

Editorial

Ethno library and our heritage

The word 'ethno' represents traditional knowledge, culture, literature, science, technology etc. of a society. The written texts available on the traditional knowledge are preserved in these libraries. These are found mostly in the manuscript forms. The traditional knowledge is the heritage knowledge because these were produced at the time when there were no machines and the people used to do their works by their own hands manually. The intellectual activities as well as the domestic or any other technical activities were done by manually at that time. The whole society was lead by their manual energy and activity.

At present most of our activities are done by the machines using energy from outside. We are really in a mechanical society now. Our heritages of the traditional society are preserved in the ethno libraries. The ethno libraries are there in the religious institutions, in the museums, archives and so on. There are two types of ethno libraries. One is the libraries of ethnic knowledge and another is the libraries which conserve the ethnic materials. We should take care of these libraries to save our heritage.

The countries like India, China, Nepal, Egypt, England, USA, Russia, Australia etc. have been conserving these libraries which are managed by the library professionals. These may not be utilized by the users as like the modern libraries, but these are the sources of our heritage and history. Every nation should have one national ethno library to conserve the traditional knowledge of the respective countries as well as the whole World.

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A study on the problems of government and private schools at primary stage in Kokrajhar town

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Abstract:

This study is aimed at investigating the problems of Government and Private schools at the primary level in Kokrajhar Town. The sample for the present study contains 20 schools i.e. 10 Government Schools and 10 private schools of Kokrajhar Town. Random Sampling technique and Descriptive method is used for the present study. Self-prepared Questionnaire and interview schedule is made used for the present study. The study revealed that both in Government and private schools there is lack of provisions for teachers training, Baby care facilities, hostel facilities etc. This study will be helpful to the curriculum framers and policy makers.

Keywords:- Primary school, Problems, Education.

1. Introduction:

Primary education is the first stage of education between the ages of 5-11years. Primary education comes before pre-school and before secondary school. In most of the Countries, it is compulsory for children to receive primary education. Primary education is the fundamental need of life and its development. Education is the birth right of every child which must be ensured by the state or the central government. Primary education is the mini education for the individual which helps in the removal of the darkness of ignorance and illiteracy from his life. It makes man capable of reading and writing and knowing the environment in which he lives. It enables him to make a proper adjustment and progressive development with society. Education can identify and unfold the native potentialities of an individual for development. It can help in the effective use of the human and natural resources of the country. Therefore, it becomes the obligatory duty and bounded responsibility of the government of welfare state to make this education available to every child.

Kokrajhar is one of the main districts of Bodoland Territorial Council. The district lies roughly between 89.46'E to 90.38'E longitude and 26.19'N to 26.54'N longitude. The district is bounded on the North by Bhutan and by Dhubri District on the south, Bongaigaon district on the East and West Bengal on the West. In 2011, Kokrajhar district had population of 887,142 of which male and female were 452,905 and 434,237 respectively. In 2001 census, Kokrajhar had a population of 843,243 of which males were 433,360 and remaining 409,883 were women. Average literacy rate of Kokrajhar in 2011 were 65.22 compared to 52.29 of 2001. If things are looked out at gender wise, male and female literacy were 71.89 and 58.27 respectively. For 2001 census, same figures stood at 61.01 and 43.06 in Kokrajhar District. Total literate in Kokrajhar District were 489,305 of which male and female were 275,220 and 214,085 respectively. In 2001, Kokrajhar District had 4,797,838 in its district. Under Kokrajhar Town the total Government Primary Schools are 25 and 10 Private Primary Schools. Primary School generally starts or begins from class 1-V in both Government and private School in Kokrajhar Town.

2. Objectives of the study:

- 1) To study the problems of the Primary Government Schools and Private Schools in Kokrajhar Town.
- 2) To study the problems of drop-outs in Primary Government Schools and Private Schools in Kokrajhar Town.
- 3) To give suggestions for improvement of Primary Schools both in Government and Private Schools in Kokrajhar Town.

3. Methodology:

For the purpose of the study, the survey method is considered as most appropriate. Interview method is also used.

3.1 Population of the study:-

The population for the present study comprised of all the schools in the Kokrajhar Town under Kokrajhar District BTAD, Assam. The details of the sample drawn for the study are shown in the table provided as below:-

Table No.3.01 showing the population of the study:

No. of schools	No. of Government schools	No. of Private schools	No. of teachers.	
			Government	Private
35	25	10	100	186

3.2 Sample of the sample:-

The sample of the present study comprised of 20 schools in Kokrajhar Town under Kokrajhar District and random probability sampling technique was adopted. Accordingly, 10 Government Schools and 10 Private Schools were selected. The details of the sample for the study are shown in the table given below:-

Table No.3.01 showing the sample of the study:

No. of schools	No. of Government schools	No. of Private schools	No. of teachers.	
			Government	Private
20	10	10	10	10

3.3 Delimitations of the study:-

Due to lack of time and funds the investigator is not able to conduct the study on a large area. Therefore for the present study the investigator delimited the study in Kokrajhar area and only 20 samples is done for the present study.

