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Surface Water Proximity Analysis for Villages of Pithampur Planning Area Using Geospatial Technology

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ABSTRACT

Surface water is the easiest way of getting water to human being for fulfilling the daily need of lifestyle. In planning concern it can play a major role considering the availability and conservation of such surface waterbodies. The study carried out in Pithampur Planning area is mainly highlighted the proximity of surface water to villages of planning area. All waterbody included small ponds, lakes, reservoir and river streams are delineated in and around 10 km of planning area boundary. The village boundaries are extracted from cadastral obtained from commissioner landrecord of Madhya Pradesh. Proximity analysis reveals that 37 villages having waterbody within their boundary, 19 villages are under the availability of 0-1 km distance of waterbody, 13 villages are 1-2 km far from waterbody, 4 villages are 2-3 km far from waterbody and only one village Tarapur doesn't have any waterbody within 3 km surrounding.

INTRODUCTION

The world's water exists naturally in different forms and locations: in the air, on the surface, below the ground, and in the oceans. The water on the Earth's surface as surface water occurs as streams, lakes, ponds, reservoirs and wetlands, as well as bays and oceans. Surface water also includes the solid forms of water snow and ice (Thomas C. Winter, 1998). Improved fundamental understanding of the quantity, quality, distribution, and use of water resources is necessary to increase the reliability and utility of water-resource assessment and management tools (GSA, 2012). A surface water resource includes mainly river, lakes, ponds and tanks present on earth surface. These resources are one of the major sources of fresh water available to population for drinking purpose and other activities. Urban planning requires information about villages having proximity to water resource; the number of villages having surface waterbodies and the villages

which are at a far distant from waterbody. Planning needs information about feasibility of land with available water resources. Geospatial technology with its tools can help up to an extent in this regard. Satellite data interpretation integrated with GIS software can reveal various parameter and statistics essential for the analysis.

Study area

The study area is positioned in Indore and Dhar districts of Madhya Pradesh and covers an area of 367 Sq km. It lies between 22° 34' 4" N to 22 ° 42' 32" N latitudes and from 75° 29' 34" E to 75 ° 49' 9" E longitudes. Pithampur planning area is declared by Town and country planning department under section 13 and subsection (1) of Town & Country Planning Act 1973, MP. Govt on 10.06.1985. Study area comprises of total 74 villages which are a part of four tehsils, one of Dhar district and 3 Tehsils belongs to Indore

district. Location map of the study area is shown in figure no. 1 and spatial distribution of villages in planning area is shown in figure no 2.

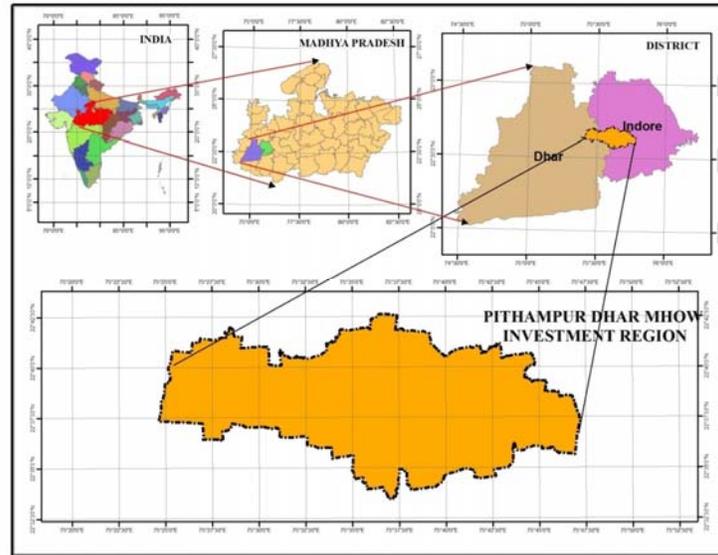


Figure 1 Location Map of The Study Area

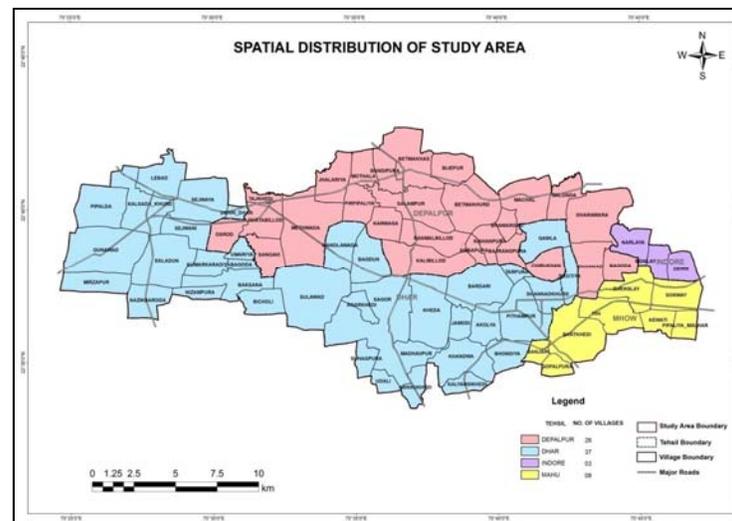


Figure 2 Spatial Distribution of Study Area

Material and Methodology

A very short methodology is adopted to analyze proximity between surface water bodies and administrative boundaries. Here village boundaries are considered as administrative unit. Satellite image of Cartosat satellite is used to interpret the landuse/landcover within the 10 km of study area. The buffer

of study area is taken because waterbody may be present outside the study area which influences the nearest village. After that all surface waterbodies are extracted from landuse, these waterbody includes all rivers, drainages, lakes, ponds and other reservoirs. Administrative boundaries of the villages are produces using cadastral maps of the land record department, it gives an accurate and authenticity to the administrative boundaries. The both layers, waterbodies and village boundaries are used for proximity analysis and it reveals the fact that how much villages are within the range of availability of water. Brief methodology is given in Figure.

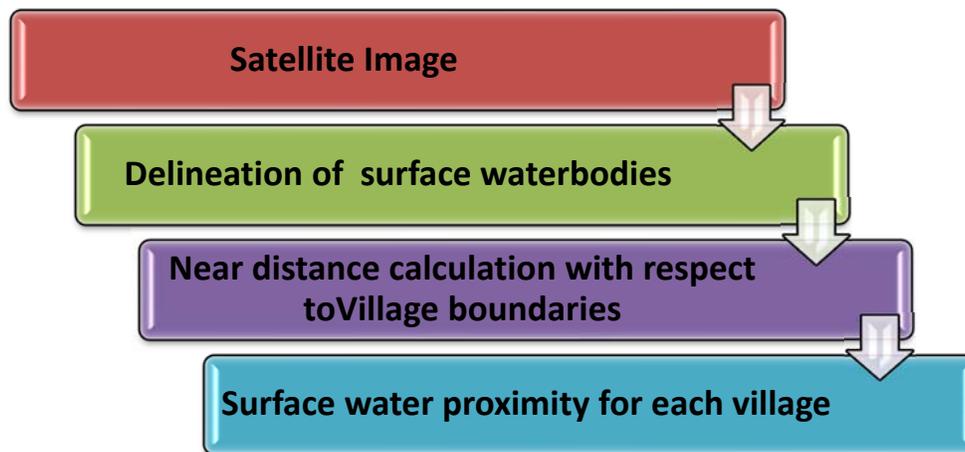


Figure . Brief Methodology

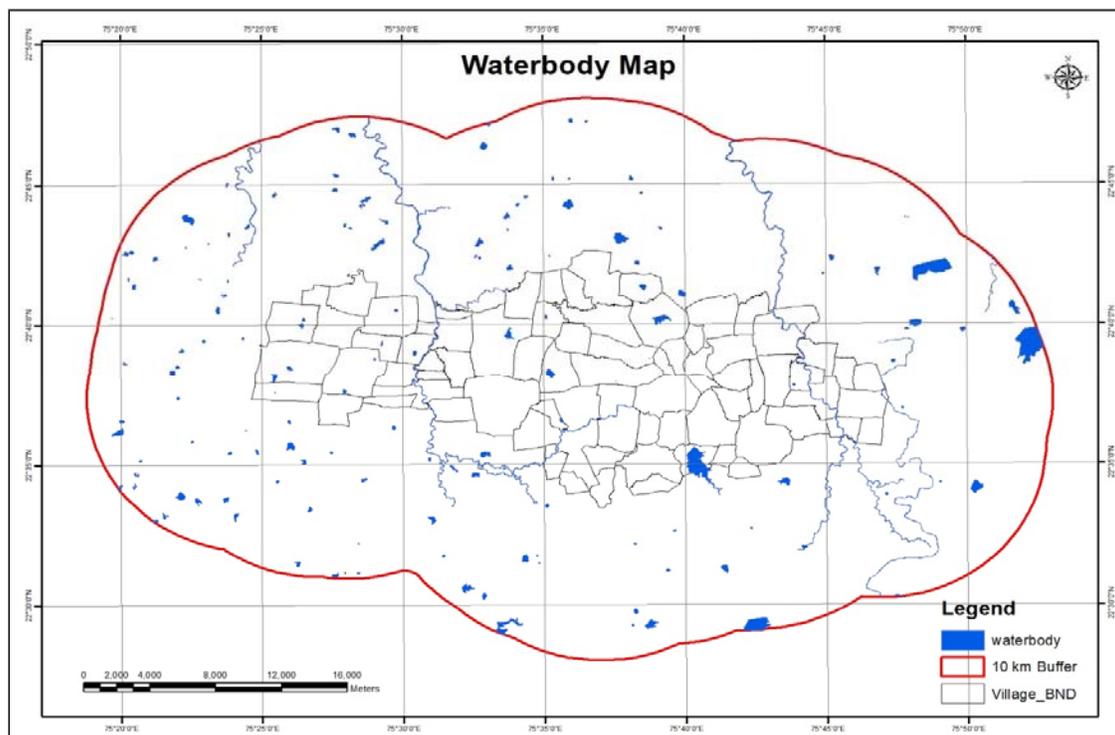


Figure 3 Location of Surface water Body in and Around Study Area

Result & Discussion

There are total 74 villages present in planning area and total number of water body within study area and 10 km around the study area found are 160 in numbers, these waterbody includes lakes, ponds and rivers which may be perennial to seasonal. Location of surface waterbodies and villages is shown in figure no. After doing analysis of surface waterbody proximity with village boundary, it is found that total 37 (50%) village are having waterbody within the village boundary, 19(26%) villages are within a range of 0-1 km from any type of waterbody, 13(18%) villages having waterbody within a distance range of 1-2 km, 04 village having a range of 2-3 km and only one village Tarpura is within a range of more than 3 km. Distance criteria of village are shown in table no.... this analysis will helps in planning in context to water availability in particular village. If a village having good water availability then that village is more suitable for development as it can fulfil the water requirement to the population residing in the area.

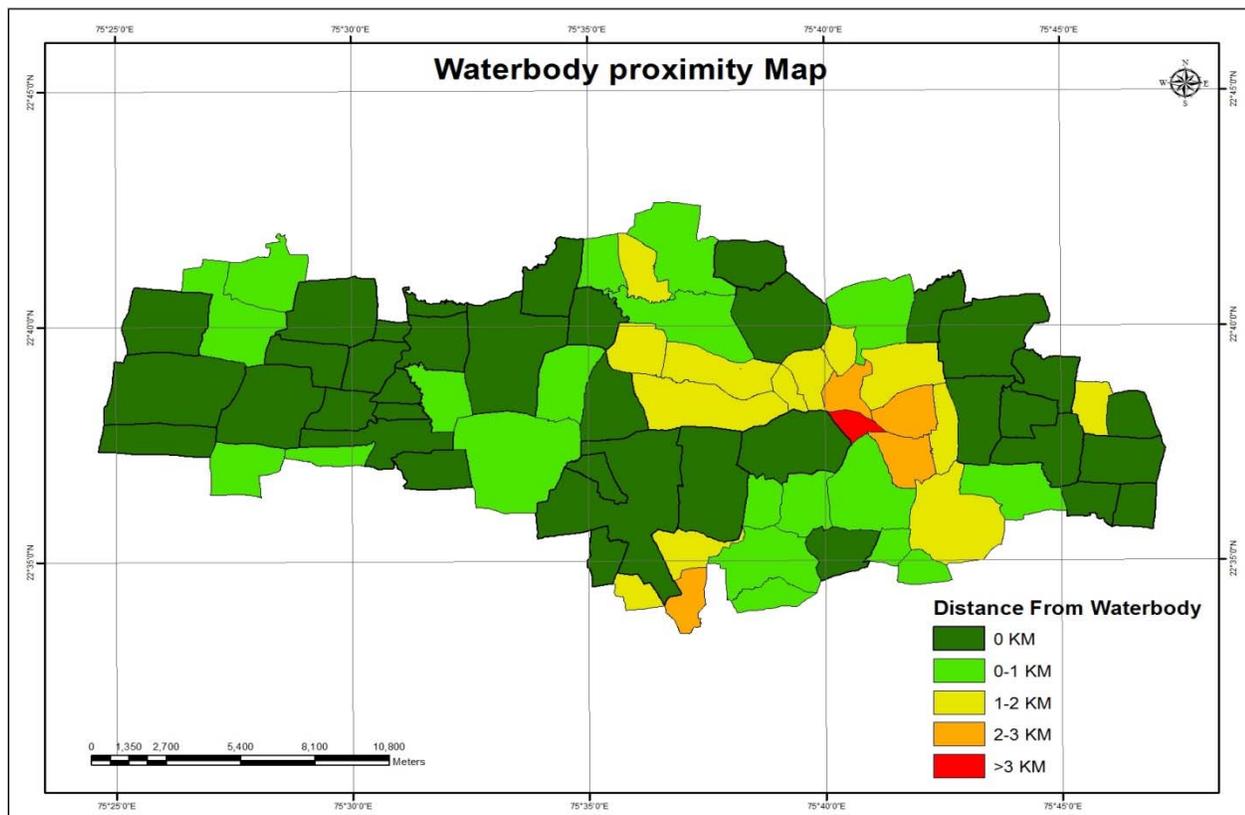


Figure 4 Water Proximity Map

Table no. Surface water proximity to villages

| Sr. No. | Distance in KM | Number of village |
|---------|--------------------|-------------------|
| 1 | 0 KM | 37 |
| 2 | 0-1 KM | 19 |
| 3 | 1-2 KM | 13 |
| 4 | 2-3 KM | 4 |
| 5 | >3 KM | 1 |
| | Grand Total | 74 |

