

## An Overview of Fluoride and Fluorosis

Millions of men, women and children in many countries of the world are affected by fluorosis and many of them are crippled and leading a vegetative life. The economically weaker sections of the society having low nutritional status are affected more. The incurable disease continues to be a major public health problem and urgent preventive measures are needed.

The relationship between fluoride and dental caries was first noted in the early part of the 20th century. It was observed in residents of certain areas of U.S.A. who developed brown stains on their teeth. These stained teeth, though unsightly were highly resistant to dental decay and caries (Black and May 1916). In the 1930s, it was discovered that the prevalence and severity of this type of mottled enamel was directly related to the amount of fluoride in the water (Smith et al. 1931). Subsequently it was recognized that fluoride consumption in optimal amounts in the water supply imparted protection against the development of dental caries without staining the teeth (Dean 1938). Another benefit of fluorides is that the incidence of osteoporosis seems to occur less frequently in regions with high fluoride content in water than in those in which the inhabitants consumed little fluoride. Although, the importance of this element to normal mineralization of hard tissues and formation of caries resistant enamel has been recognized, there has been as yet no conclusive evidence proving that it is an essential element for human health (McClure 1970). Indeed, fluoride deficiency syndrome is yet to be described. This may be due to the fact that human body requirement of this micronutrient must be small, which is met with naturally through food and water.

Excessive ingestion of fluoride through water, food or dust causes acute toxicity or a debilitating disease called 'fluorosis' a term coined and first used by Cristiani and Gautier in 1925. Acute fluoride intoxication is rarely seen and results mostly by accidental ingestion of large amounts of fluoride compounds. The acute lethal dose of fluoride for the 70 kg man is 2.5-5.0 grams. Chronic fluoride poisoning is more common and can affect animals as well as humans. Excessive intake during pre-eruptive stage of teeth leads to dental fluorosis and further continued ingestion over years and decades causes bony or skeletal fluorosis. It has been found that the IQ of the children living in the high fluoride areas was significantly lower (Lu et al., 2000). In further stages disease produces neurological manifestations. A disease in animals called 'gaddur' is also believed to have arisen from fluoride intoxication.

Feil first mentioned fluorosis in humans as an occupational disease in 1930. Skeletal fluorosis was next reported as a disease endemic to Nellore, an area in India (Shortt et al 1937). Their study led to the publication of first reports of neurological manifestations of fluorosis in late stages. Subsequently cases of endemic and industrial fluorosis have been reported from various parts of world (Raja Reddy 1979). Endemic fluorosis is usually restricted to tropical and sub-tropical areas, and is frequently complicated by factors such as calcium deficiency or malnutrition. It is widely prevalent in China, India, Middle East, North Africa, Ethiopian rift valley and other parts of Africa.

High incidence of endemic fluorosis in India is due to the fact that large area of the country contain water supplies having high levels of fluoride. All states of India except



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## Newsletter

# National Institute of Health and Family Welfare

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*For Restricted Circulation*

North East reported cases of fluorosis and 25 to 30 million people are exposed to high fluoride intake and half a million suffer from skeletal fluorosis (Li et al. 2001).

## Sources of Fluoride

Fluoride enters the human body mainly through the intake of water and to a lesser extent by food. In majority of endemic areas around the world, the main contribution is from water and only in few areas of India and China significant amounts come from foods and rarely the polluted air is the culprit. The food items that are rich in fluoride include fish and tea (EPA, 1997). Besides, inhalation of fluoride dust and fumes emitted by various industries is as dangerous as consuming fluoride containing food, water or drugs. Also, prolonged use of fluoride containing drugs and cosmetics may cause fluorosis. Additionally, the toothpastes and mouth-rinses whether labeled fluoridated or otherwise, also contain high fluoride concentration.

## Total Daily Fluoride Intake

The fluoride contents from all the sources determine the total daily intake of fluoride by a person. The estimated range of safe and adequate intake of fluorides for adults is 1.5 to 4.0 mg per day and it is less for children and those with renal disease. Ingested fluorides are quickly absorbed in the gastrointestinal tract; the body retains 35-48 per cent of it. Majority of it is stored in skeletal and classified tissues, and the balance is excreted largely in the urine.

