Original Research Article

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Prevalence and severity of genu valgum among school children aged 6-12 years in rural South India

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ABSTRACT

Background: Fluorine is the most abundant element in nature, and about 96% of fluoride in the human body is found in bones and teeth. Fluorosis is caused by exposure to a continuous high level of fluoride for a long time leads to dental and skeletal deformities. Study was done to assess the prevalence and severity of genu valgum among the school children in rural Koppal.

Methods: The present cross-sectional study was carried out among all the students, in the age group 6-12 years in Koppal taluk from August 2016 to December 2016. Data was compiled, tabulated and analyzed using proportions and chi-square test.

Results: The total school children enrolled in study 1722, the mean age group was 9.24. 31.4 % were in the age group of 10-11, Male students constituted about 45.1%. Majority of the students had nuclear family in their house (59.8%). Almost half of the study subjects were in class III socio-economic status (42.7%). The prevalence of genu valgum was 11.2%.

Conclusions: The study finding interprets the prevalence of genu valgum is high in the community.

Keywords: School children, Genu valgum, Prevalence, Flurosis

INTRODUCTION

Fluorosis is an important public health problem in 24 countries across the globe. Fluoride in water and eatables is mostly of geological origin. A continuous levels of fluoride more than 1.5 ppm and above in drinking water is considered hazardous for the health. In India, the disease is endemic in about 275 districts of 20 states and UT's, and about bout 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis. Out of these; 6 million are children below the age of 14 years. Skeletal fluorosis clinically manifests in the form of various deformities viz. Genu varum, Genu valgum and Kyphosis. The disease severity depends on many factors like age, nutritional status and response of the individual to exposure.

World Health Organization (WHO) has set the upper limit of fluoride concentration in drinking water at 1.5 mg/l, and The Bureau of Indian Standards, has therefore, laid down Indian standards as 1.0 mg/l as maximum permissible limit of fluoride with further remarks as "lesser the better". 7,8 Exposure to very high fluoride over a prolonged period of time results in acute to chronic skeletal fluorosis. It was stated in 1993 that crippling skeletal fluorosis might occur in people who have ingested 10 to 20 mg of fluoride per day for over 10 to 20 years. Early stages of skeletal fluorosis start with pain in bones and joints, muscle weakness, sporadic pain, stiffness of joints and chronic fatigue. During later stages, calcification of the bones takes place, osteoporosis in long bones, and symptoms of osteosclerosis where the bones become denser and develop abnormal crystalline structure. General skeletal fluorosis directly affects the economy of villagers as it causes illness and debilitation

not only in humans but, also in their domestic animals, on which they depend for their basic income. Skeletal fluorosis leads to impairment, disability and subsequently makes the affected subject handicap. Therefore, they are unable to get employment or labour for their daily livelihood, lead their life as dependents on others. ¹

METHODS

The present cross-sectional study was conducted from August 2016 to December 2016 using the method of population proportionate to size sampling in the age group of 6 to 12 years children. Using the list of villages as per the 2011 census report of Koppal district and by cluster interval 15 villages were selected. Permission from the authorities of education department was obtained. In the selected villages, the primary school visit was done and children in the age group of 6 to 12 years were selected and examined. Total of 1722 students (776 boys and 946 girls) were interviewed and examined. They were interviewed through oral questionnaire method and desired information was collected using predesigned and pre-tested proforma.

Genu valgum was measured with the help of a divider and a plastic scale. The degree of genu valgum is measured by the distance between the medial malleoli at the ankle when the child stands or lies down with the knees touching each other and accordingly it is graded as Mild (<5 cm), Moderate (5-10 cm) and Severe (>10 cm).⁹ Operationally those with moderate and severe degree of genu valgum were considered as having genu valgum.

RESULTS

Our study subjects constituted about 1722; the mean age group was 9.24. 31.4% were in the age group of 10-11, and 16.7% were 12 years and equal. Male students constituted about 45.1% and 54.9% were female. Majority of the students had nuclear type of family in their house (59.8%), while only 12.9% were 3 generation family. Almost half of the study subjects were in class III socio-economic status (42.7%), while only 1.4% was in class I SES (Table 1).

Table 1: Socio-demographic indicators of study participants.

Indicators	Frequency	Percentage (%)
Age in years		
6-7	492	28.6
8-9	402	23.3
10-11	540	31.4
≥12	288	16.7
Gender		
Male	776	45.1
Female	946	54.9
Type of family		
Nuclear	1030	59.8
Joint	470	27.3
3-generation	222	12.9
Socio-economic status		
I	24	1.4
II	238	13.9
III	736	42.7
IV	558	32.4
V	166	9.6
Total	1722	100.0

Table 2: Association of age group with genu valgum.

	Genu Valgum		
Age group (in years)	Present	Absent	Total
	No. (%)	No. (%)	No. (%)
7-Jun	57(11.6)	435(88.4)	492
9-Aug	43(10.7)	359(89.3)	402
11-Oct	42(7.8)	498(92.2)	540
≤12	51(17.7)	237(82.3)	288
Total	193(11.2)	1529(88.8)	1722

 χ^2 = 18.79, df=3, p<0.01.

Table 3: Association of gender with genu valgum.

	Genu Valgum		
Gender	Present	Absent	Total
	No. (%)	No. (%)	No. (%)
Male	91(11.7)	685(88.3)	776
Female	102(10.8)	844(89.3)	946
Total	193(11.2)	1529(88.8)	1722

 $\chi^2 = 0.382$, df=1, p=0.536.