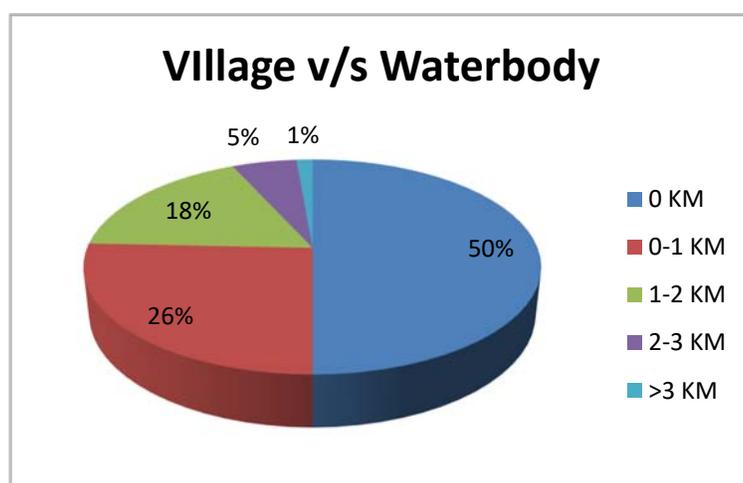


Figure 5 Graph showing percentage of villages with different proximity class

Conclusion

The research concluding at finding villages with availability of surface water resource which plays a major role in planning process. Remote sensing and GIS tools can help in identification and delineation of surface water bodies using high resolution satellite data. Availability of surface water is useful in setup of new urban development in the form of residential, commercial, industrial and recreational activities. Surface water in the form of dams, ponds, lakes and reservoir can fulfil the drinking water and other water requirements of human beings.

Surface water proximity analysis is very much important before any planning and it helps in success of planning.

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STUDIES ON STATIC PROPERTIES OF LITHIUM CHLORIDE

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ABSTRACT

The static properties of lithium chloride are calculated using a three-body interaction potential. This includes the prediction of third order elastic constant (TOEC), Fourth order elastic constant (FOEC) and pressure derivatives second order elastic constant (SOEC) and third order elastic constant (TOEC). The experimental and theoretical results are in good agreement.

INTRODUCTION

Lithium chloride is an inorganic compound with the formula LiCl. The compound is a bright yellow solid but samples almost always contain impurities of metallic lithium that give a light yellow coloration. The lithium contamination arises because LiCl is highly photosensitive. There are many of the crystal properties which cannot be explained without including the static contributions arising from the potential energy expression. These crystal properties are the thermal expansion, the specific heat beyond $3R$ (R is the gas constant) the thermal conductivity and higher order elastic constants and their pressure and temperature variations among them are of special interest because they are related to all the static properties of solids. The coefficient of first order anharmonic term in the multipole interaction potential determines the static properties such as thermal expansion pressure dependence of SOECs etc. The thermal expansion produces the difference between the adiabatic and isothermal elastic constant which provide physical insights into the nature of bonding and interatomic forces in solids.

Several investigators (1-7) have studied the Third order elastic constant (TOEC) and pressure derivatives second order elastic constant (SOEC) using both two-body (1-3) and three-body (4-7) potentials. The latter potentials have given their prediction better than those revealed

by other potential (1-3). Elastic constants are measured by Lundqvist Potential (8) Singh and Verma (9) Karlsson (10). In the present paper, we have used three-body potential to explain the static properties of lithium chloride.

Calculations have been performed using the expression for the third and fourth order elastic constant given by Verma and co-workers (4) and those for the pressure derivatives of SOE constants are given by Garg et al (5) respectively. The essential theory and calculations are given in section 2. The results are presented and discussed in section 3.

2. THEORY AND METHOD OF CALCULATIONS:

Interaction potential energy of rock salt structure solid with contribution from the long-range coulomb and three-body interactions and the short-range repulsive and van der Waals dipole-dipole and dipole –quadrupole attractions is given by

$$W(r) = amZ(Z+6 f(r))/r + [W1(r)+W2(r)] e^2 \quad (1)$$

First term is the Coulomb interaction with a m as the Madelung constant, Z is the ionic charge and e is the electronic charge. Here r ($=r_0$) and r_1 ($=2r_0$) are the first and second neighbor distances. $f(r)$ is the three-body

force parameter dependent on r . W_1 and W_2 are the short-range interactions defined as

$$W_1(r) = b\beta/e2\beta^{++} \exp(r_+ + r_- - r) / .+ - C+-/r^6 - d+-/r^8 \quad (2)$$

$$W_2(r) = b\beta/e2 \beta^{++} \exp (2r_+ + r') / .++ + b\beta--/e2 \exp (2r_- - r') / .-- -(c++ + c--)/r'^6 -(d++ + d--)/r'^8 \quad (3)$$

$$\text{Where } \beta_{ij} = 1 + (z_i/n_i) + (z_j/n_j) \quad (4)$$

With n_i as the number of electrons in outermost orbit. Here, b and β is the repulsive strength and hardness parameters, respectively. In our calculations value of ionic radii (r_i) and van der Waals coefficients (c_{ij} and d_{ij}) have been taken from Singh(9) and co-workers(11-21). The values of β_{ij} for the lithium chloride have been taken from Hafemeister and Flygare(22). The values of b for them have been evaluated from the equilibrium condition

$$dW(r) / dr = 0 \text{ at } r=r_0 \quad (5)$$

Using the values of $f(r)$ obtained from the knowledge of overlap integral and its derivatives from the knowledge of overlap integral (5).

$$f(r_0) = f_0 \exp(-r_0 \backslash .+ -) = \epsilon+- S+-^2 \quad (6)$$

$$\text{With } f_0 = A+- (1 - 2r_+/r_0) \quad (7)$$

Values of overlap integral ($S+-$) and constants ($A+-$) are directly taken from (14). Values of parameters (β_{ij} , b and f_0) have been given in Table 3.2 together with the equilibrium nearest neighbor distance r_0 , which is the only input data used for the calculation of the parameter b .

3. RESULT AND DISCUSSIONS

TABLE: 3.1 Values of input for ionic crystal.

CRYSTAL (LiCl)

r_0 10-8 cm (a)

r_+ 10-8 cm (b)

r_- 10-8 cm (b)

C11 1011 dyne/cm² (a)

C12 1011 dyne/cm² (a)

C44 1011 dyne/cm² (a)

Table 3.2 Model Parameters for ionic solids

CRYSTAL. b (in 10⁻¹² erg) $f(r)$

LiCl 0.254 0.17 -000016

Table 3.3 Third order elastic constants (TOECs) 1011 dyne/cm² for ionic crystals.

Crystal C111 C112 C166 C123 C144 C456

LiCl -3.23 -1.42 -1.43 -1.31 -1.30 -1.23

Table-3.4 Calculated values of fourth order elastic constants (FOECs) (in 1011 dyne/cm²) for ionic crystals.

Crystal C1111 C1112 C1166 C1122 C1266 C4444 C1123 C1144 C1244 C1456 C4466

LiCl 33.60 7.90 7.91 8.80 8.80 8.81 8.00 7.20 7.22 7.01 7.01

Table 3.5 Pressure Derivatives of Second Order Elastic Constants (SOECs) (108 dyne/cm²).

Crystal dc'_{44}/dp ds'/dp dk'/dp

LiCl 2.38 0.58 6.59

Table 3.6: Calculated values of pressure derivatives of third order elastic constants (TOECs).

Crystals dc 111/dp dc 112/dp dc 116/dp dc 123/dp dc 144/dp dc 456/dp

LiCl -76.59 -47.70 -43.59 -44.50 -46.20 -44.12

The model parameters listed in Table 3.1 have been used to evaluate the various –order derivatives of the short-range interactions. A_i, B_i, C_i, D_i ($i=1, 2$). Those parameters are the same as those defined by Verma and Coworkers (4) except for the difference that we have included the effect of short range Vander Waals attraction and represented the overlap repulsion by the HF potential. With the knowledge of parameters and input data we have calculated the values of third, fourth order elastic constants using their relevant expressions reported (4, 5).

Results obtained in the table are in good agreement with the experimental results which shows that the agreement between experimental and our theoretical results are better.

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Stress Analysis of Academicians of Management Institutes of Kolhapur District

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ABSTRACT

Stress is a state of psychological and physiological imbalance resulting from the disparity between demands and the ability to meet those demands on individuals. The following objectives of the study are (i) To measure level of stress of the teachers in management institutes (ii) To evaluate the impact of stress on physiological, psychological and behavioural aspects of the teachers in the management institutes (iii) To study various techniques used by teachers to overcome stress. (iv) To give suggestions there on. Descriptive research design is followed for this study. The data is collected from the primary sources. Non- probability convenience sampling technique is used to select a sample of 24 management teachers including head of the department, professors, associate professors and assistant professors of Kolhapur District. The following tools were employed to analyse the data like (a) Percentage Analysis (b) Henry Garrett Ranking (c) Two way ANOVA. The study concluded that the stress is growing at a rapid pace day by day especially when it comes at work place. The major causes of distress of the teachers are problems related with work place. It is also found that compared to male respondents female respondents are having higher level of stress whereas age remains an insignificant variable.

INTRODUCTION

Twentieth century is titled as the age of 'speed'. Certainly, there has been an explosion of information in all areas of human activity and a rapid dissemination of knowledge. The result has been a growth in expectations as well which has affected individuals at micro and macro levels and leads to stress. Stress has been substantially found in life of even a common man. No one if escaped from the trap of stress and to a certain extent it is good also. Kelly Mcgonigal has rightly quoted- "How you think about stress- matters!" Stress is a common experience of people when any demands are placed on them by their work or personal environment. Even though stress is a much studied concept, it is still not

understood correctly and thus surrounded by confusion.

i. Stress

Stress is the psychological, physiological and behavioural response by an individual when they perceive a lack of equilibrium between the demands placed upon them and their ability to meet those demands, which, over a period of time, leads to ill-health. (S. Palmer, 1989)

"Stress is a demand made upon the adaptive capacities of the mind and body" - David, Fontana. (1989).

Stress is man's adaptive reaction to an outward situation which would lead to physical, mental and

behavioral changes. Even though stress kills brain cells, not all stresses are destructive in nature. Appropriate amount of stress can actually trigger passion for work, tap latent abilities and even ignite inspirations.

ii. Stress at workplace

Pressure at the workplace is unavoidable due to the demands of the contemporary work environment. Pressure perceived as acceptable by an individual, may even keep workers alert, motivated, able to work and learn, depending on the available resources and personal characteristics. However, when that pressure becomes excessive or otherwise unmanageable it leads to stress. Stress can damage an employees' health and the business performance.

Work-related stress can be caused by poor work organisation (the way we design jobs and work systems, and the way we manage them), by poor work design (for example, lack of control over work processes), poor management, unsatisfactory working conditions, and lack of support from colleagues and supervisors.

Research findings show that the most stressful type of work is that which values excessive demands and pressures that are not matched to workers' knowledge and abilities, where there is little opportunity to exercise any choice or control, and where there is little support from others.

2. OBJECTIVES OF THE STUDY

The main objectives of the study are as follows:

- i. To measure level of stress of the teachers in management institutes.
- ii. To evaluate the impact of stress on physiological, psychological and

behavioural aspects of the teachers in management institutes

- iii. To study various techniques used by teachers to overcome stress.
- iv. To give suggestions there on.

