Association of Down's syndrome and water fluoride level: a systematic review of the evidence

ABSTRACT

The evidence of an association between water fluoride level and Down's syndrome incidence is inconclusive.

INTRODUCTION

Introduction A review of the safety and efficacy of drinking water fluoridation was commissioned by the UK Department of Health to investigate whether the evidence supported a beneficial effect of water fluoridation and whether there was any evidence of adverse effects. Other than dental fluorosis, bone fracture and cancer there was very little evidence available on adverse effects in humans. Down's syndrome was the most discussed of the other adverse effects reported and was therefore selected as the focus for this paper. In approximately 90% of cases, Down's syndrome is due to the non-disjunction of chromosome 21, most often in the oocyte, which may occur during two separate periods: before the completion of the first meiosis or around the time of ovulation. Exposure to risk factors should therefore be measured at the time at which the abnormality may occur, around the time of conception. The main risk factor for Down's syndrome is maternal age with many studies having shown an increased incidence of Down's syndrome with increased maternal age. There has also been some suggestion of an association with paternal age however this has not been confirmed. Other suggested risk factors include race, with an increase rate among Hispanic mothers, ionising radiation, increased parity, although this has not been confirmed by all studies, and season, with a peak in births in summer. Any study of a risk factor for Down's syndrome, such as water fluoride level, should consider these other suggested risk factors as possible confounding factors, and should certainly make attempts to control for the confounding effects of maternal age. Water fluoride level has been suggested as a possible risk factor for Down's syndrome and its association with water fluoride exposure has been investigated by a number of studies. If fluoride is associated with Down's syndrome then other sources of fluoride may act to confound the association of water fluoride level with the incidence of Down's syndrome. For example, two women living in different areas, one with a high water fluoride level and the other with a low water fluoride level, might be receiving similar amounts of fluoride if the woman in the low fluoride area was consuming fluoride from other sources, such as fluoride tablets, tea and fluoridated toothpaste. Exposure to other sources of fluoride should thus be considered and measured so that the effects can be controlled for in the investigation of the association of Down's syndrome with water fluoride levels. The objective of this report is to investigate the association of water fluoride level with Down's syndrome and discuss in detail the quality of the studies investigating this association.

CONCLUSION

Conclusions The evidence of an association between water fluoride level and Down's syndrome incidence is inconclusive. However, the quality of the studies included in the review was relatively low and further high quality research is needed. Future studies investigating the association of Down's syndrome with water fluoride levels should measure individual exposure to water fluoride and control appropriately for confounding factors, especially maternal age, incidence of termination of pregnancies in which the child is

diagnosed with Down's syndrome, and exposure to other sources of fluoride. Study areas should be chosen at random and investigators should be blinded to the fluoridation status of mothers when identifying cases. The denominator selected to measure the risk of a Down's syndrome birth should relate to the total number of births, not to the overall population of the study area. Case ascertainment should be as complete as possible, and should be identical in all populations studies.