## Optimum Concentration of Fluoride in Drinking Water

According to WHO standards, the fluoride in drinking water should be within a range that slightly varies above and below 1 mg/L. In temperate regions, where water intake is low, fluoride level up to 1.5 mg/L is acceptable. The Ministry of Health and Family Welfare, Government of India, has prescribed 1.0 and 2.0 mg/L as permissive and excessive limits for fluoride in drinking water, respectively.

## Health Effects and Fluoride

Water is the major contributor to the total daily fluoride intake in human body. So as the concentration of fluoride in drinking water varies, its effect on human health also varies accordingly. If there is no fluoride intake from any source it may result in limited growth and fertility problems. A fluoride concentration of less than 0.5 in drinking water may result in dental caries. Fluoride concentration of 0.5-1.5 mg/L in drinking water is the optimum amount that promotes dental health and prevents tooth decay. Further increase in fluoride concentration in drinking water (1.5-4.0 mg/L) can cause dental fluorosis i.e. mottling and pitting of

teeth. If drinking water fluoride concentration is in the range of 4-10 mg/L it may result in dental as well as skeletal fluorosis and if the fluoride concentration in drinking water exceeds beyond 10 mg/L it may cause crippling fluorosis (WHO, 2004).

## Magnitude of the Problem

### Global Scenario

The latest information shows that fluorosis is endemic in at least 25 countries across the globe. The total number of people affected is not known but a conservative estimate would number in the tens of millions. 17 of India's 35 states are identified as endemic for fluorosis. In Mexico, 5 million people (about 6% of the population) are affected by fluoride in groundwater. Fluorosis is prevalent in some parts of central and western China and caused not only by drinking fluoride in groundwater but also by breathing airborne fluoride released from the burning of fluoride-laden coal. Worldwide, such instances of industrial fluorosis are on the rise (www.unicef.org).

### Indian Scenario

India is one among the 25 nations around the globe where health problems have been reported due to excessive fluoride in drinking water. The problem of fluorosis has been known in India for a long time. The disease earlier called 'mottled enamel' was first reported by Vishanathan to be prevalent in human beings in Madras Presidency in 1933. However, Shortt (1937) was the first to identify the disease as 'fluorosis' in human beings in Nellore district of Andhra Pradesh.

An estimated 62 million people in India in 17 out of 35 states are affected with dental, skeletal and/or non-skeletal fluorosis.

Fluoride concentrations reported in groundwater of India: Southern part of India is severely affected by fluoride problem where its concentration in groundwater varies from 0.2-20 mg/L. Similarly the North-West region of India is also highly affected and groundwater concentration in this region is 0.4-19 mg/L. Central India and Deccan province of India is moderately affected having groundwater fluoride concentration ranging from 0.2-10mg/L and 0.4-8mg/L respectively (Agarwal et al. 1997).

## Various Forms of Fluorosis

### Dental Fluorosis

This form of fluorosis affects the teeth and mainly occurs in children. The natural shine or luster of the teeth disappears. In the early stage, the teeth appear chalky white and then gradually

become yellow, brown or black. The discoloration will be horizontally aligned on the tooth surface as 'lines' or 'soot's' away from the gums. Tiny pits or perforations can be seen in the form of cavities on the surface of teeth. Dental fluorosis affects both the inner and outer surface of the teeth. One can become edentulous even as much younger age in the fluoride endemic areas. The disease has mostly cosmetic implications and has no treatment.

### Skeletal Fluorosis

Skeletal fluorosis affects the bones/skeleton of the body. Skeletal fluorosis can affect both young and old alike. One can have aches and pain in the joints. The joints that are normally affected by skeletal fluorosis are neck, hip, shoulder and knee that make it difficult to walk and movements are painful. Rigidity or stiffness of joints also sets in. More worrisome is that skeletal fluorosis is not easily detectable until the disease attains an advanced stage. In severe cases, there is complete rigidity of the joints resulting in stiff spine, called as 'Bamboo spine' and immobile knee, pelvic and shoulder joints.

### Non-skeletal Manifestations

The soft tissues of the body may be affected by excessive consumption of fluoride. The symptoms include gastrointestinal complaints, loss of appetite, pain in stomach, constipation followed by intermittent diarrhoea. Muscular weakness and neurological manifestations leading to excessive thirst tendency to urinate more frequently are common among the affected individuals. Cardiac problems may arise due to cholesterol production. Repeated abortions or still birth, male infertility due to sperm abnormalities are also some of the complications.

### Prevention of Fluorosis

Use of alternative water sources: Since the major source of fluoride is drinking water, the use of surface water, rainwater, and low-fluoride groundwater for drinking purpose can help.