3. LIMITATIONS

- i. The study is restricted to Kolhapur District.
- ii. The study is based on teacher's perception and their current experiences which may change in the days to come.

4. RESEARCH METHODOLOGY

i. Research Design

Descriptive research is used for the study as it involves fact- finding enquires related to stress aspect of teachers of management institutes of Kolhapur District

ii. Sampling Design

Convenient sampling method is used for the purpose of collecting data.

iii. Sample Size

Primary data has been collected from 30 teachers of Management institutes including head of the department, professors, associate professors and assistant professors and visiting teaching staff.

iv. Tools for analysis

- Simple percentage analysis
- Average range
- Standard Deviation
- Two way ANOVA
- Henry Garrett Ranking

5. HYPOTHESES

- i. Genders have no significant effect on level of stress.

- ii. Age have no significant effect on level of stress.
- iii. Gender and age interaction will have no significant effect on stress.

6. DATA ANALYSIS AND INTERPRETATION

A. CLASSIFICATION OF THE RESPONDENTS

The following table is prepared to classify the respondents for the further analysis. In the table respondents are classified on the basic of demographic factor like age, gender, marital status, education, experience and designation. It is observed from the table that the majority of the respondents belong to the age 30-39 years of age group whereas the least respondents are from the age group of 25-29 years. It is also observed that male respondents are double in number as compared to the female respondents.

| | | |
|-------------|---------------------|----|
| EXPERIENCE | M.PHIL | 9 |
| | Ph. D | 7 |
| | 5-10 YEARS | 12 |
| | 10-15 YEARS | 5 |
| | 15-20 YEARS | 7 |
| | 20-25 YEARS | 3 |
| DESIGNATION | 25 YEARS AND ABOVE | 3 |
| | ASSISTANT PROFESSOR | 10 |
| | ASSOCIATE PROFESSOR | 9 |
| | PROFESSOR | 3 |
| | HOD | 4 |
| | VISITING | 4 |

TABLE NO.1

Between-Subjects Factors

| | Value Label | N |
|-----------|-----------------|----|
| AGE | 25-29 | 2 |
| | 30-39 | 14 |
| | 40-49 | 11 |
| | 50-54 | 3 |
| GENDER | MALE | 20 |
| | FEMALE | 10 |
| STATUS | MARRIED | 27 |
| | SINGLE | 3 |
| EDUCATION | MBA | 4 |
| | ENGG AND MBA | 6 |
| | MBA AND DIPLOMA | 2 |
| | M.COM AND MBA | 2 |
| | MBA | 2 |

Descriptive Statistics LEVEL OF STRESS

| GENDER | AGE | Mean | Std. Deviation | N |
|--------|-------|---------|----------------|----|
| | | | | |
| MALE | 25-29 | 18.0000 | . | 1 |
| | 30-39 | 16.7500 | 5.84930 | 8 |
| | 40-49 | 11.8889 | 2.80377 | 9 |
| | 50-54 | 14.0000 | .00000 | 2 |
| | Total | 14.3500 | 4.68227 | 20 |
| FEMALE | 25-29 | 27.0000 | . | 1 |
| | 30-39 | 22.8333 | 6.08002 | 6 |
| | 40-49 | 18.5000 | 2.12132 | 2 |
| | 50-54 | 16.0000 | . | 1 |
| | Total | 21.7000 | 5.55878 | 10 |
| Total | 25-29 | 22.5000 | 6.36396 | 2 |
| | 30-39 | 19.3571 | 6.51161 | 14 |
| | 40-49 | 13.0909 | 3.72705 | 11 |
| | 50-54 | 14.6667 | 1.15470 | 3 |

| | | | |
|-------|---------|---------|----|
| Total | 16.8000 | 6.03095 | 30 |
|-------|---------|---------|----|

TABLE NO. 2

It is observed from the above table, both male and female respondents from the 25- 29 years of age group are having higher level of stress. When compared on the basis of gender, level of stress is higher in female respondents than male respondents.

Tests of Between-Subjects Effects Dependent Variable: LEVEL OF STRESS

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. |
|-----------------|-------------------------|----|-------------|---------|------|
| Corrected Model | 563.078 ^a | 7 | 80.440 | 3.599 | .010 |
| Intercept | 4773.565 | 1 | 4773.565 | 213.573 | .000 |
| GENDER | 127.516 | 1 | 127.516 | 5.705 | .026 |
| AGE | 157.960 | 3 | 52.653 | 2.356 | .100 |
| GENDER * AGE | 15.799 | 3 | 5.266 | .236 | .871 |
| Error | 491.722 | 22 | 22.351 | | |
| Total | 9522.000 | 30 | | | |
| Corrected Total | 1054.800 | 29 | | | |

a. R Squared = .534 (Adjusted R Squared = .385)

TABLE NO. 3

B. HYPOTHESES TESTING BY ANOVA

i. Genders have no significant effect on level of stress.

Interpretation: Considering gender as first factor, from the above table shows p value is 0.026 which is less than 0.05, i.e. 5% level of confidence. So, we reject the hypothesis that gender has no significant effect on level of stress. It can be concluded as gender of the respondents has significant effect on level of stress and there is a 2.6% chance of getting higher level of stressed by random chances.

ii. Age have no significant effect on level of stress.

Interpretation: Here second factor is age. From the above table calculated p value is 0.10 which is greater than 0.05, i.e. 5% level of confidence. So, here hypothesis cannot be rejected. Hence we accept hypothesis that age has no significant effect on level of stress.

iii. Gender and age interaction will have no significant effect on level of stress.

Interpretation: P value for interaction of gender and age is 0.871 which is greater than 0.05, i.e. 5% level of confidence. So here hypothesis is accepted and it is said that gender and age in combination have no impact on level of stress.

C. CAUSES OF DISTRESS BY HENRY GARRETT RAKING METHOD

RANKING THE CAUSES OF DISTRESS

| S. No | Causes | Total Score | Mean Score | Rank |
|-------|--------------------|-------------|------------|------|
| 1 | Personal Problems | 1320 | 44.00 | IV |
| 2 | Family Problems | 1505 | 50.17 | II |
| 3 | Financial Problems | 1500 | 50.00 | III |
| 4 | Social Problems | 1260 | 42.00 | V |
| 5 | Official Problems | 1915 | 63.83 | I |

TABLE NO. 4

It is observed from the above table that official problems or the problems related with work place are the major causes of distress and thus ranked on the first position followed by family and financial problems as second and third position respectively. Similarly personal and social problems are placed on fourth and fifth position of ranking.

7. FINDINGS

- i. The study reveals Female teachers are having higher level of stress as compared to male teachers.
- ii. From the study, it was also found that age has no significant effect on level of stress.
- iii. Impact of Interaction of age and gender also remain insignificant on level of stress.
- iv. Work place related problems are the major stressor followed by

family problems and financial problems.

8. SUGGESTIONS

- i. Stress can be avoided or reduced by sharing problem with the colleagues, family members and friends.
- ii. Teachers belonging from the age group of 25- 29 years can engage themselves in learning at workplace from their seniors.

9. CONCLUSIONS

Stresses are an inescapable part of most people's lives and especially work life. People working in Institutes imparting education are also a part to it. The present study titled "Stress analysis of Academicians of Management Institutes of Kolhapur District" was conducted with the selected teachers of management institutes as respondents. The main finding of the study shows that female teachers are having high level of stress. Main reasons for stress are managing personal and professional life, relationship with other employees and recognition of work in the organisation. It was also found that official and family problems are the main reasons of stress for all the respondents.

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DEVELOPMENT OF SKILL FOR UNDERSTANDING OF TEACHING-LEARNING PROCESS USING 5E CYCLE IN CHEMISTRY OF ACID-BASE CONCEPTS AT SECONDARY LEVEL

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ABSTRACT

The main purpose of this study was to know the effectiveness of 5E learning cycle model based on constructivist approach over traditionally designed Chemistry instructions on tenth grade students', understanding of acid-base concepts. According to NCF-2005 teacher should act as a facilitator and not as a transformer of content where learner's can think, realize, analyse and develop their own way of learning which should be something beyond the text books. For this purpose thirty nine tenth grade students of a chemistry course (Acids and Bases topic) taught by the same teacher in DMS School RIE Bhopal, were enrolled in the study. The classes were randomly assigned as two groups. Students in the first (control) group were instructed by traditionally designed chemistry instruction whereas students in the second (experimental) group were taught by the instruction based on 5E learning cycle model. Acid-Base concepts, achievement test were administered to both groups as a pre-test and post-test in order to assess their understanding of concepts related to acid-base. The results indicated that instruction based on constructivist approach caused significantly better acquisition of scientific conceptions related to acid-base. Using constructivist approach teaching and learning process have brought excellent improvements in the learner's and teachers. Students in both groups showed statistically equal development in attitude toward chemistry as a school subject.

INTRODUCTION

The major aim of science teaching is to promote the understanding of the concept being taught with a view to applying the knowledge of such understanding to real life situations. In spite of the much focus on teaching strategies in science, students' performance in science subjects continued to record a persistent and depressing downward trend. Studies show that students are unable to successfully integrate or contrast memorized facts and formulate with real-life applications outside the science classroom. Practical knowledge and school knowledge are becoming mutually exclusive; many students see little connection between what they

learn in the science classroom with real life. Moreover, the traditional teaching method in which of teacher as information-giver to passive students appears outdated. They emphasize the learning of answers more than the exploration of questions, memory at the expense of critical thought, bits and pieces of information instead of understanding in context. In addition, they fail to encourage students to work together, to share ideas and information with each other, or to use modern instruments to extend their intellectual capabilities. One solution for this problem is to prepare students to become good adaptive learners. That is, students should be able to apply what they learn in school to the various

situations in real-life. Obviously, the traditional teacher-as- in formation giver, textbook guided classroom has failed to bring about the desired outcome of

producing thinking students. An alternative is to change the focus of the classroom from teacher-centered to student-centered using a constructivist approach. With the emphasis on the learner, we see that learning is an active process occurring within and influenced by the learner as much as by the instructor and the school. From this perspective, learning outcomes do not depend on what the teacher presents. Rather, they are an interactive result of what information is in countered and how the student processes it based on perceived notions and existing personal knowledge.

Constructivism is defined as a set of beliefs about knowledge that begins with the assumption that reality exists but cannot be known as a set of truth (Tobin et al, 1994). Constructivists believes that objective knowledge cannot exist, rather all of us are involved in constructing our own words, part of which we take as being shared by others. Constructivist believes in truth but not in a truth that has been constructed by somebody. It maintains that individuals create or construct their own new understandings or knowledge through the interaction of what they already know and believe and the ideas, events, and activities with which they come in contact. Knowledge is acquired through involvement with content instead of imitation or repetition. Constructivism is not accepting what you are told but your prior knowledge about what you are taught and your perceptions about it. The new idea is not imposed on the learner. The learner is actively restructuring his past and present experiences. Students' active involvement is emphasized in constructivism; the knowledge is then rooted into their memory. Von Glasersfeld (1993) argues that constructivism is a way of knowing that recognizes the real world as a source of knowledge. There is an external world made up of objects and events, which we want students to learn about. However students as well as scientists can never fully know reality. They can form approximations of freality, but never a true picture of it. Absolute truth is not possible. What we

can aim for is to build useful ideas about the world that are viable and can be used to understand and explain nature. Viable knowledge can be applied to further our purposes and the quality of life. This notion implies that reality is dependent upon the mind for its existence, hence knowledge is constructed by the mind rather than being a facsimile of reality.

Constructivism is not really a new concept. It has its roots in various disciplines such as education, psychology, philosophy and the history of science. John Dewey, Jean Piaget, Edmund Husser and Thomas Kuhn are only handful of theorists whose work impacts constructivist thought. As its name implies, constructivism emphasizes building or constructing the knowledge. All learning takes place in the brain of the learner, which is constructed as connections are made

with previously made constructions. Giambatista Vico commented in a treatise in 1710 that "one only knows something if one can explain it." (Yager, 1991). Immanuel Kant further elaborated this idea by asserting that human beings are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation (Cheek, 1992). Learning cycle which is an inquiry- based teaching model is useful to teachers in designing curriculum materials and instructional strategies in science. The model is derived from constructivist ideas of the nature of science, and the developmental theory of Jean Piaget (Piaget, 1970) and developed by Robert Karplus. The learning cycle of Karplus has three phases. These are exploration, term introduction and concept application. Over the years the learning cycle is revised and added several phases. So, 5E learning cycle is formed. It consists of the following phases: engagement, exploration, explanation, elaboration and evaluation. The 5E learning cycle has been shown to be an extremely effective approach to learning (Lawson 1995; Guzzetti et al. 1993). For this reason, in the present study we aimed to examine the effectiveness of acid- base concepts" instruction based on 5E learning cycle model and attitudes toward science as a school subject. Students'

attitudes, feelings and perceptions of science are also important for science achievement. This study investigates also the effect of treatment on students' attitudes toward chemistry. Chang (2002) and Parker (2000) stated in their studies that the type of instruction affected students' attitudes toward science as a school subject. Students' attitudes, feelings and perceptions of science play an important role for their science achievement and their selection of career related to science in the future. In this study, science process skills that are important for understanding scientific concepts are also investigated. In science education, Lazarowitz (2002) indicated that learning science requires high cognitive skills. The present study examines the contribution of students' science process skills to their understanding of acids-bases concepts.