3.4 Tools and techniques of data collection:

The investigator had used self prepared “A Study on the comparison between Government and Private Schools at Primary Stage” Questionnaires, Group Discussion in order to obtain required and accurate information.

3.5 Procedure of data collection:-

In order to collect reliable data for the present study the investigator covered the selected sample in Kokrajhar town under Kokrajhar District BTAD, Assam personally. Data were

collected by the investigators through Questionnaires, interview and group discussion etc. The questionnaires formulated were given to the selected teachers by the investigators. The investigators tried to establish rapport with the teacher and explain the objective of the study to them before distributing the questionnaire. In distributing the questionnaires to the selected teachers, the investigators requested them to return them as earlier as possible.

3.6 Procedure of data analysis:-

The investigators had compiled all the data gathered through structured questionnaire, interview schedule and group discussion carefully. The raw data were systematized and tabulated in different tables. Further, raw data were also analyzed by using the statistical technique of percentage. The content analysis techniques were also adopted for the qualitative analysis of the study. From the collected data we have come to know the various problems of Government and Private schools at the primary stage in Kokrajhar town. The problems are as follows:-

4. Analysis of data:-

4.1 It is found that the parents mostly enroll their children in private schools, so more student in private schools in comparison to Government school.

4.2 Responses regarding healthcare facilities:

Table No.4.2: Showing responses regarding healthcare facilities:

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	2	8	10	20%	80%
2	Private	7	3	10	70%	30%

The table shows that only 20% of Government schools have healthcare facilities but 70% of Private schools have healthcare facilities.

4.3 Responses regarding mid-day meal:

Table No.4.3: Showing responses regarding mid-day meal

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	10	0	10	100%	0%
2	Private	1	9	10	10%	90%

From the above table it is seen that there is 100% mid-day meal facility in Government schools but such facility is not available in private schools.

4.4 Responses regarding organization of parent's day:

Table No.4.4: Showing responses regarding parent's day:

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	7	3	10	70%	30%
2	Private	10	0	10	100%	0%

From the above it indicates that only 70% of Government schools organize parent's day but 100% of private schools organize the same.

4.5 Responses regarding Teacher's training facility:

Table No.4.5: Showing responses regarding Teacher's training facility:

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	6	4	10	60%	40%
2	Private	3	7	10	30%	70%

From the above table it is seen that 60% of Government school teachers have undergone training whereas 30% of Private school teachers have undergone training.

4.6 Responses regarding the failure of the students in Examination:

Table No. 4.6 Showing the reasons for failing in the examination:

Reasons	Government	Private
Lack of communication	10%	10%
Lack of finance	20%	30%
Lack of material resources	20%	40%
Frequent bandhs	10%	10%
Lack of students effort	40%	10%

It is seen that the main reason behind the student's failure in the examination in Government Schools is due to lack of students effort in their studies(40%), whereas in private schools the main reason is due to lack of material resources(40%) respectively.

4.7 Responses regarding leadership training:

Table No.4.7: Showing responses regarding leadership training:-

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	5	5	10	50%	50%
2	Private	6	4	10	60%	40%

From the above table it is found that 50% Of the Government school teachers give leadership training to their students, whereas 60% of private school teachers also give leadership training to their students.

4.8 Responses regarding the hostel facility:

Table No.4.8: Showing responses regarding hostel facility:

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	0	10	10	0%	100%
2	Private	6	4	10	60%	40%

From the above table it is seen that there is no hostel facility in Government schools but 60% of the Private schools have hostel facilities.

4.9 Responses regarding common room:-

Table No.4.9: Showing responses regarding common room:-

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	2	8	10	20%	80%
2	Private	7	3	10	70%	30%

The table shows that only 20% of Government schools have common room in their schools but 70% private schools have common rooms in their schools.

4.10 Responses regarding baby care facilities:-

Table No.4.10: Showing responses regarding baby care facility:-

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	0	10	10	0%	100%
2	Private	0	10	10	0%	100%

From the above table it is seen that there is lack of baby care facilities both in Government and Private schools.