Defluoridation: It is removal of excess fluorides from water. Removal is achievable either by Nalgonda Technique which is a combination of several unit operations and processes incorporating rapid mixing, chemical interaction, flocculation, filtration and disinfection or by filtering water down through a column packed with a strong adsorbent, such as activated alumina (Al<sub>2</sub>O<sub>3</sub>), activated charcoal, or ion exchange resins.

Improving the nutritional status of populations at risk: Clinical data indicate that adequate calcium and Vitamin C intake is clearly associated with a reduced risk of dental fluorosis. In consequence, measures to improve the nutritional status of an

affected population, particularly children appear to be an effective supplement to the technical solutions as discussed above.

Some governments are not yet fully aware of the fluoride problem or convinced of its adverse impact on their population. Efforts are, therefore, needed to support more research on the subject and promote systematic policy responses by governments.

### References

1. Agrawal, V., Vaish, A.K. and Vaish, P. (1997). Groundwater Quality: Focus on Fluoride and Fluorosis in Rajasthan. *Current Sci.* 73(9): 743-746.
2. Black, G.V. and FA. McKay: *Dent. Cosmos.* 58 (1916) 129.
3. Dean, H.T. (1938). Endemic Fluorosis and Its Relation to Dental Caries. *Public Health Rep.* 53, 1443-52.
4. EPA (1997). Public Health Global for Fluoride in Drinking Water. Pesticide and Environmental Toxicology. Section Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, December.
5. <http://www.unicef.org/wes/fluoride.pdf>
6. Li, Y., Liang, C., Slemenda, C.W., Ji, R., Sun, S., Cao, J., Emsley, C., Ma, F., Wu, Y., Ying, P., Zhang, Y., Gao, S., Zhang, W., Katz, B., Niu, S., Cao, S. and Johnston, C. (2001). Effect of Long-term Exposure to Fluoride in Drinking Water on Risks of Bone Fractures. *Journal of Bone Mineralisation Research*, 16(5), 932-939.
7. Lu, Y., Sun, Z.R., Wu, L.N., Wang, X., Lu, W. and Liu, S.S. (2000). Effect of High Fluoride Water on Intelligence of Children. *Fluoride* 33(2): 74-78.
8. McClure, F.J. (1970). *Water Fluoridation: The Search and the Victory.* Bethesda, MD, U.S. Department of Health, Education and Welfare, 263-284.
9. Reddy, D.B., Rao, C.M. and Sarada, D. (1969). Endemic Fluorosis. *J. Indian Med. Ass.* 53, 275-81.
10. Shortt, W.E. (1937). Endemic Fluorosis in Nellore District, South India. *Indian Medical Gazette*, 72: 396.
11. Smith, M.C., Lanze, E.M. and Smith, H.V. (1931). The Cause of Mottled Enamel. *Science* 74, 244.
12. Viswanathan, G.R. (1935). Annual Report Madras. Indian Council of Agricultural Research, New Delhi. (Quoted from *Indian Institute of Science*, 33A, 1, 1951).
13. WHO (2004) Guidelines for Drinking Water Quality. Volume 1, Recommendations, 3<sup>rd</sup> Edition. World Health Organization, Geneva.

*(The Editor-in-Chief acknowledges the help rendered by Mrs. Vinod Joon, Research Assistant, and Prof. M. Bhattacharya, Head, Department of Community Health Administration, in preparing the Editorial.)*

## Events

### Annual Day

Annual Day of the Institute was celebrated on 9 March 2007. Dr. R.K. Shrivastava, Director General of Health Services, Ministry of Health and Family Welfare, Government of India, was the Chief Guest. In his speech, while underlining the relevance of NRHM, Dr. Shrivastava expected the Institute to assume major responsibilities in implementing the vision of NRHM. Of course, this is a challenge and the Institute should put best of its efforts to reach the rural masses with various welfare measures forecast under NRHM.

A booklet on 'National Vector Borne Disease Control Programme' was released by Dr. Shrivastava on this occasion as part of the revision of Health Programme Series of the Institute.

Dr. Shrivastava also gave away the Best Student Award to Dr. Swasti Charan for MD in Community Health Administration and Dr. Vanlahariatpuii for Diploma in Health Administration. Dr. Shuchi Subhash and Dr. Sangita Trivedi were also awarded for their outstanding performance in the PG Certificate course through Distance Learning in Health and Family Welfare Management and Hospital Management respectively.