OBJECTIVE OF THE STUDY:

1. To identify an acid and a base by using the physical and chemical properties.
2. To state the relation between acids and bases.
3. To clarify the strength of acid solutions increases with the amount of H^+ ions in the solutions and base solutions increases with the amount of OH^- ions in the solution.
4. To give examples for acidic and basic substances in everyday life.
5. To explain that solutions with a pH less than 7 are acids and a solution with a pH more than 7 are bases.
6. To state that strength of an acid increases with a decrease in pH and of a base increases with a increase in pH.
7. To show that acids change blue litmus paper to red and bases change red litmus paper to blue.
8. To clarify that a solution with a pH = 7 is neither an acid nor a base but a neutral solution.
9. To identify that a acid-base reactions are neutralization reactions.

SIGNIFICANCE OF THE STUDY

Students are unable to successfully integrate memorized facts and formulate with real life application in chemistry concepts. The concept "Acid-Base" is one of them. This is because it's abstract

nature. Also teaching methods of acid-base concept play very important role. The old methods used in science curriculum do not develop student interest in the subject matter. The old methods also do not empower students to become deep thinkers who are capable of making new discoveries and solving complex problems. Constructivism is a theory that gives hope to the development of the deep understanding of the sciences in students of all ages. In the constructivist approach, students construct their knowledge by making links between their ideas and new concepts through experience they acquire in school or daily life. Learning cycle instructional technique based on the constructivist approach an result in greater achievement in science, better retention of concepts, improved attitudes toward science and science learning, improved reasoning ability, and superior process skills than would be the case with traditional instructional approaches (Abraham & Renner, 1986; Raghbir, 1979; Renner, Abraham & Birnie, 1985). This study deals with 5E learning cycle model, and its effectiveness. It tries to compare instruction based 5E learning cycle model with traditional chemistry instruction. Therefore this study will provide some information about the instruction based on 5E learning cycle model, its application into the classroom situation.

METHODOLOGY:

Instruction based teaching -learning process is student centered in that learners make use of subject matter for interaction and healthy engagement, classroom environment encourages discussions and negotiation of idea. This gives opportunity to students revise their structure and see other students ideas. In this way, the teacher may realize learner's difficulty and focus on activities to change them with scientifically correct explanation. Therefore; the teachers also should be more sensitive to children's prior knowledge. . Since learning is a social process, students worked in groups with their friends. So interaction is maximized through this way. In the learning process, students also made hands-on and minds- on activities. They participated actively in instruction. In this strategy, in the first phase of cycle called "engagement", students are asked several questions. Here the purpose of teacher was to

activate students' prior knowledge. In the exploration phase, the teacher asked a question for students to explore the phenomena by themselves. In two phases, teacher let the students to discuss with their friends. In this learning environment, students tried to make connections between the new concepts and the existing ones. The main advantage of the constructivist instruction was that the students derived the scientific facts after long discussions with their peers; scientific facts were not narrated by the teacher as in the traditional instruction. Discussion was mostly used through all phases to increase student- student and also student-teacher interaction. Since students cannot discover all important ideas on their own, social interaction is a vital part of their educational excursion. Students benefit from discussions with teachers and interactions with peers who can help them to acquire new concepts. Further, students received information that has been organized by others, so long as it is meaningful to their way of thinking and knowing. In this way, the teacher also created a learning environment where students could use their prior knowledge and become aware of their already existing conceptions. During discussion with their peers, the students tried to make a connection between their existing knowledge and the new concept. They analyzed, interpreted, and predicted information. By this way they constructed knowledge actively, instead of receive it from the teacher passively. Teaching and learning was an interactive process that engaged the learners in constructing knowledge. In the elaboration part, students applied the newly learned concepts into new situations. Evaluation and assessment of students' knowledge is made through the instruction. In the evaluation phase students are asked several questions. So, the teacher had an idea whether the students gained the necessary concepts or not. During, the PAC-programme/2016-17, at DMS, School, RIE, Bhopal an attempt was made to develop on instruction based teaching-learning strategy in Acids and Bases concept at school level for class tenth and try out the validity of the same. The promotion of skill for construction of understanding enabling teaching-learning process was carried out as:

1. For teaching-learning using instruction based process at school level, Acids, Bases topic was selected to teach class X students in DMS ,RIE, Bhopal and was decided to prepare test questionnaires and test was included two parts. First part consisted of two tier questions and evaluated learner's knowledge of Acids and Bases. Each question had two parts: a response section which students were asked to mark only one of two possible answers and a reason section in which explains the answer in the previous part of the questions. Second part consisted of multiple choice questions. Each questions in this part had one correct answer and four distracters. There were 15 items totally in the test.
2. As per decision taken in the first step, frame work of Acids and Bases topic was prepared using class X and test questions were prepared using NCERT text book. Planning for implementation of test items on Acids and Bases was made for students of class X, DMS, RIE, Bhopal.
3. Pre-test of 20 marks for 45 minutes durations was conducted. The pre-test was conducted followed by the presentation of topic. Students were made to think logically so that they understand the concept clearly. Thought provoking questions were put at every point of the topic which made the students to think and search the solution for the questions. After the presentation, the students were evaluated with the help of post-test. The pre-test and post-test were compared as result. A tremendous change in the learning aspect was found, the students were also asked to, rate various skill like about Acids and Bases, contents clarity of the topic, impact of the instruction based teaching-learning process and topic wise evaluation was done.
4. The result obtained was compiled and evaluation on the Acids and Bases was done as per the suggestions and feedback collected by the students and teachers.

RESULTS AND DISCISSIONS:

The result of the pre-test and post-test was complied which shown in graph no. 1 & 2. The scale of evaluation of topic (Acids and Bases) also shows the percentage improvement of the topic taught using the instructions based teaching-learning process (5E

cycle). The feedback obtained from the student's shows that the implementation of instruction based process skills made excellent and positive impact on their learning process. All the learners have shown an increase of 33% to 86% in the marks of post-test. It shows the success of instruction based (5E cycle) learning process support.

In the light of the results obtained from analysis, it can be concluded that traditional instruction is less effective than instruction based on 5E learning cycle model. There may be some reasons. The traditional instruction was teacher-centered that is the teacher transferred their thoughts and meanings to the passive students. The teacher provided information without considering students' prior knowledge and checked whether students have acquired it or not. Lecture method is generally used by the teacher in

instruction. She wrote important notes to the board and distributed work sheets to the students to complete. During instruction students listened to their teacher, took notes, studied their textbooks and completed the worksheets. The students were not given any opportunity to develop their thinking, reasoning and communication skills. They only received the teacher's truth while she lecturing. They were not given opportunity to use problem-solving skills in other situations. Since the teacher instructed the lecture, students in first (control) group did not have so many chances to discuss or share ideas with each other. There was no interaction between teacher and students, and students and students in first (control) group. They didn't become more confident in their understanding of science.

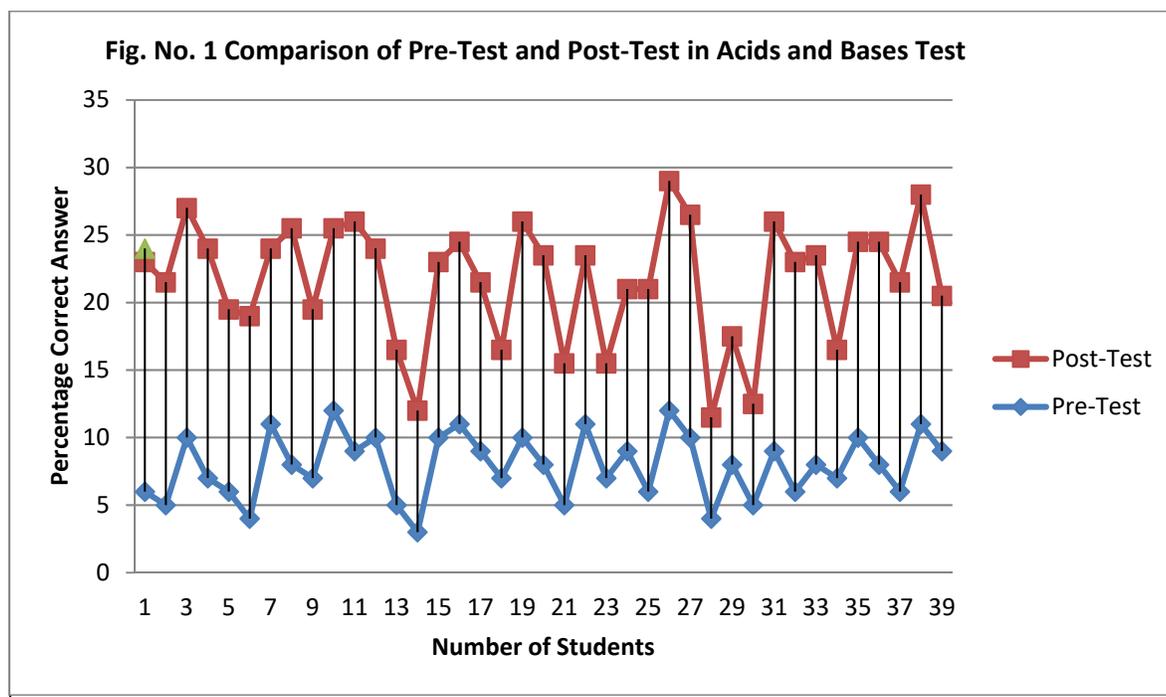
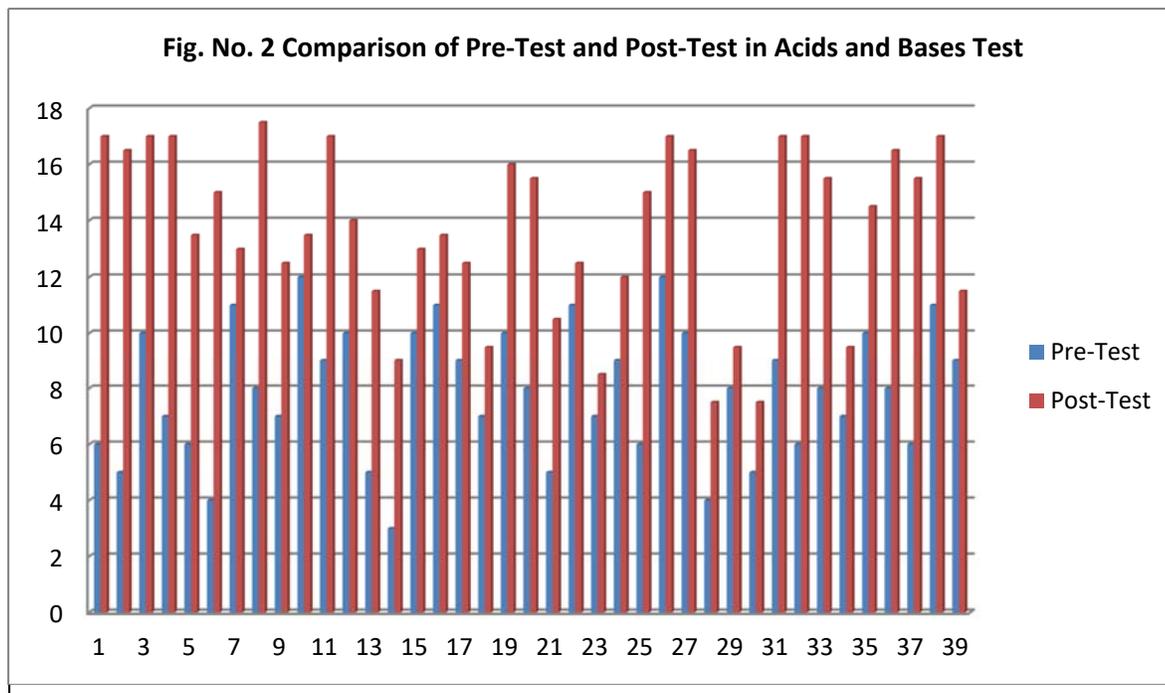


Fig. No. 2 Comparison of Pre-Test and Post-Test in Acids and Bases Test



On the other hand, in 5E learning cycle based instruction students were actively involved in the learning process and constructed their own knowledge. This might be caused the difference in the concept test scores in traditional instruction versus 5E learning cycle instruction. Teacher who engages students in thinking, questioning, testing ideas, explaining, and representing ideas. The teacher should have good subject- matter knowledge and be flexible in their teaching methods. Otherwise, they tend to use the traditional way of teaching). So, it can be concluded that the second (experimental) group in this study were provided for meaningful learning to be occur. After the results are assessed, it is seen that there is a significant mean difference between the first (control) and second (experimental) group. Both groups of students increased their understanding in the acid-base concept as expected, but the improvement is greater in the experimental group.

