal damage to the large bowel, parenteral spread of the bacteria to the bloodstream — septicemia, septic shock, hematogenous spread to bones, brain and meninges — and, for *Shigella* species, a syndrome comprised of hemolysis, renal failure and hemorrhage, and thromboses of blood vessels in the bowel, brain and other parts of the body, for example, hemolytic uremic syndrome.

In developing countries, these complications are particularly serious in infants and malnourished children, and can be fatal.

Since invasive strains of *Shigella* and *Salmonella* are relatively common, the choice of antibiotics depends very clearly on the sensitivity pattern of *Shigella* species in the country. It is important to look at sensitivity patterns from several outbreaks.
in the country or a neighboring country if local data are not available (6).

Sd1 epidemics occur about every 10 years, with much lower levels of Sd1 in the community during inter-epidemic periods. So, even though the proportion of children with Sd1 in non-epidemic years may not appear to be very large, during epidemics these can easily account for more than 50 percent of cases of dysentery. Shigella dysentery 1 is the most important pathogen for which sensitivities are required. Other Shigella and Salmonella strains are less invasive and cause less severe disease.

Unfortunately, with the development of multiple resistant Shigella and Salmonella species, many countries have limited choice of oral drugs. Antibiotics should be: effective when given orally, inexpensive and readily available.

**SLIDE 15 Shigella – Ineffective antibiotics**

Metronidazole is used for the treatment for amoebic dysentery but Shigella are uniformly resistant to this antibiotic. Other antimicrobials that are completely ineffective include Streptomycin, all the Tetracyclines, Chloramphenicol and Sulfonamides (7).

**SLIDE 16 Shigella – Ineffective antibiotics (continued)**

There are other antimicrobials to which Shigella are sensitive in the laboratory but human trials have shown them to be ineffective in vivo. These are all the Aminoglycosides, Nitrofurans, such as Furazolidone, the first- and second-generation cephalosporins and, surprisingly, Amoxicillin. While Amoxicillin has not been shown to be effective for the treatment for Shigella, Ampicillin has been.
**SLIDE 17 Shigella – Effective antibiotics**

Two drugs — **Ampicillin and Trimethoprim-Sulfamethoxazole** — are commonly used for the treatment of both ARI and dysentery. These two antibiotics are inexpensive and readily available in most countries, but unfortunately are not effective anymore as most *Shigella* species have become resistant to both Ampicillin and Trimethoprim-Sulfamethoxazole.

The next least expensive option is Nalidixic acid. This antibiotic, which was commonly used many years ago and then dropped out of favor because of increasing use of Ampicillin and Trimethoprim-Sulfamethoxazole, is becoming the first line antibiotic in many countries. Resistance rates are less than 20 percent to Sd1 in many countries (8). **Nalidixic acid is more expensive, less available and is often not on the essential drug list in countries.** A further disadvantage of Nalidixic acid is that it causes vomiting and pseudotumor cerebrii in young infants who receive an overdose.

**Pivmecillinam, or amdilocillin pizoxil,** and the fluoroquinolones such as Ciprofloxacin are still effective for most strains of Sd1 but are much more costly, and are not readily available in most countries (9). However, short-course therapy with Ciprofloxacin and other quinolones such as Norfloxacin have been shown to be effective against Sd1 and a three-day course may be less costly, but still five times more expensive than Ampicillin or Trimethoprim-Sulfamethoxazole (10).

Finally, **Ceftriaxone** has also been shown to be effective, but is the most expensive alternative and must be given intramuscularly.

**SLIDE 18 Persistent Diarrhoea - Definition**

Persistent diarrhoea is defined as diarrhoea that occurs for 14 or more days. It accounts for less than 10 percent of all diarrhoea but is associated with 30 to 50 percent of diarrhoea deaths (11). Malnutrition greatly increases the risk of death in children with persistent diarrhoea. The major pathogenesis is
due to infection, mucosal injury, delayed repaired of these mucosal injuries and host susceptibility, all strongly influenced by malnutrition.

**SLIDE 19  Persistent Diarrhoea — Causes**

The most important cause of persistent diarrhoea is **secondary disaccharidase deficiency**. Let me explain. The brush border of the epithelial cells lining the small intestine produce disaccharidases that are responsible for the digestion of disaccharides such as sucrose and lactose. In malnourished children and those who have persistent diarrhoea, the brush border is lost, and thus, the ability to digest disaccharides is also lost (12). Ingesting food containing disaccharides, such as milk for example, causes the persistence of diarrhoea because the undigested disaccharides increase osmotic pressure in the GI tract. Other causes of persistent diarrhoea are those that cause mucosal injury. In the malnourished child with poor healing, a combination of infection and mucosal injury result in persistent diarrhoea. These are the *Salmonella* and *Shigella* species as well as EAEC and cryptosporidia (11).

Persistent diarrhoea is as much a function of poor mucosal and host immunity. Factors leading to poor immunity include **protein energy malnutrition, micronutrient deficiencies** in Vitamin A and Zinc (13), and **immunodeficiency** such as AIDS, and can result in poor healing and persistent diarrhoea.

**SLIDE 20  Severe Persistent Diarrhoea - Classification**

A child with persistent diarrhoea and dehydration should be referred to hospital for evaluation and further treatment (11).

There are two main reasons why it is important to recognize a child with persistent diarrhoea and dehydration:

- the **mortality from persistent diarrhoea is 8 to 10 times higher** than that with acute diarrhoea; and
- these children may require both **nutritional rehabilitation** and/or **investigation for immune deficiencies and/or resistant bacteria**.
Persistent Diarrhoea — Therapy

Treating persistent diarrhoea depends on an understanding of the pathophysiology. Therapy must include correcting dehydration, improving nutrition status and using antibiotics.

Reducing disaccharides in the diet — especially milk — is very important. This dietary intolerance is often associated with failure of therapy. When milk is removed from the diet, other protein sources such as vegetable, egg, and meat are well tolerated. Chronic diarrhoea often occurs with underlying malnutrition and, if it persists for a long time, can cause malnutrition itself. Thus, increased caloric intake is essential for therapy of persistent diarrhoea and reduction in mortality.

Micronutrient deficiencies are also common in malnourished children and may be exacerbated by losses in diarrhoea. Supplementing micronutrients, especially Zinc (14), plays an important role in the therapy of persistent diarrhoea. Since micronutrients are not available in sufficient quantities in normal food to make up for deficiencies, supplementation may be necessary.

In children with persistent diarrhoea that have blood in the stools, it is important to treat the cause of dysentery as well. Dysentery causes a loss of iron and further contributes to malnutrition.

Since antibiotics have not been shown to be effective in watery diarrhoea, they should not be used in a child with persistent diarrhoea who does not have dysentery (15,16). Likewise, anti-motility agents are dangerous in infants and young children and should not be used.

Finally because malnutrition is such an important cause of both morbidity and mortality from persistent diarrhoea, feeds should not be diluted; indeed, the nutrient intake of these babies needs to be supplemented in order for good bowel healing to occur.
References