The Best Worker Award for the year was given to Mr. Umed Singh, LDC, and Mrs. Raksha Kumari, Peon.

In his speech, Prof. Deoki Nandan, Director, NIHF, was happy to announce 'Public Health Networking', as the theme of the Institute for the year 2007. He deliberated on how to develop partnership with various national and international organizations and strengthening partnership with those institutions with which the Institute has already developed partnerships; for example, European Commission, Partners in



*Dr. R.K. Shrivastava, Director General of Health Services, Government of India, addressing the august gathering on the occasion of the Annual Day of the Institute.*

Population and Development, UNFPA, etc. He also briefly explained about various activities undertaken by the Institute during 2006-2007 as well as the proposed activities for 2007-2008 with regard to education and training, research and evaluation, specialized projects and consortium, etc.

### Lecture

Ms. Shailja Chandra, Executive Director, Population Development Fund, New Delhi, delivered a lecture on 'Population Stabilization' on January 16, 2007.

### Holi Milan Samaroh - A Cultural Eve

In an initiative to add fragrance to various activities of the Institute just after assuming the office of Director of the Institute on 1 March, 2007, Prof. Deoki Nandan, had pleasure to invite all the faculty, staff members, former Directors, and retired faculty and staff members of the Institute on the eve of Holi on 2 March 2007. The purpose of such a meeting was not only to celebrate Holi or Phagwah (a popular Hindu spring festival celebrated all over India) but also to have an opportunity to interact with all the employees; including the retired ones; to have their views to put the Institute on right track.



*Prof. Deoki Nandan, Director, NIHF (right) presenting the activities undertaken by the Institute during 2006-2007 as well as the proposed activities for 2007-2008 to the distinguished guests, faculty and staff members of the Institute on the occasion of the Annual Day of the Institute (left).*

## Training Courses and Workshops

Training Course on Hospital Administration for Senior Hospital Administrators from Himachal Pradesh

Coordinator Prof. J.K. Das  
Co-coordinators Dr. Uma Vasudeva and Dr. Preetha G.S.  
Associates Mr. G.P. Devrani, Mr. S.S. Mehra and Dr. Rachna Agarwal  
Dates 8-19 January, 2007

Training-cum-Workshop on Counselling Skills for Health Professionals

Coordinator Dr. Rajni Bagga  
Co-coordinator Mr. Ramesh Gandotra  
Associate Mr. Ghanshyam Karol  
Dates 15-19 January 2007

National Level Orientation Programme for Master Trainers of ASHA

Coordinator Prof. K. Kalaivani  
Co-coordinator Dr. Savita Mehta  
Associate Dr. Jaya Lalmohan  
Dates 23-25 January 2007

Technical Workshop on Health Sector Reforms and Sustainable Financing

Coordinators Dr. Rajni Bagga, Dr. Sanjay Gupta and Ms. Hadi Samaha Karam (WBI)  
Associates Mr. Ramesh Gandotra and Mr. Ghanshyam Karol  
Dates 30 January-2 February 2007

Workshop on Molecular Technologies in Family Health and Welfare

Coordinators Prof. S.K. Guha and Dr. M.M. Misro  
Date 5 February 2007

Integrated Training Course on NRHM for the States of Bihar, Haryana, Karnataka, Kerala, Madhya Pradesh and Punjab

Coordinator Dr. Saroj Menon  
Co-coordinator Dr. Bindoo Sharma  
Associates Mr. S.C. Garg and Mrs. Renuka Patnaik  
Dates 5-10 February 2007



*Participants and coordinating team members of the National Level Orientation Programme for Master Trainers of ASHA*

## Forthcoming Training Courses/Workshops

Training Course on Planning, Implementation and Monitoring of Development Programmes under WHO Biennium Fellowship

Course Director Prof. Deoki Nandan  
Coordinator Dr. V.K. Tiwari  
Co-coordinators Dr. Lam Khan Piang and Mr. J.P. Shivdasani  
Course Associate Mr. Pardeep Kumar Kamboj  
Dates 2-27 April 2007

Annual Sentinel Surveillance for HIV Infection 2006 - Review Workshop for NGOs

Coordinator Prof. M. Bhattacharya  
Associates Mrs. Vaishali Jaiswal and Mrs. Vinod Joon  
Dates 13-14 April 2007