Table 4: Association of type of family with genu valgum.

	Genu valş	Genu valgum	
Type of family	Present (%)	Absent	Total Total
	No. (%)	No. (%)	No.
Nuclear	111(10.8)	919(89.2)	1030
Joint	54(11.5)	416(88.5)	470
Three generation	28(12.6)	194(87.4)	222
Total	193(11.2)	1529(88.8)	1722

 χ^2 = .670, df=2, P=0.715

Table 5: Association of socio-economic status with genu valgum.

	Genu valgum	Genu valgum			
SES	Present	Absent	Total		
	No. (%)	No. (%)	No. (%)		
I	3 (12.5)	21 (87.5)	24 (1.4)		
II	35 (14.7)	203 (85.3)	238 (13.8)		
III	70 (9.5)	666 (90.5)	736 (42.7)		
IV	67 (12.0)	491 (88.0)	558 (32.4)		
V	18 (10.8)	148 (89.2)	166 (9.6)		
Total	193(100.0)	106 (100.0)	1722 (100.0)		

 $\chi^2 = 5.477$, df=4, P=0.242.

The prevalence of the genu valgum was 11.2%. There is statistically significant associations was observed between various age group with occurrence of fluorosis (p<0.05) (Table 2).

There is no statistical significant associations was observed between gender with occurrence of fluorosis (p=0.536) (Table 3).

There was no statistical significant associations was observed between families with occurrence of fluorosis (p=0.715) (Table 4).

There is no statistical significant associations was observed between socio-economic status with occurrence of fluorosis (p<0.05) (Table 5).

DISCUSSION

The prevalence of genu valgum in our study was 11.2%. A study by Arjunan et al in Kaiwara village, Karnataka showed the prevalence of genu valgum to be 11.0% among the school children, and study by NIN in Nawada district of Bihar state showed the prevalence of genu

valgum to be 20.5% in 1 to 5 year age group in Fluorosis affected village and 14.0% in the age group of 6 to 11 years. ^{10,11} Bharati et al study showed a prevalence of 5.4% in neighboring Gadag district. ¹² Our study findings shows almost similar results when compared with gender distribution whereas study done by NIN in Nawada district of Bihar showed no perceivable difference in genu valgum among males and females and study done by Chakma et al in Mandla district of Madhya Pradesh showed that genu valgum is more among males as compared to females. ^{11,13}

CONCLUSION

The study relates the occurrence of skeletal fluorosis to high levels of fluoride in prime drinking water sources, mainly deep tube wells. An immediate change in water supply to common water source along with health education to the community is highly desirable. The simple interventions include provision of surface water, rainwater and consumption of Low-fluoride groundwater. Other interventions are defluoridation of water through flocculation and adsorption. Similarly, health education

and better nutrition are the some of the cost-effective intervention measures.

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REFERENCES

- 1. Arlappa N, Aatif Qureshi I, Srinivas R. Fluorosis in India: an overview. Int J Res Dev Health. 2013;1(2):97-102.
- World Health Organization. Water related diseases. Available at http://www.who.int/water_sanitation _health/diseases/fluorosis/en/.html. Accessed on 4 March 2017.
- 3. Saravanan S, Kalyani C, Vijayarani MP, Jayakodi P, Felix AJW, Nagarajan S, et al. India prevalence fluorosis among primary school children in rural areas of Chidambaram Taluk, Cuddalore District, Tamil Nadu, Indian J Community Med. 2008;33:146-50.
- 4. Susheela AK. Fluorosis: Indian scienario: A treatise on fluorosis. Fluorosis Research and Rural Development Foundation; New Delhi, India. 2001.

- 5. Krishnamachari K, Krishnamswamy K. Genu valgum and osteoporosis in an area of endemic fluorosis. Lancet. 1973;2:887–9.
- 6. Choubisa SL, Choubisa L, Choubisa D. Osteodental fluorosis in relation to nutritional status, living habits, and occupation in rural tribal areas of Rajasthan, India. Res report Fluoride. 2009;42(3):210–5.
- 7. Andezhath SK, Ghosh G. Fluorosis management in India: the impact due to networking between health and rural drinking water supply agencies. IAHSAISH Publication. 2000;260:159–65.
- 8. Guidelines for drinking water quality. Geneva: WHO; 2004. World Health Organization.
- 9. Natarajan M. Textbook of Orthopedics and Traumatology. 5th edition. Chennai; M.N. Orthopaedic hospital publishers. 137-138.
- Isaac A, Silvia WDCR, Somanna SN, Mysorekar V, Narayana K, Srikantaiah P. Prevalence and manifestations of water-born Fluorosis among school children in Kaiwara village of India: a preliminary study. Asian Biomed. 2009;3:1-4.
- 11. Fluorosis in young children in village of Bihar state. National Institute of Nutrition (India), Annual report (2003-2004).
- 12. Bharati P, Rao M. Epidemiology of fluorosis in Dharwad district, Karnataka. J Hum Ecol. 2003;14:37–42
- 13. Chakma T, Singh SB, Godbole S, Tiwary RS. Endemic Fluorosis with Genu Valgum Syndrome in a Village of District Mandla, Madhya Pradesh. Indian Paediatrics. 1997;34:232-36.

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