In short, this study showed that 5E learning cycle model is an effective teaching strategy. On the contrary, traditional instruction does not seem effective in developing students' understanding of acid-base concepts. 5E learning cycle model can provide teachers with many insights into how students can learn about and appreciate science. By using this teaching strategy, better acquisition of scientific concepts could be observed. 5E learning cycle model is useful not only improving achievement but also they help students construct their views about science and develop thinking ability advance questioning activates relevant prior knowledge and promotes meaningful learning.

CONCLUSIONS

Acids and Bases which is studied in this study includes that one way to make sense of how students learn is through constructivism. Learning is regarded as an active process hereby students construct personal

meaning of the subject matter through their interactions with the physical and social world. It is the student who makes sense out of the experiences. The learning process is facilitated by the skilled teacher who engages students in thinking, questioning, testing ideas, explaining, and representing ideas. The teacher should have good subject- matter knowledge and be flexible in their teaching methods. Otherwise, they tend to use the traditional way of teaching .So, it can be concluded that the experimental (second) group in this study were provided for meaningful learning to be occur. After the results are assessed, it is seen that there is a significant mean difference between the experimental (second) group and control (first) group. Both groups of students increased their understanding in the acid-base concept as expected, but the improvement is greater in the experimental group. Furthermore, this study also investigated the effect of treatment; 5E learning cycle based instruction and traditionally designed chemistry instruction, on students' attitudes towards chemistry as a school subject. In order to have more positive attitude, 5E learning cycle model can be used throughout the whole science concepts. In short, this study showed that 5E learning cycle model is an effective teaching strategy. On the contrary, traditional instruction does not seem effective in developing students' understanding of acid-base concepts. 5E learning cycle model can provide teachers with many insights into how students can learn about and appreciate science. By using this teaching strategy, better acquisition of scientific concepts could be observed. 5E learning cycle model is useful not only improving achievement but also they help students construct their views about science and develop thinking ability.

IMPLICATIONS

In the light of the findings of the present study the following implications could be offered:

1. Since its abstractive nature learning chemistry is difficult. Prospective teachers should be given opportunities to apply their understandings about 5E learning cycle model based on constructivist

approach on high school students. Universities and schools should work together to create more fully developed constructivist teachers.

2. Teachers should use instructional techniques that promote students' understanding such as: 5E learning cycle based instruction since traditional instruction is less effective than 5E learning cycle based instruction. The role of the teacher is facilitate safe, guided or open inquiry experiences and questioning so students uncover their misconceptions about the concept. And also, in universities, teacher education programs especially methods of science courses should include some topics related to 5E learning cycle approach.

3. Teachers should create disequilibrium with students' existing conceptions, so that, they will have to rethink and try to reconstruct understanding.

4. Teachers should be trained about the usage and importance of 5E Learning Cycle based on constructivist approach and they must plan the instructional activities accordingly. Curriculum programs should be based on the constructivist perspective.

5. Teachers should be aware of students' attitudes towards chemistry as a school subject. They must know that attitudes affect the students' achievement and should seek to improve students' attitudes.

RECOMMENDATIONS

Based on the results of this study, the followings recommendations are made for further:

1. A study can be conducted for different grade levels and different science courses to investigate the effectiveness of the 5E learning cycle model.

2. Further studies can be carried out to investigate the effectiveness of 5E learning cycle approach in understanding science concepts in different schools. So, more accurate results can be obtained.

3. This study can be conducted with larger sample size out in order to obtain more accurate results.

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Corresponding Author Dr. Ramprakash Prajapati Assit. Prof. of Chemistry, RIE ,Bhopal Theme and subtheme-Constructivist approaches in facilitating learning of science

Reduction of Overvoltage across Lightning Arrestors in EHV Substations using Power Diodes

Shivangi Jain and Amit Gupta

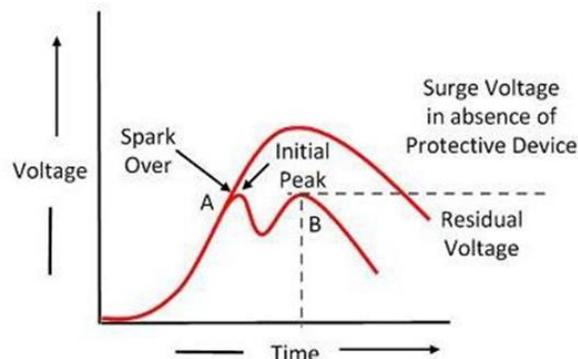
Gyan Ganga College of Technology, Jabalpur M.P.

ABSTRACT

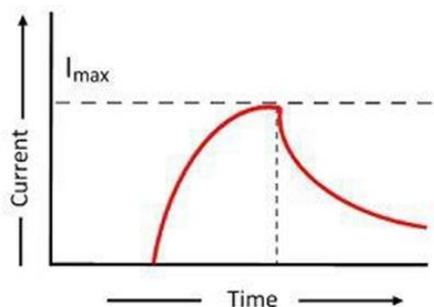
The device which is used for the protection of the equipment at the substations against travelling waves, such type of device is called lightning arrester or surge diverter. In other words, lightning arrester diverts the abnormal high voltage to the ground without affecting the continuity of supply. It is connected between the line and earth, i.e., in parallel with the equipment to be protected at the substation. The substation experiences various overvoltages due to switching transient, resonance or electrostatic discharge. The failure of lightning arrestors due to overvoltage is serious problem. This paper suggest a method of using power diode across lightning arrester to avoid failure . The MATLAB simulation model is prepared and conclusion has been drawn through waveform and data analysis.

INTRODUCTION

When a travelling wave reaches the arrester, it sparks over at a certain prefixed voltage as shown in the figure below. The arrester provides a conducting path to the waves of relatively low impedance between the line and the ground. The surge impedance of the line restricts the amplitude of current flowing to ground. The lightning arrester provides a path of low impedance only when the travelling surge reaches the surge diverter, neither before it nor after it. The insulation of the equipment can be protected if the shape of the voltage and current at the diverter terminal is similar to the shape shown below in fig 1 and 2.



Voltage Characteristic



Current Characteristic

(Fig 1 and 2 voltage and current characteristics of L.A.)

An ideal lightning arrester should have the following characteristics;

1. It should not draw any current during normal operating condition, i.e., it sparks-over voltage must be above the normal or abnormal power frequency that may occur in the system.
2. Any transient abnormal voltage above the breakdown value must cause it to break down as quickly as possible so that it may provide a conducting path to ground.
3. When the breakdown has taken place, it should be capable of carrying the resulting discharge current without getting damaged itself and without the voltage across it exceeding the breakdown value.
4. The power frequency current following the breakdown must be interrupted as soon as the transient voltage has fallen below the breakdown value.

There are many types of lightning arrester which are used to protect the power system. The choices of the lightning arrester depend on the factor like, voltage and frequency of the line, cost, weather condition and reliability.

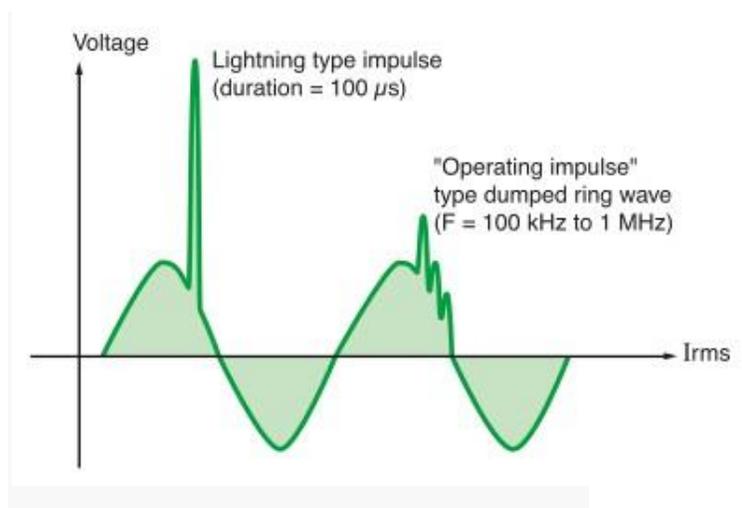
Location of Lightning Arrester:

The lightning arrester is located close to the equipment that is to be protected. They are usually connected between phase and ground in an AC system and pole and ground in case of the DC system. In an AC system, separate arrester is provided for each phase.

In an extra-high voltage AC system the surge diverter is used to protect the generators, transformers, bus bars, lines, circuit breakers, etc. In HVDC system the arrester is used to protect the buses, valves converter units reactors, filter, etc.

Overvoltage : overvoltage (in a system) is defined as any voltage between one phase conductor and earth or between phase conductors having a peak value exceeding the corresponding peak of the highest voltage for equipment

An overvoltage is a voltage pulse or wave which is superimposed on the rated voltage of the network



(Fig. 3: Examples of overvoltage)

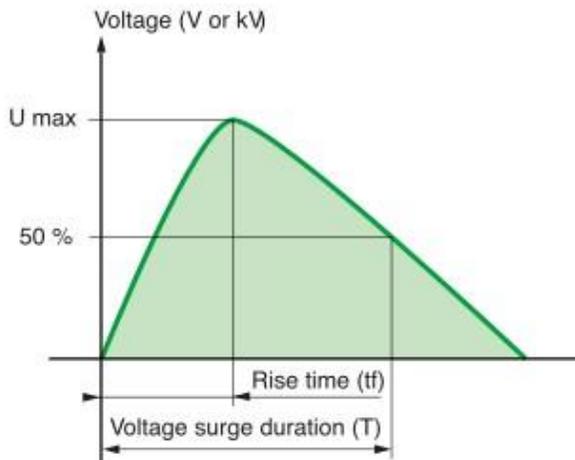
This type of overvoltage is characterized by (see Fig. 4):

the rise time t_f (in μs);

the gradient S (in $kV/\mu s$).

An overvoltage disturbs equipment and produces electromagnetic radiation. Moreover, the

duration of the overvoltage (T) causes an energy peak in the electric circuits which could destroy equipment.

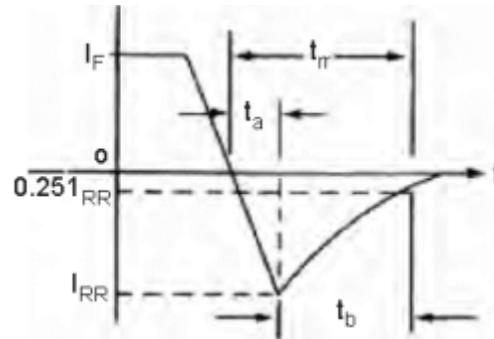


(Fig. 4: Main characteristics of an overvoltage)

Four types of overvoltage can disturb electrical installations and loads:

1. Switching surges: high-frequency overvoltages or burst disturbance (see Fig. J1) caused by a change in the steady state in an electrical network (during operation of switchgear).
2. Power-frequency overvoltages: overvoltages of the same frequency as the network (50, 60 or 400 Hz) caused by a permanent change of state in the network (following a fault: insulation fault, breakdown of neutral conductor, etc.).
3. Overvoltages caused by electrostatic discharge: very short overvoltages (a few

nanoseconds) of very high frequency caused by the discharge of accumulated electric charges (for example, a person walking on a carpet with insulating soles is electrically charged with a voltage of several kilovolts).



