

## Increased Incidence of Spina Bifida Occulta in Fluorosis Prone Areas

S.K. Gupta  
R.C. Gupta  
A.K. Seth

Spina bifida is a congenital deformity of posterior wall of vertebra of spine. This is a midline defect of skin, vertebral arches and neural tube, usually in the lumbosacral region. The incidence usually ranges from 0.2-0.4/1000 live births(1). Little is known about the etiology of the spina bifida. It may take any of the following forms(2): (i) *Spina bifida occulta* is due to failure of neural arches to unite, but there is no protrusion of cord or membrane. The spina bifida occulta is an isolated, insignificant finding in about 20% of all spines examined roentgenographically; (ii) *Spina bifida manifesto* commonly takes one of the following forms (a) Meningocele, (b) Meningomyelocele. Other rare forms may be (c) Syringomyelocele, and (d) Myelocele.

Gupta, *et al.*(3) demonstrated that the placenta permits a limited passage of fluoride to the fetal circulation. Gedalia *et al.*(4) showed that once fluoride enters the fetal

circulation, it is incorporated into fetal bones and teeth undergoing calcification. Factors leading to fluoride deposition in bones during extrauterine life (continued intake of water and food having high fluoride content; poor nutrition; protein, calcium and ascorbic acid deficiency) also operate in fetal bones during intrauterine life(5).

### Subjects and Methods

This study was undertaken to evaluate therapeutic effect of a proposed regimen on fluorosis, conducted on 30 children, selected randomly in July 1992, aged 4 to 12 years and ingesting high fluoride concentration (4.5 to 8.5 ppm) in drinking water. The children were evaluated for antenatal history, clinical, dental, radiological and biochemical examination for manifestations of fluorosis. The criteria for grading are summarized in *Table I*.

### Results and Discussion

The children were conceived in the same area. Their mothers were also drinking fluoride rich water during the antenatal period. The children were manifesting clinical (Grades I & II), dental (Grades I to IV) and skeletal fluorosis (Grade 0 & I). The blood fluoride levels were 0.9 to 1.1 ppm while serum fluoride levels ranged from 1.6 to 1.9 ppm.

Of the 30 skiagrams of lumbosacral region, 14 (47%) were showing spina bifida occulta which was silent on clinical examination.

We have not come across literature correlating these two, which is much higher than the 20% reported in literature. Now we are proposing to conduct a randomized controlled study to evaluate a possible correlation between spina bifida and high fluoride intake.

*From the Department of Physiology, S.M.S. Medical College and NEERI Zonal Laboratory, Jaipur.*

*Reprint requests: Dr. Sunil Gupta, 15 Burmese Colony, Jaipur 302 004.*

*Received for publication: July 20, 1993;*

*Accepted: April 30, 1994*

TABLE I—Grading of Fluorosis

---

(A) <i>Clinical Grading(6)</i>
(i) Mild—generalized bone and joint pain.
(ii) Moderate—generalized bone and joint pain, stiffness and rigidity, restricted movements at spine and joints.
(iii) Severe—symptoms of moderate grading with deformities of spine and limbs, knock knees, crippled or bedridden state.
(B) <i>Radiological Grading(6)</i>
(i) Mild—osteosclerosis only.
(ii) Moderate—osteosclerosis, periosteal bone formation, calcification of interosseous membrane, ligaments, capsules, muscular attachments, tendons.
(iii) Severe—findings as in moderate with exostoses, osteophytosis and associated metabolic bone disease.
(C) <i>Dental Fluorosis(7)</i>
Grade 0—normal, translucent, smooth and glossy teeth.
Grade I—white opacities, faint yellow line.
Grade II—Changes as in grade I and brown stains.
Grade III—brown line, pitting and chipped off edges.
Grade IV—brown, black and/or loss of teeth.

---

### Acknowledgements

The investigation was conducted under a research grant received from the Department of Science and Technology, Government of Rajasthan.

### REFERENCES

1. Hutten Locher PR. Spina bifida with meningomyelocele. *In: Nelson textbook of Pediatrics*, 14th edn. Eds. Behrman RE, Vaughan VC, Philadelphia, WB Saunders Co, 1992, pp 1483-1485.
2. Mann Charles V, Russell RCG. Bailey and Love's Short Practice of Surgery, 21st edn. London, Chapman and Hall, 1991, pp 504-505.
3. Gupta S, Seth AK, Gupta A, Gavane AG. Transplacental passage of fluoride. *J Pediatr* 1993, 123: 139-141.
4. Gedalia I, Brezezinski A, *et al.* Fluoride concentration in placental tissue, fetal blood and maternal blood at low and elevated fluoride intake. *J Dent Res* 1964b, 43: 669-671.
5. Fluorine and fluorides, Environmental Health Criteria, Geneva, World Health Organisation, 1984, p 77.
6. Teotia SPS, Teotia M, Singh DP. Bone static and dynamic histomorphometry in endemic fluorosis. *In: Fluoride Research 1985. Studies in Environmental Science Vol. 27*, Amsterdam, Elsevier Science Publishers, 1985, pp 347-355.
7. Rajyalakshmi K, Rao NVR, Krishna N. Investigations on the relevance of defluoridated water and nutritional supplements in fluorosis endemic areas in Andhra Pradesh, India. *In: Fluoride Research 1985: Studies in Environmental Science, Vol. 27*, Amsterdam, Elsevier Science Publishers, 1985, p 358.