



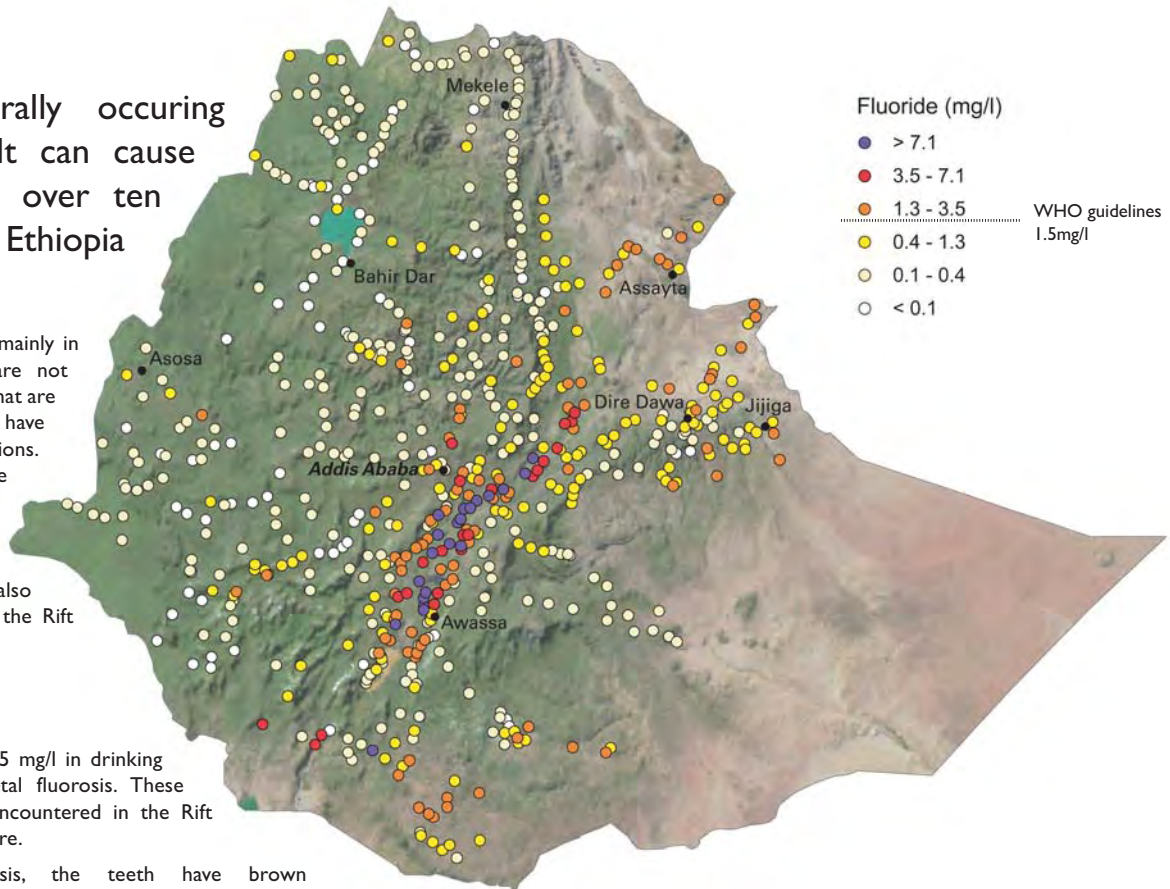
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Fluoride Problems in Ethiopian Drinking Water

Fluoride is a naturally occurring element in water. It can cause health problems and over ten million people in Ethiopia could be at risk.

High fluoride concentrations occur mainly in the Rift Valley. However, they are not universally high, and wells or springs that are only a short distance apart may have radically different fluoride concentrations. This variation is due mainly to the geology: fluoride is dissolved from certain types of rocks or associated with geothermal waters.

Some high fluoride concentrations also occur in drinking water outside of the Rift Valley, but this is less common.



Effects on Health

Concentrations of fluoride above 1.5 mg/l in drinking water can cause dental and skeletal fluorosis. These clinical conditions are commonly encountered in the Rift Valley. The complications have no cure.

With dental fluorosis, the teeth have brown discolouration. Pitting and chipping of the teeth cause functional problems. Dental fluorosis is a life-long handicap (see image left and below right).

Skeletal fluorosis is caused by high concentrations of fluoride in drinking water consumed over many years. Symptoms include joint pains, progressive stiffness and limitation of mobility leading to severe invalidity (crippling skeletal fluorosis - as seen on below left). Disabling neurological complications (paralysis of limbs) occur in about 10 percent of skeletal fluorosis cases.

In areas where children have poor nutrition, or lack calcium, high fluoride can lead to deformity of the lower limbs.

Not all people exposed to high concentrations of fluoride in drinking water develop fluorosis. General health and nutrition and genetic factors can all play an important role. The most vulnerable people are those who are malnourished and with little calcium in their diet.

Potential solutions

There are no easy solutions to the problem of high fluoride concentrations in drinking water, so a combination of approaches will be needed:

- **Target new wells to low fluoride areas.** Since fluoride concentrations are not universally high in the Rift Valley, and can vary from source to source, it may be possible to locate new wells in rocks that have low fluoride concentrations. To do this successfully fluoride distributions would need to be mapped in existing sources, and studies carried out to work out the geological conditions that lead to high fluoride.
- **Reduce annual fluoride intake.** Although fluoride in some wells may be high, fluoride concentrations in rainfall or shallow seasonal springs may be lower. Therefore, promoting the use of low fluoride sources for drinking and cooking purposes for part of the year will help to reduce the annual intake. Also, some food stuffs (e.g. teff and tea) can have high fluoride, therefore identifying variations of fluoride in food and also calcium (which can buffer fluoride) may help to reduce overall fluoride intake.

- **Defluoridation.** There are different techniques to remove fluoride from drinking water. These techniques all have their own strengths and weaknesses, but there are very few examples worldwide of fluoride treatment being sustainable at a household or community level. The most common methods are treatment with aluminium sulfate and lime (Nalgonda method), treatment with activated aluminium, use of bone char or calcinated clay and precipitation. Problems with the organisation of each method exist: the sustained effort, the supply of chemicals, the cost, local sensitivities or the disposal of sludge.

Next steps in Ethiopia

The following actions could be undertaken to start tackling the problem:

- Accelerate the development of safe systems (safe sourcing or defluoridation) in highly fluorosis-affected areas, based on best practice.
- Develop a comprehensive database to guide the development of new water systems in high risk areas in Ethiopia.
- Carry out geological and groundwater studies to map areas of high and low fluoride risk.
- Improve understanding of the impact of socioeconomic status, nutrition and water chemistry on the development of fluorosis.

This poster was produced by RIPPLE in partnership with organisations working on fluorosis in Ethiopia. It aims to create wider understanding of this major problem and supports the work of the National Steering Committee. For online copies of this poster and more information, please see www.rippleethiopia.org