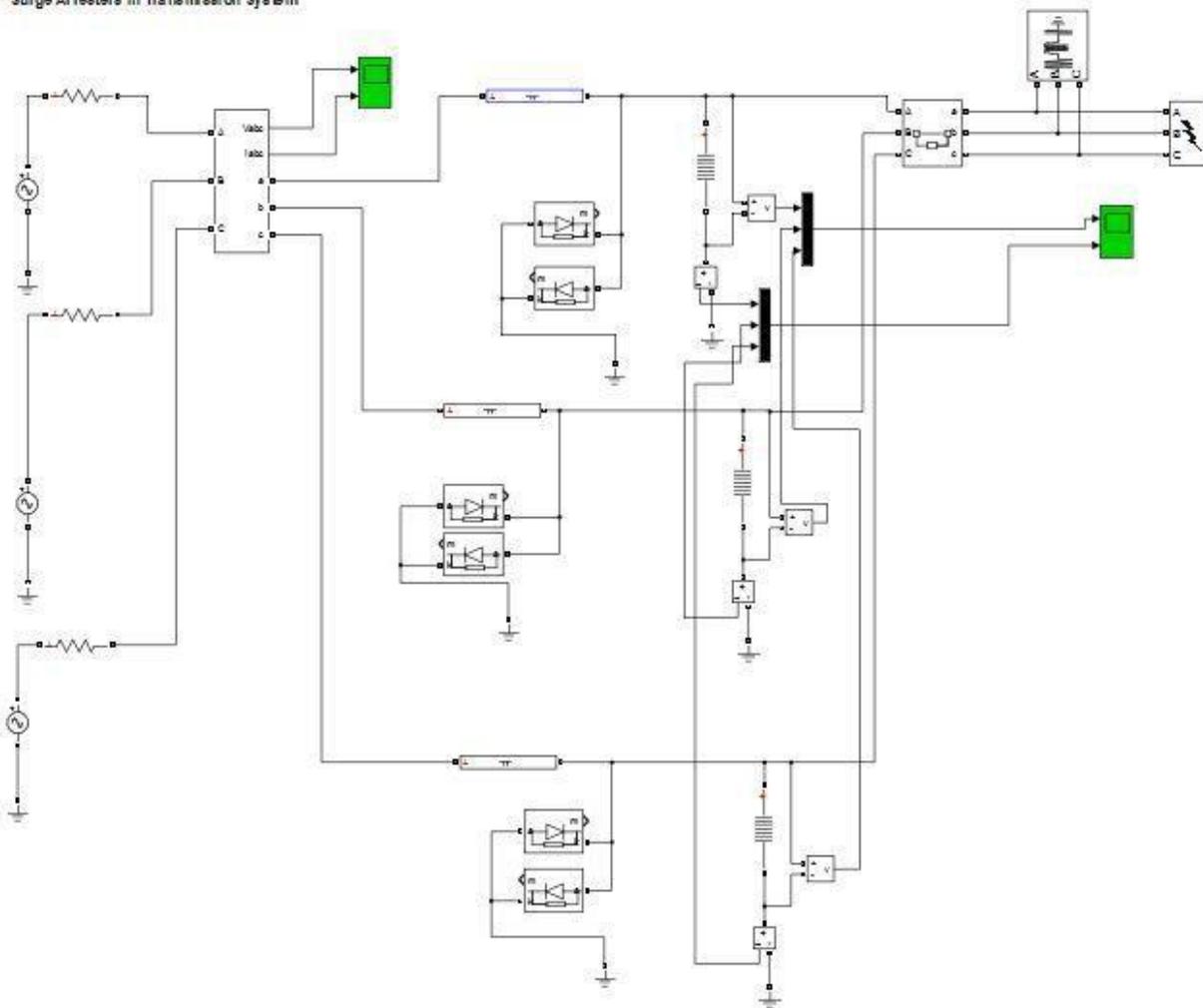
4. Overvoltages of atmospheric origin.

Power Diode Characteristics: The reverse recovery characteristics of the Power diode are shown in the figure 5. From the figure, we can understand the turn off characteristic of the diode. The Reverse recovery time T_{rr} is the (fig. 5 reverse recovery characteristics of the Power diode) time interval between the application of reverse voltage and the reverse current dropped to 0.25 of I_{RR} .

Parameter t_a is the interval between the zero crossing of the diode current to it reaches I_{RR} . Parameter t_b is the time interval from the maximum reverse recovery current to 0.25 of I_{RR} .

The lower T_{rr} means fast diode switching. The ratio of the two parameters t_a and t_b is known as the softness factor SF.

Surge Arresters In Transmission System



Datasheet Parameters:

For power diodes, a data sheet will give two voltage ratings. One is the repetitive peak inverse voltage (VRRM) and the other is the non-repetitive peak inverse voltage.

The non repetitive voltage (VRM) is the diode’s capability to block a reverse voltage that may occur occasionally due to over voltage surge.

The data sheet of a diode normally specifies three different current ratings. They are: (1) Average current; (2) RMS current; and (3) Peak current. A design engineer must ensure that each of these values are never exceeded.

MATLAB SIMULATION: The 132 KV three phase transmission systems is simulated in MATLAB using Simulink. The model

consist of 132 kv generation system, transmission line pi- section of 100 km length, the metal oxide varistor (MOV) type lightning arresters are connected between phase to ground with leakage current measuring device. The transmission systems employs three phase R-L Load and connected through circuit breaker. On load side a three phase fault is simulated. Supply system voltage , current is measured . The voltage across L.A. and leakage current is also measured using scopes. The two anti-parallel power diodes on each phase across L.A. is also connected. Practical

MPSEB Data has been used to obtain simulation results

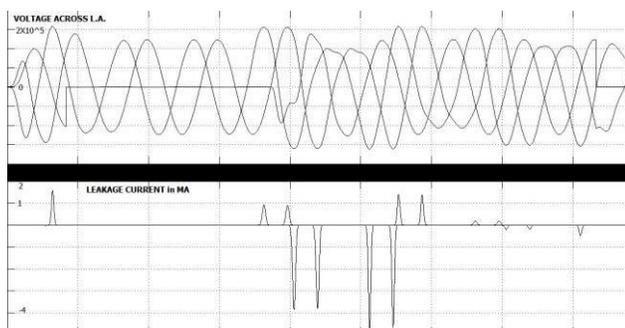
RESULTS:

| FAULT type | VOLTAGE WITH OUT POWER DIODE S in KV | VOLTAGE WITH POWER DIODE S in KV | Leakage current WITH OUT POWER DIODE S | Leakage current WITH OUT POWER DIODE S |
|------------------|--------------------------------------|----------------------------------|--|--|
| No fault | 76.21 | 76.21 | 1.1 mA | 1.1 mA |
| R Phase to earth | 210.30 | 100.72 | 45 mA | 2.6 mA |
| R-Y Phase | 220.36 | 110.72 | 42 mA | 2.1 mA |
| R-Y- Earth | 214.44 | 104.17 | 48 mA | 2.9 mA |
| R-Y- B Phase | 244.10 | 101.88 | 43 mA | 2.1 mA |
| R-Y- B- earth | 275.30 | 145.72 | 52 mA | 2.8 mA |

CONCLUSION: It has been observed that using power diodes combination across lightning arrestor the overvoltages are reduced to much extents also the leakage currents also decreases. Thus it reduces the failure of lightning arrestor and increasing the life span. It is also observed that using power diodes with suitable resistance values also reduces overvoltages during different fault conditions.

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Future Prospects of Postal Services in Digital Age in India

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ABSTRACT

The aim of this study is to provide an overview of the current technological developments in the postal market and assess the potential future impact of various technologies and innovations on the market, and on Indian consumers in particular. This study is conducted by a research scholar for the partial fulfillment of the PhD degree, using mix of desk research, expert interview and own analysis. The findings are based on literature review, expert interview and validated during interviews with postmaster, postman and consumers.

INTRODUCTION

This study provides an overview of recent developments in the postal market and research on technology trends which will impact postal consumers. It summarizes technological developments in the postal and delivery sector in the India. It assesses how technologies will change the postal market and the strategic location of the postal sector. The main objective is to evaluate how future technological development will impact consumers of postal services in the short and long run. To achieve this purpose, the study develops scenarios of future technology development.

Background of digitalization in India:-

Services sector contributes more than 60% to India's economy and 28% to the total employment. Attracting highest FDI inflows, services sector is on a growth trajectory driven by digital efforts of the government and highly skilled and low cost manpower. We have witnessed good revenue generation with growing sectoral activities across tourism, healthcare, telecom, information technology, banking, finance, education and space. The new sectors, which have gained significant momentum from government and private players,

include sports, railways and retail including e-commerce and hence, these are included as focus areas in the Global Exhibition on Services 2017. These sectors are increasingly gaining global visibility and attracting global players to invest and partner with domestic players. Various government initiatives – Smart Cities, Clean India, Digital India, etc. are creating enabling environment giving further push to the services sectors such as communication, healthcare, environment, technology, energy, banking to name a few. With the right regulatory and policy framework and creating a climate that will ease the way of doing business in India, the services sector can achieve new height and hold an enlarged share of global services trade pie. These conscious efforts of the government to engage with global companies and governments have led to increased investments and participation in India's strategic initiatives. However, simplified regulations and standards, and the establishment of global rules on service such e-commerce, etc. to facilitate cross-border trade will be critical for future growth.

Technology Drivers in Postal Sector:-

As emails and SMSes become the order of the day, the good-old Postal Department is going hi-tech by geo-tagging the post offices and has begun monitoring timely clearance of the letter boxes through a mobile app. In collaboration with the Department of Space, India Post has geo-tagged over 1.5 lakh post offices on the indigenous geo-portal Bhuvan, developed by ISRO, to help people search the nearest post office and know about services and timings.

India Post has over 1.55 lakh post offices of which more than 1.39 lakh are in the rural areas. An official in communications and IT ministry said that the remaining post offices would also be geo-tagged soon on Bhuvan, a Hindi word for 'universe'. The initiative is part of Prime Minister Narendra Modi's drive to use space technology by various departments of the government he added.

"More than 1,50,000 post offices have been geotagged and their exact location on a GIS satellite imagery map along with photograph, services and office timings etc have been made available on the portal," he added. Bhuvan, developed by Indian Space Research Organisation (ISRO), is providing visualisation services and earth observation data to users in public domain. Bhuvan, started in 2009 with simple display of satellite data and basic GIS functionality, now has more than 6,000 map services which are being used under various applications. Regarding other achievements of India Post in the last two years, the official said core banking solution (CBS) for providing 'anywhere banking' has been rolled out in 21,319 post offices, covering more than 30 crore Post Office savings bank accounts. Besides, 910 post office ATMs have been installed across the country. "A mobile app is being used for monitoring timely clearance of letter boxes in more than 16 cities".

ePOST: Bridging the Digital Divide:-

In the recent past, Internet and e-mail have revolutionized the world of communications. At the

same time, accessibility to email continues to be a major problem for many people, especially in the rural areas. In its endeavor to make the benefits of e-mail available to everyone and to bridge the digital divide, Department of Posts has introduced ePOST service.

Through ePOST, customers can send their messages to any address in India with a combination of electronic transmission and physical delivery through a network of more than 1,55,000 Post Offices. ePOST sends messages as a soft copy through internet and at the destination it will be delivered to the addressee in the form of hard copy. ePOST costs just Rs. 10 per page of A4 size.

ePOST can also be availed by the corporate customers, by having a business agreement with India Post. Corporate customers will get special ePOST rates and other value additions.

Digital Post Office Coming Up By 2017:-

The Postal Department is planning Digital Post Offices across the country by March 2017 as a part of modernization project. The communication and IT minister Ravi Shankar Prasad said that the government has approved the department of Post IT Modernization Project with the outlay of Rs4909 crore for digitization and networking of 155000 post offices including 129323 Gramin Dak Sewak Post Offices in rural areas across the country.

The modernization project also visualizes all the postal mail. Accounts and administrative offices in the country will be computerized on a single wide area network and they would also set up a centralized data centre and disaster recovery centre. Infosys Limited is the vendor for rural system integrator and Telecommunication Consultant India Limited is lead partner of Consortium with Ricoh India Limited for supplying and maintaining the hardware.

The project will also increase the rural reach of the Postal Department, traffic of financial remittances, savings accounts, rural postal life insurance, disbursing social security schemes and improving mail operation processes.

E-commerce is a key driver for postal services:-

India Post is cashing in on the boom in e-commerce deliveries, especially the surging cash-on-delivery consignments of the country's top online sellers — Amazon, Snapdeal and Flipkart-Myntra.

The postal department's revenues by ways of COD consignments from e-commerce majors have surged to Rs 1,300 crore during the year ending March 2016, up from Rs 500 crore during the whole of 2014-15, and just Rs 100 crore in 2013-14. The deliveries are primarily directed at tier-II towns, and parts of the rural heartland, where India Post has unparalleled reach.

The incremental e-commerce revenue boost, said Minister for Communications and Information Technology, Ravi Shankar Prasad, are proving to be a big boost for the postal department. "The postal department collected Rs 1,300 crore in COD collections during 2015-16, compared with Rs 100 crore in 2013-14," Prasad told The Indian Express.

However, according to India Post documents, it had expected the remittances from COD to exceed Rs 1,500 crores during 2015-16. The postal department has tied-up with more than 400 e-commerce companies including Flipkart, Snapdeal, Amazon, YepMe, Shopclues for delivering e-commerce pre-paid as well as COD orders. According to India Post, Jeff Bezos-led Amazon is India Post's largest business partner in e-commerce. As of December 2015, average monthly consignments from the department's top six e-commerce customers was up over six-fold, primarily on account of a big surge in Amazon's deliveries, which had sharply jumped to 3 lakh consignments until December 2015 from an average of 50,000 in 2014-15.

Average numbers of consignments from Snapdeal had reached 80,000 until December 2015, as against 35,000 in 2014-15. Flipkart-Myntra has clocked average consignment numbers of about 80,000 so far this year.

Ravi Shankar Prasad had earlier told that the incremental e-commerce revenue boost was at the heart of his plans to revive the fortunes of India's postal service.

Conclusion:-

India has the largest postal network in the world

with over 154,882 post offices, of which 89.86% are in rural areas. While all of them are supposed to have an internet connection (and be digitized by the end of the year), internet connectivity is non-functional at hundreds and thousands of post offices. The government-operated institution employs over 6 lakh people, and offers a range of mail and monetary exchange facilities. With such a wide network—each post office is meant to serve an area of about 20 square kilometers—it would be ideal for the post offices to have access to broadband internet connectivity and functional mobile/digital literacy to not just carry out traditional services offered at a post office but transform into digitally-enabled entitlements' offices.