Training Course for State Level Programme Management Unit (PMU) Officials

Course Director Prof. Deoki Nandan  
Coordinator Dr. S. Menon  
Co-coordinator Mr. N.S. Rawat  
Associate Mr. Shridhnad  
Dates 30 April-4 May 2007

Managerial Skills Training for CGHS Medical Officers

Course Director Prof. Deoki Nandan  
Coordinator Prof. J. K. Das  
Co-coordinators Dr. Anamika Khanna/Dr. U. Datta/  
Dr. Neera Dhar  
Associates Sh. G.P. Devrani, Sh. S.S. Mehra and Dr. Rachna Agarwal  
Dates 7-11 May 2007, 21-25 May 2007 and 4-8 June 2007

## Change of Directorship of the Institute



*Prof. Deoki Nandan, Doctor Honoris Causa, MD, FAMS, FIPHA, FIAPSM, FISCD, took over the charge of Director of National Institute of Health and Family Welfare, New Delhi, on 1 March 2007. He is known all over the country as well as abroad for his outstanding contributions to Public Health. He worked as Principal/Dean and Chief of Hospital, S.N. Medical College, Agra, and did a commendable job to improve the image of the college with regard to its teaching, training, research and quality of patient care.*

*Prof. Nandan has provided consultancy to several international organizations and the notable are WHO-SEARO, UNICEF, CARE-India, EPOS, Population Council, MOST-India and USAID.*

*He has also been acting as a member of many state as well as national level technical expert committees, specially for AIDS, IMNCI and Child Health. He has got a number of awards for his excellent work in public health, to quote for an example, Uttar Pradesh Ratan and Brij Vibhuti. Prof. Nandan has also been nominated as a member by the Government of Uttar Pradesh for Human Rights Commission.*

*Prof. Nandan has been recognized as one of the National Level Trainers for ICDS, CSSM, RCH, RTI/STD, HIV/AIDS and IMNCI. Prof. Nandan has successfully completed more than 45 community-based research studies/projects on issues related to EPI, RCH, RTI/STD and HIV/AIDS, in collaboration with various national and international agencies. He has published a large number of research papers in reputed national and international scientific journals.*

*Prof. Nandan has honour to serve as one of the expert members of the following:*

- Selection board of the Union Public Service Commission, New Delhi, and Public Service Commission of Uttar Pradesh and Uttaranchal;  
Academic Councils for the Universities of Agra, Aligarh and Gwalior;  
Governing Council of State Medical Faculty, Uttar Pradesh; and  
International meets/workshops*

*Prof. Deoki Nandan has been serving as an examiner for MBBS and MD examinations for more than 30 universities in the country.*

### Training Course for Integrated Service Delivery under NRHM

Course Director	Prof. Deoki Nandan
Coordinator	Prof. K.Kalaivani
Co-coordinator	Dr. Bindoo Sharma
Associate	Mrs. Renuka Patnaik
Dates	14-18 May, 2007

### Training Course on Hospital Administration for Senior Hospital Administrators from Himachal Pradesh

Course Director	Prof. Deoki Nandan
Coordinator	Prof. J.K. Das
Co-coordinator	Dr. Neera Dhar
Associates	Mr. S.S. Mehra and Dr. Rachna Agarwal
Dates	11- 22 June, 2007

## Nuggets

### Director's Activities

In addition to his regular activities in the Institute, Prof. Deoki Nandan, Director, participated as an expert in several scientific meetings, seminars, workshops, symposia, etc. organized by various national and international organizations during this quarter. Some of his significant activities include:

- Meeting of Integrated Management of Neo-natal and Childhood Illnesses (IMNCI) at NIHF on 2 March, 2007,
- Meeting on ICMR School of Public Health Partners, at the Post Graduate Institute of Medical Education and Research, Chandigarh, during 6-7 March, 2007,
- Meeting regarding Modification of Course Curriculum for

Professional Development Course at MOHFW on 12 March, 2007,

Meeting on Public Health at National Institute of Public Cooperation and Child Development, New Delhi, on 14 March, 2007, and

Meeting regarding Integrated Management of Neonatal and Childhood Illnesses (IMNCI) at NIHFW, on 14 March, 2007.

