Electrolyte and mineral water quality in intensive therapeutic feeding centres: informing standards development

Severe acute malnourished (SAM) patients are extremely sensitive to electrolyte and mineral levels, and high concentrations might influence treatment outcomes – water quality guidance is urgently needed.

BACKGROUND and PROJECT AIM

An unusual mortality cluster was observed in an ITFC during the 2017 nutritional crisis in Somali region of Ethiopia, reigniting a discussion about the health impact of mineral (chemical) water quality (WQ) on SAM patients. Highly mineralised groundwater might have impacted treatment outcomes in this and other MSF interventions (e.g. Somalia 2007). This project has the objective of synthesising knowledge around this topic and contributing to the establishment of concrete guidelines for MSF field teams.

THE METHOD

Identify those water quality parameters of most concern in ITFCs using a toxicological risk assessment approach:

1. Hazard Identification
2. Exposure Assessment
3. Risk Characterization (Parameters of Concern)

RISK ASSESSMENT

24 water quality parameters were identified as possible hazards. An exposure assessment tool was developed to quantify the total minerals of reconstituted treatment products (ORS, Resomal, F100 and F75) used under various treatment regimens (see below). A worst case WQ scenario was applied to this calculation tool to compare with standard upper limits from various regulatory bodies, e.g. USEPA and US Institute of Medicine.

Four parameters were considered to be most significant: sodium, magnesium, sulphate and nitrate/nitrite. Only nitrate/nitrite have health based WQ guidance, the others have guideline values based on acceptability alone. Other WQ parameters (e.g. fluoride and arsenic) were considered to be issues over periods of more chronic exposure rather than at the acute level SAM patients are subject to.

EXPERT PANEL

The expert panel meeting highlighted a number of key issues:
- Water quality was not considered when F75 and F100 products were developed
- Osmolarity and renal solute load (RSL) must also be considered significant
- There are no clear upper limits of mineral intake for SAM patients

LITERATURE REVIEW

Only 7 articles were finally considered for inclusion and 3 of these were opinion pieces - a SERIOUS KNOWLEDGE GAP!

MEDEICAL AND TECHNICAL OUTPUTS

Medical Output: Generation of an evidence matrix for all SIX parameters of concern giving:
- Literature findings
- All published recommended daily intakes
- Overviews of expert opinion
- Physiological/metabolic

Technical Output: Water quality testing and treatment options were explored and presented in an extensive knowledge synthesis document. WQ testing protocols were developed (see right) and new water treatment methods recommended for follow-up and potential field trials.

CONCLUSIONS

Mineral water quality is:
- An under-considered risk in ITFCs
- Potentially related to adverse treatment outcomes in SAM patients
- Poorly understood and lacks proper guidance
- Important to other clinical realms, e.g. neonatology and antenatal care

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Expert Panel: James Berkley (University of Oxford/Kenya Medical Research Institute); André Briand (University of Tamperé); Robert Baudouin (Hospital for Sick Children/University of Toronto); Mathieu Valcke (Institut national de santé publique du Québec).

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