This way, every post office will act as a government centre for the last mile, providing citizens with information on various government schemes and entitlements, and enabling access to the same by allowing download of relevant application forms for schemes, assisting rural communities in filling up the forms and submitting the forms online on behalf of the beneficiaries. Since the post offices are the last-mile access for most villages, it will save villagers the money and time that they would otherwise expend to travel to the nearest block to access these services.

Recommendations:-

- All post masters be trained in functional digital literacy.
- All post offices must become hubs of digital services such as printing, scanning and copying.
- No need for additional infrastructure for common services centers in all areas.
- Enabled e-services to reach the farthest corners of India via widespread network.
- To provide single access point for people to access postal banking and insurance services along with other government information and benefits.

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EFFECT OF FLUORIDE ON HUMAN BEING WITH SPECIAL REFERENCE TO SEHORE DISTRICT .M.P.

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ABSTRACT

The present deals about the contamination of fluoride in ground water and their effect on human being. The samples were taken and analyse , here we used data only for effect of fluoride on human being. Fluoride affected village peoples are mainly suffered by Dental fluorosis and Skeletal fluorosis. These villages are namely (Ramkheri (6.89 post monsoon 5.78 pre monsoon), Mahoriya (6.99 post monsoon 5.66 pre monsoon), Kauriya (1.92 post monsoon and 1.62 pre monsoon), Phutibawari (2.08 post monsoon and 1.98 pre monsoon), Barkheri (2.00 post monsoon and 1.78 pre monsoon), Hasnabad (5.96 post monsoon and 5.00 pre monsoon), Jahangirpura (4.53 post monsoon and 4.02 pre monsoon), Ujarkhera (2.05 post monsoon and 1.96 pre monsoon), Pipliyaminan (3.2 pre monsoon only).

1.1 INTRODUCTION :

It is well known fact that the excess fluoride intake is responsible for dental and skeletal fluorosis. The problem of fluorosis has been known in India for a long time. The disease earlier called "mottled enamel" was first reported by Vishanathan (1935) to be prevalent in human beings in Madras Presidency in 1933. Mahajan (1934) reported a similar disease in cattle in certain parts of old Hyderabad state. However, Shortt (1937) was the first to identify the disease as "Fluorosis" in human beings in Nellore district of Andhra Pradesh.

Fluoride is present in the teeth, bones, thyroid gland and skin of animals. It plays an important role on the formation of dental enamel and normal mineralization in bones but can cause dental fluorosis and adversely affect the central nervous system, bones, and joints at high concentrations (Agarwal *et al.*, 1997). The fate of fluoride in the soil environment and groundwater is of concern for several reasons. It is generally accepted that fluoride stimulates bone formation

(Richards *et ai*, 1994) and small concentration of fluorides have beneficial effects on the teeth by hardening the enamel and reducing the incidence of caries (Fung *et al.* 1999). At lower levels (<2 mg/ml) soluble fluoride in the drinking water may cause mottled enamel during the formation of teeth, but at higher levels other toxic effects may be observed (Weast and Lide, 1990). Excessive intake of fluoride results in skeletal and dental fluorosis (Czarnowski *et al.* 1999). Severe symptoms lead to death when fluoride doses reach 250-450 mg/ml (Luther *et al.*, 1995). It has been found that the IQ of the children living in the high fluoride areas (drinking water fluoride > 3.15 mg/ml) was significantly lower (Lu *et al.*, 2000).

Fluoride enters in the human body mainly through the intake of water and to a lesser extent by food. The foods which are rich in fluoride include fish and tea (EPA, 1997). Ingested fluorides are quickly absorbed in the gastrointestinal tract, 35-48% is retained by the body mostly in skeletal and classified tissues, and the balance is excreted largely in the urine. Chronic ingestion of fluoride rich fodder

and water in endemic areas leads to development of fluorosis in animals e.g. dental discoloration, difficulty in mastication, bony lesions, lameness, debility and mortality (Patra *et al.*, 2000).

Naturally occurring fluorides in groundwater are a result of the dissolution of fluoride containing rock minerals by water while artificially high soil fluoride levels can occur through contamination by application of phosphate fertilizers, sewage sludge, or pesticides (EPA 1997). Due to its strong electronegativity is attracted to positively charged calcium in teeth and bones. Major health problems caused by fluoride as dental fluorosis, teeth mottling, skeletal fluorosis and deformation of bones in children as well as in adults. Excess fluoride affects plants and animals also. The effect on agriculture was also evident due to inhibition an plant metabolism leading to necrosis, needle scratch and tip burn diseases.

India is one among the 23 nations around the globe where health problems have been reported due to excessive fluoride in drinking water. An estimated 62 million people in India in 17 out of 28 states are affected with dental, skeletal and non skeletal fluorosis. The endemic states with the percentage area affected are given in Table 6.1.

Table - 1.1 Indian states with areas affected by fluoride poisoning

| No. | State | Area Affected (%) |
|-----|-----------------|-------------------|
| 1. | Assam | - |
| 2. | Andhra Pradesh | 50 - 100 |
| 3. | Bihar | 30 - 50 |
| 4. | Delhi | < 30 |
| 5. | Gujarat | 50 - 100 |
| 6. | Haryana | 30 - 50 |
| 7. | Jammu & Kashmir | < 30 |
| 8. | Karnataka | 30 - 50 |
| 9. | Kerala | < 30 |

| No. | State | Area Affected (%) |
|-----|----------------|-------------------|
| 10. | Maharashtra | 30 - 50 |
| 11. | Madhya Pradesh | 30 - 50 |
| 12. | Orissa | < 30 |
| 13. | Punjab | 30 - 50 |
| 14. | Rajasthan | 50 - 100 |
| 15. | Tamil Nadu | 50 - 100 |
| 16. | Uttar Pradesh | 50 - 100 |
| 17. | West Bengal | - |

1.2 SOURCES OF FLUORIDE :

Various sources of fluoride entering the body are drinking water, food, industrial exposure, drugs and cosmetics etc. However, drinking water is considered as the major contribution to fluoride entering the human body.

1. Drinking Water

The major source of fluoride in the groundwater is fluoride bearing rocks from which it get weathered and / or leached out and contaminates the water. Fluorides occur in three forms, namely, fluorospar or calcium fluoride (CaF_2), apatite or rock phosphate [$\text{Ca}_3\text{F}(\text{PO}_4)_3$] and cryolite (Na_3AlF_6). Concentration of fluorides is five times higher in granite than in basalt rock areas. Similarly, shale has a higher concentration than sandstone and limestone. Alkaline rocks contain the highest percentage of fluoride (1200 to 8500 mg/kg) (Chand, 1998).

The Geological Survey of India has brought out considerable data which reveal that fluorite, topaz, apatite, rock phosphate, phosphatic nodules and phosphorites are widespread in India and contain high percentage of fluorides.

2. Food

Besides water, food items especially agricultural crops are heavily contaminated with fluoride as they are grown in the areas where the earth's crust is loaded with fluoride bearing rocks.

Fluoride is present to some extent in nearly all foods, but the concentrations vary widely. Studies of the fluoride contents of foodstuffs reported in the WHO Monograph (1970) have been reviewed by Muhlar (1970). Prival and Fisher and have made a more recent compilation on fluoride contents.

Among the foodstuffs notably high in fluoride are fish, particularly those, such as sardines, that are eaten with the bones. Fish-meal flour, which is produced from the whole fish, is also high in fluoride. Tea is unusually rich in fluoride. Milk and most fruits are generally low in fluoride. Vegetables vary greatly in fluoride content.

Hodge and Smith (1965) computed the total fluoride intake from food at 0.5-1.5 mg/day for areas with nonfluoridated water. Marier and Rose (1966) showed that use of fluoridated water in canneries increased the fluoride content of canned food by 0.5 mg/liter and converted this to 0.5 mg/day in the diet. The proposed total intake from the diet then became 1.0-2.0 mg/day.

However, Hodge and Smith estimate came from Machle and Largent (1943), whose values were based erroneously on earlier work (Machle *et al.*, 1942). In this earlier work the average total fluoride intake per day for 20 weeks was just under 0.5 mg with only 0.16 mg of the intake from food as such. In a more recent review Hodge and Smith (1970) have lowered their estimate 0.3-0.8 mg fluoride daily from the diet.

Recent studies indicate that the total intake of fluoride is as high as 3 mg/day rather than the earlier figure of 1.5 mg/day, primarily because of increases in the estimated levels of fluoride in foods (Spencer *et al.*, 1970). Balance data presented by Spencer also suggest a higher retention by bone, nearly 2 mg/day rather than the 0.2 mg/day indicated earlier.

Two recent articles from Spencer's group (Kramer *et al.*, 1974; Dace *et al.*, 1974) appear to support a higher estimate for dietary fluoride intake. The first is based on hospital-prepared food from 16 U.S. cities. The fluoride intake from food in the fluoridated communities was found to range from 1.6-3.4 mg/day (av. 2.6) while that from nonfluoridated cities was 0.8-1.0 mg (av. 0.9). The very high values and the marked difference between fluoridated and nonfluoridated cities can be explained in part by the inclusion of coffee and other water-based beverages as dietary intake. This classification is not usually followed by other investigators. The second article reports average fluoride intake from diets used in balance studies in a fluoridated city over a 6-yr period as 2.0 mg/day.

These findings are important because, if valid, they might represent a shift in intake that could lead to dental Fluorosis in fluoridated communities. Also, a retention of 2 mg/day would mean that an average individual would experience skeletal Fluorosis after 40 yr, based on an accumulation of 10,000 ppm fluoride in bone ash. However, these new estimates for fluoride in food are questionable; consequently, so are their implications. The values are suspect because of analytical problems. The diffusion method of Singer and Armstrong (1969a) was used with a colorimetric reagent and false high values are obtained with this technique (Taves, 1966).

A study more limited in scope, because it was restricted to 16 to 19 yr old males, found 2.0-2.3 mg/day total fluoride intake (San Filippo and Battistone, 1971). The increase over earlier values may reflect the fact that the food portions were large for the test group.

Data from balance studies in children tend to support the lower values. The dietary fluoride intake for nine children aged 4 to 18 years averaged 0.3 mg/day (Forbesero, 1973).

The quickest and most reliable method of checking whether there has been a shift in total intake of fluoride in the past 20-30 yr is through surveys of the urinary and bone fluoride concentrations occurring in people in fluoridated communities. There has been no question about the analytical techniques used in these earlier data on urine and bone because the concentrations involved were relatively high. A recent (Parkins, 1974) bone survey in Iowa done at autopsies showed bone fluoride levels higher than those in earlier publications, particularly when taking into account that they are for unashed bone, which means that the concentrations need to be approximately doubled to compare them to values for ashed bone. Detailed comparison of the method he used has shown no systematic error, but other bone fluoride values found in Rochester, New York, show concentrations which match earlier values almost exactly (Charen *et al.*, in preparation, 1976). The fluoride content in food material mainly depends upon:

1. Fluoride level in soil
2. Fluoride level in atmosphere
3. Use of fertilizers and pesticides and other sources of contamination.

The fluoride content of some food items has been given in Table 6.2

Table : 1.2 Fluoride content in various food

| Food Item | Fluoride (mg/kg) | Food Item | Fluoride (mg/kg) |
|-----------|------------------|---------------|------------------|
| Cereals | | Fruits | |
| Wheat | 4.6 | Banana | 2.9 |
| Rice | 5.9 | Mango | 3.2 |
| Maize | 5.6 | Apple | 5.7 |
| | | Guava | 5.1 |
| Pulses | | Beverages | |
| Gram | 2.5 | Tea | 60-112 |
| Soybean | 4.0 | Coconut water | 0.32 - 0.6 |

| Food Item | Fluoride (mg/kg) | Food Item | Fluoride (mg/kg) |
|---------------------|------------------|--------------------------|------------------|
| Vegetables | | Spices | |
| Cabbage | 3.3 | Coriander | 2.3 |
| Tomato | 3.4 | Garlic | 5.0 |
| Cucumber | 4.1 | Ginger | 2.0 |
| Ladyfinger | 4.0 | Turmeric | 3.3 |
| Ladyfinger | 4.0 | Turmeric | 3.3 |
| Spinach | 2.0 | Food from Animal sources | |
| Mint | 4.8 | Mutton | 3.0 - 3.5 |
| Brinjal (egg plant) | 1.2 | Beef | 4.0 - 5.0 |
| Potato | 2.8 | Pork, | 3.0 - .5 |
| Carrot | 4.1 | Fishes | 1.0 - 6.5 |

Source : Prevention and control Fluorsis in India. Vol.1 (Health Aspects) (Ed. Susheela, A.K.) Rajeev Gandhi National Drinking Water Mission, New Delhi.