## Faculty Activities

Prof. M. Bhattacharya, Head, Department of Community Health Administration, attended the following:

Review Meeting of Microbiologist involved in HSS 2006, at All India Institute of Hygiene and Public Health, Kolkata, during 15-16 January 2007,

Training on District Action Plan, organised by MOHFW, at Mussoorie, during 29 January-2 February 2007,

Meeting regarding Five-Year Evaluation of the Global Fund for TB, AIDS and Malaria (GFTAM), at UNAIDS, New Delhi, on 23 February 2007,

Regional Immunization Training at Agra, Uttar Pradesh, during 19-23 March 2007, and

Meeting on ICMR School of Public Health Partners, at the Post Graduate Institute of Medical Education and Research, Chandigarh, during 6-7 March, 2007.

Prof. T. Mathiyazhagan, Head, Department of Communication, attended the National Training of the Trainers on Adolescent Health and Development, organized by the IEC Division of the MOHFW at SWACH, Panchkula, Haryana, during 13-16 February 2007.

Prof. J.K. Das, Head, Department of Epidemiology, attended the Expert Group Meeting on Issues related to Sample Size and Sample Design for Sero-Surveillance under Yaws Eradication Programme (YEP), at National Institute of Communicable Diseases, Delhi, on 23 and 31 January 2007.

Dr. U. Datta, Reader and Acting Head, Department of Education and Training, delivered a lecture on 'Systems Approach to Training MLRC/Log Frame Approach in District Action Plan' in the Professional Development Course, at State Institute of Health and Family Welfare, Mohali, Punjab, on 7 February 2007.

Dr. Gita Bamezai, Reader, Department of Communication, delivered a lecture on Gender and Communication at Indian Institute of Mass Communication, New Delhi, on 14 March, 2007.

Dr. Poonam Khattar, Reader, Department of Education and Training, delivered a lecture on 'Human Resource Development and Leadership Techniques' for the Medical Officers of Border Security Force, New Delhi, on 5 February 2007.

Dr. Pikee Saxena, Lecturer, Department of Reproductive Bio-Medicine, participated in the All India Conference of Obstetricians and Gynaecologists, organised by the Federation of Obstetricians and Gynaecologists Society of India, Kolkata, during 5-9 January 2007.

Dr. Pushpanjali Swain, Senior Lecturer, Department of Statistics and Demography, attended a National Workshop on Adoption of New WHO Child Growth Standards, organized by the Ministry of Women and Child Development and Ministry of Health and Family Welfare in collaboration with UNICEF, New Delhi, during 8-9 February 2007.

Dr. Neelam Makol, Research Officer, Department of Population Genetics and Human Development, attended the International Conference on Recent Advances and Challenges in Reproductive Health Research and the 17<sup>th</sup> Annual Meeting of the Indian Society for the Study of Reproduction and Fertility (ISSRF), at Indian Council for Medical Research, New Delhi, during 19-21 February 2007.

Mr. Salek Chand, Senior Documentation Officer, participated in the International Conference on 'Semantic Web and Digital Libraries', organized by the DRTC&ISI, Bangalore, during 21-23 February 2007.



*Prof. Deoki Nandan, Director, NIHFW, with Prof. Somnath Roy, former-Director, faculty and staff members of the Institute on the occasion of the Holi Milan Samaroh.*

## Health and Population : Perspectives and Issues



The Institute publishes its quarterly Journal, Health and Population: Perspectives and Issues regularly. It is circulated both at national as well as at international levels. It includes articles of scientific and educational interest in the areas of health services, family welfare, population, hospital administration, materials management, IEC, social sciences and other allied disciplines.

The Journal is indexed in the following:

Index Medicus for WHO South-East Asia Region,  
WHO, New Delhi.

Cambridge Scientific Abstracts, Bethesda, MD,  
USA.

IndMED: A Bibliographic Database of Indian Bio-  
Medical Research, New Delhi.

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EMBASE, The Excerpta Medica Database,  
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All India Index to Periodical Literature in English  
Database, Hyderabad.

CAB Abstracts, CAB International Publishing,  
Wallingford, The United Kingdom.

Global Health Database, CAB International  
Publishing, Wallingford, The United Kingdom.

### Invitation to Authors

We take this opportunity to invite original papers from academicians, researchers, subject matter specialists, programme officers, health administrators and policy makers on Health and Family Welfare.

Typed written paper may be sent in to the Editor, "Health and Population: Perspectives and Issues", National Institute of Health and Family Welfare, Munirka, New Delhi-110 067, India, in triplicate together with its floppy.

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### Retirements

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