3. Industrial Exposure

Industrial exposure to fluoride-containing dusts and gases has been a serious problem in many parts of the world. A committee of the National Academy of Sciences on the Biological Effects of Atmospheric Pollutants (1971) reported on fluoride as an atmospheric pollutant both in the work place and in the ambient air.

Operations that introduce fluoride dusts and gases into the atmosphere include: grinding, drying, and claiming of fluoride-containing minerals; acidulation of the minerals; smelting; electrochemical reduction of metals with fluoride fluxes or melts as in the aluminum and steel industry; kiln firing of brick and other clay products and the combustion of coal.

Generally speaking, good progress has been made in reducing fluoride exposure to industrial workers by ventilation and emission control practices.

4. Drug and Cosmetics

The sodium fluoride containing drugs for Osteoporosis, Osteosclerosis and dental caries are in use for many years. The prolonged use of these drugs may cause fluorosis. Additionally, the toothpastes and mouth-rinses (whether labelled fluoridated or otherwise) also contain higher fluoride concentration. The fluoride content arising from raw materials used for the manufacturing of tooth-paste, namely, calcium carbonate, talc and chalk can have as high as 800-1000 mg/kg of fluoride. In the fluoridated brands of tooth-pastes, the fluoride content has been reported up to 1000-4000 mg/kg. Moreover, some of the mouth rinses are nothing but fluoridated water of a very high fluoride concentration.

| Fluoride Concentration (mg/L) | Effect |
|-------------------------------|---|
| Nil | Limited growth and fertility |
| < 0.5 | Dental caries |
| 0.5 - 1.5 | Promoters dental health, prevents tooth decay |
| 1.5 - 4.0 | Dental fluorosis (mooting and pitting of teeth) |
| 4.0 - 10.0 | Dental fluorosis, skeletal fluorosis (pain in neck bones and back). |
| > 10.00 | Crippling fluorosis. |

5. Air :

Air pollution by fluoride dusts and gases has done substantial damage to vegetation and to animals in the vicinity of industrial fluoride sources. However, the contribution of ambient air to human fluoride intake is only a few hundredths of a milligram per day (NAS, 1971), an amount that is insignificant in comparison to other sources of fluoride.

1.3 HEALTH IMPACTS AND FLUORIDE :

1. 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 (Meenakshi *et al.*, 2004). In temperate regions, where water intake is low, fluoride level up to 1.5 mg/L is acceptable. The Ministry of Health, Government of India, has prescribed 1.0 and 2.0 mg/L as permissive and excessive limits for fluoride in drinking water, respectively. Table 3 shows different health impacts at varying fluoride concentrations in drinking water.

Table 1.3 Concentration of Fluoride in drinking water and its effects on human health

1.4 SENSITIVITY TO FLUORIDE :

A recent report (Grimbergen, 1974) suggests confirmation of the earlier claims by Waldbott (1962) that some people are very sensitive to fluoride. Waldbott's claims have been dismissed on two grounds: that he was the only one to report such effects, and that sensitivity of this type has not been reported among the-billions of tea drinkers in the world who would be ingesting extra fluoride (WHO, 1970, p. 15).

Grimbergen's report was a preliminary methodological paper and is not convincing. Two aspects of the methodology seem weak and could lead to erroneous conclusions. First, when large numbers of double-blind tests are done, it is to be expected that control patients will occasionally have symptoms that correspond to those associated with the administration of fluoride; the investigator should indicate the rate of positive responses and the results of retesting. Second, the patients selected themselves for inclusion in the study based on their beliefs that they were already sensitive to fluoride. Waldbott's case reports (1962) are more completely documented and he used concentrations that were probably too low to be identified by taste. He reported 29 positive responders among 48 people tested. The Royal College of Physicians (1976, p. 63) review stated

that sodium fluoride at 1 mg/15 ml of distilled water has a distinctive taste. However, Taves (unpublished, 1976) found that four people out of five could not tell the difference at 1 mg/15 ml.

Waldbott and Grimberger are not the only ones who have described patients with syndromes that they explained as intolerance to fluoride. Douglas (1947) tested 32 patients in a group of 133 with histories suggestive of sensitivity to fluoride-containing dentifrices. He implied that none were able to complete a series of six alternating trials using fluoride and nonfluoride toothpastes, because of intolerance, mainly in the form of ulcerations of the mouth. Feltman and Kosel claimed that, among pregnant mothers and their children, 1% (at least four of them) reacted adversely to 1 mg fluoride tablets. They stated that they established (by means of placebos) that it was the fluoride, rather than the binder, that caused the adverse effect (Feltman, 1956; Feltman and Kosel, 1961). Shea, Gillespie, and Waldbott (1967) reported on seven cases of patient improvement after discontinuing vitamin drops or toothpaste containing fluoride. They subjected one case to a double-blind.

Study with sodium fluoride in the cases involving toothpaste, the associated cation is not stated. Stannous fluoride is commonly used in toothpaste; therefore, sensitivity to tin, rather than to fluoride, cannot be ruled out. Petraborg (1974) reported on seven case histories of what seemed to be fluoride sensitivity, but the patients were not subjected to objective tests, so the evidence is weak.

The quantities of fluoride involved are clearly relevant to the question of the safety of fluoridation. But, if Feltman and Kosel's estimate of 1% intolerant people is correct, there should have been more reports of adverse effects in the studies in which fluoride tablets were given to school going children (at least 10,000 children by 1967, mainly in Switzerland) (O'Meara, 1968). Also, as methoxyflurane anesthesia for surgery typically causes serum fluoride content to

increase to 30-50 times normal (Fry *et al.*, 1973), there should have been striking cases of such intolerance in an estimated 12 million patients who have received methoxyflurane (NAS-NRC, 1971). Moreover, cases of intolerance to fluoride (20-100 mg/day) for osteoporosis have been associated with very few symptoms of the type reported by Waldbott. There have not been reports of intolerance from people who move into and out of numerous towns with naturally high fluoridated water supplies. Opportunities for such discovery existed before any bias for or against fluoridation.

So, although sensitivity to fluoride has not been demonstrated firmly, a possibility of sensitivity or idiosyncratic reaction to fluoride should be kept in mind. Clarification might come from two kinds of study. Studies on the administration of fluoride drops or tablets for prevention of dental caries should include consideration of possible intolerance and definite statements should be made about any findings in this regard; in most such reports, no comments are made about a search for intolerance. Quibbles and Suttee (1972) have demonstrated an ability of fluoride-resistant cells to remove or exclude fluoride from their interiors *in vitro*. Humans or animals receiving fluoride for long periods should be studied to see whether a cellular resistance develops *in vivo*. If this could be demonstrated, the metabolic consequences of resistance or its absence might shed light on how intolerance could occur.

1.5 HEALTH ASPECTS :

ACUTE EFFECTS

Acute toxicity from fluoride is quite rare and occurs principally as a result of suicide or accidental poisoning. The lethal dose of sodium fluoride for man is about 5 g, but there are reports of recovery from amounts much greater as well as deaths from smaller quantities (Goodman and Oilman, 1975).

Initial symptoms of toxicity are a result of the local action of fluoride on the mucosa of the gastrointestinal tract. Vomiting, abdominal pain, nausea, and diarrhoea are followed by paresthesias, hyperactive reflexes and convulsions. No system of the body can be considered exempted, and death is usually due to respiratory paralysis or cardiac failure. Many of the signs and symptoms of acute fluoride toxicity are a result of the calcium-binding effects of fluoride (Goodman and Gilman, 1975; WHO, 1970).

CHRONIC EFFECTS

Chronic lexicological studies indicate that teeth and bone are the most fluoride-sensitive tissues. The margin of safety with fluoridated water (assuming an intake of 1 rag/day) has been estimated to be 2-8-fold for dental mottling. Years of experience with fluoridation without apparent objectionable mottling (see below for possible exceptions) attest to the adequacy of this low margin of safety. Crippling skeletal fluorosis has a 20- to 40-fold margin of safety for the average person, again assuming an intake of only 1 mg/day (Hodge, 1961 and 1962).

Epidemiological studies where the water is naturally high in fluoride have reported no adverse effects, except in rare cases, until the concentration is many times that recommended for artificial fluoridation (Hagen *et al.*, 1954; Leone *et al.*, 1954; AMA, 1957). Indeed, there is a suggestion that 1-5 ppm may prevent bone loss to some degree and decrease the amount of soft tissue calcification in older people (Bernstein *et al.*, 1966).

Controlled studies with recommended levels of added fluoride, such as in Kingston-Newburg, have reported no evidence of adverse effects (Ast *et al.* 1956).

Mongolism

The possibility that mongolism is caused by fluoride in the drinking water stems from a report by Rappaport (1959), in which he observed a dose-related association between the number of cases of mongolism registered in institutions and the concentrations of fluoride in the water. From the towns with less than 0.1 ppm to those with 1.0-2.6 ppm, the increase was nearly 3-fold. This study has been criticized because the case rates were less than half those found in intensive case-finding studies (Royal College of Physicians, 1976).

Three intensive case-finding studies in Britain (Berry, 1958, and two unpublished ones cited by the Royal College of Physicians, 1976) with different fluoride concentrations in the water have not shown such an association. Heavy tea drinking in England (Cook, 1970) might obscure differences in the British studies. However, the absolute rates were similar to those in a recent intensive case-finding study in Massachusetts (Needleman *et al.*, 1974), in which no difference was noted between fluoridated and nonfluoridated communities. Therefore, for Rappaport's hypothesis to be maintained, an explanation as to why the British rate did not reflect increased consumption of fluoride from tea drinking would be necessary. Needleman estimated that he could have detected an increase.

1.6 VARIOUS FORMS OF FLUOROSIS :

The various forms of fluorosis arising due to excessive intake of fluoride are briefly discussed below:

1. Dental fluorosis

This form of fluorosis affects the teeth and mainly occurs in children. The natural shine or lustre 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 Jines" or „soots" 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 the 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.

Dental fluorosis

Dental fluorosis is a health condition caused by the critical period of exposure is between 1 to 4 years of ages children over a child age 8 are not at risk. In its mild form, which is the most common, fluorosis appears as tiny white streaks or specks that are often unnoticeable. In its severe form it is characterized by black and brown stains, as well as cracking and pitting of the teeth.

The severity of dental fluorosis depends on the amount of fluoride exposure, the age of the child, individual response, nutritional and other factors. Although water fluoridation can cause fluorosis, most of this is mild and not usually of aesthetic concerns severe cases can be caused by exposure to water that is naturally fluoridated to levels well above the recommended levels, or by the exposure to other fluoride sources such as brick tea or pollution from high fluoride coal.

2. 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 which are normally affected by skeletal fluorosis are neck, hip, shoulder and knee that makes 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 a complete rigidity of the joints resulting in stiff spine, called as „*Bamboo spine*“ and immobile knee, pelvic and shoulder joints.

Skeletal fluorosis

Skeletal fluorosis is a bone disease caused by excessive consumption of fluoride. In advanced cases, skeletal fluorosis causes pain and damage to the bones and joints.

Field photographs of the area of study shows skeletal fluorosis. Photo No. 25 - 27.

Causes

Common causes of fluorosis include inhalation of fluoride dusts/fumes by workers in industry, use of coal as an indoor fuel source (a common practice in China), consumption of fluoride from drinking water (naturally occurring levels of fluoride in excess of the CDC recommended safe levels and consumption of fluoride from the drinking of tea, particularly brick tea.

In India, the most common cause of fluorosis is fluoride-laden water derived from deep bore wells. Over half of the ground water sources in India have fluoride above recommended levels.

3. NON-SKELETAL MANIFESTATIONS :

The soft tissues of the body may be affected by excessive consumption of fluoride. The symptoms include gastro-intestinal 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 afflicted 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. None of the Cases in observed in the area of study.

In the area of study dental fluorosis is more prominent: field photographs are showing sedentarily of dental fluorosis in different age group.

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The condition is more prevalent in rural areas where drinking water is derived from shallow wells or hand pumps. It is also more likely to occur in areas where the drinking water has a fluoride content of more than 1ppm (part per million), and in children who have a poor intake of calcium.

3 APHA 1985 Standard methods for the examination of water and waste water 16th edition.

4 Aravindan, S., Patak Suban Chandrasekhar 2006 Groundwater targeting in the hard rock area of Gaditam River Basin, Tamilnadu through remote sensing and GIS Journal Applied Hydrology Vol. XIX No. 1802, pp. 84-93.

CONCLUSION

Fluoride concentration in drinking water plays a critical role in human health In take of excess fluoride through drinking water causes fluorosis in human which can not be clinically treated. Fluorosis in initial stages causes body pains, yellowing of teeth and subsequently skeletal deformity. Out of 57 samples eight villages namely Ramkheri, Mahoriya, Kuuriya, Pipliyamiran, Berkheri, Hasuabad, Jahangirpur and Tyarkhera peoples are affected by mainly dental and skeletal fluorosis, children up to the age of 10 years mainly affected by dental fluorosis while age group of 45-55 affected by skeletal fluorosis.

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