4.11 Responses regarding drop out students:

Table No.4.11: Showing responses regarding drop out students:-

Sl. No	school	Responses		Total	Percentage	
		Yes	No		yes	No
1	Government	0	10	10	0%	100%
2	Private	1	9	10	10%	90%

From the above table it is seen that there is no dropouts in Government schools at primary level at present, due to no fail system. But in Private schools, it is found that the dropouts rate is 10%.

4.12 Responses regarding dropouts from the schools:

Table No. 4.12 showing the causes of dropouts from the schools:-

Reasons	Government	Private
Lack of classroom accommodation.	10%	10%
Financial problems.	10%	20%
Lack of material resources.	40%	20%
Punishment.	10%	10%
Lack of trained teachers.	30%	40%

It is seen that the main reason of dropout from the Government school is due to lack of material resources and in private school due to lack of trained teachers.

5. Suggestions:

- i) The Government should give provisions of audio-visuals aids both in Government and private schools.
- ii) Both private and government school teachers should be given importance on training for giving appropriate and effective teaching to the students.
- iii) The Government should give importance on provisions of hostel facilities for the students in Government schools.
- iv) The Government must give importance on provisions of healthcare facilities in the schools for the better improvement of health of students.
- v) The Government should also give importance on provisions of baby care facilities in Government and private primary schools.
- vi) The Government should give importance on imparting craft education both in Government and Private schools.

6. Conclusion:

From the above discussion, it is found that both in Government and private schools at the primary level needs to be improved in all aspects. Therefore, the Government, Community, school authority and parents should take an initiative role for the improvement of their children and also give proper guidance to them in future.

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Affects of terrorism on the economy of Assam: A Study

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Abstract:

Terrorism imposes significant economic effects on societies and will not only lead to direct material damage, but also to long term effects on the economy of Assam. The impact of terrorism on Assam's economy is enormous, leading to unemployment, homelessness, deflation, crime and other economic and social ills. The state of Assam has been adversely affected by armed insurgency over the last one and a half decades with various insurgent groups like the ULFA, NDFB, DHD, UPDS, NSCN, and BLT waging a low intensity war against the lawfully established Government.

The major insurgent groups ULFA and NDFB have committed scores of incidents of mindless violence like murders, bomb explosion, kidnapping which have created adverse impacts on the economy of Assam and have a serious bearing on the law and order situation of the state.

Introduction:

Terrorism is the premeditated use of threat of use of violence by individuals or subnational groups to obtain political or social objectives. Terrorism in India poses a significant threat to the people of India. Assam is one of the eight states of North East India and bordering seven states like Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland etc. The ULFA, BLT, NDFB etc. in Assam are the militant organisations that have been raging havoc in the life and minds of innocent people. The geographical spread of militancy in Assam is evident with a series of strikes by militant groups in upper and lower Assam and capital Guwahati. The identification and estimation of the economic effects of terrorism has received broad attention due to growing activities of terrorists. This paper is trying to look into the adverse impact of terrorism on the economy of Assam

Analysis:

Terrorism has negative economic effects. Terrorism cause economic damage. Terrorism has the capability to cripple economies, stunt welfare and create unforeseen crisis. Terrorism and insurgencies remain the biggest threat to security, business and our way of life. While examining the underlying determinants of economic growth in Assam, it is shown that these determinants differ greatly for Assam as compared to other states of India. In particular, Assam suffers from poverty, unemployment, lack of education, high public spending, high population growth and huge migration from neighbouring countries. These factors may make economic growth particularly prone to react adversely to violence in the form of terrorism and war. Assam economy is constantly being challenged by unexpected and unprecedented means of terrorism.

RECENT INCIDENTS OF TERRORIST VIOLENCE IN ASSAM 2014

SL. NO.	DATE	PLACE/ DISTRICT	OUTFIT	KILLED INJURED				
				CIVIL- IAN	SFs	terrorist	total	
1	Jan 17	Kokrajhar	NDFB IKS	6	0	0	6	2
2	Feb21	Goalpara	GNLA	0	0	3	3	0
3	March 11	Goalpara	UALA	0	0	3	3	0
4	April 30	Naojan/ Sonitpur	NDFB IKS	0	0	3	3	NS
5	May 1-12	BTAD	NDFB IKS	46	0	0	46	0
6	May 14	Langtibuk In karbianglong	KPLT	0	0	6	6	0
7	July11	Labdanguri/ Baksa	NDFB IKS	4	0	0	4	0

8	August 1	Mongre Gaon/Goalpara	ULFA-1	0	0	3	3	0
9	August 12-13	B Sector / Golaghat	NSCN IM	14	0	0	14	8
10	August 20	Raimati/ Chirang	NDFB IKS	0	0	5	5	0
11	Sep 11	Lanting/Dim a Hasao	UPLF	0	0	3	3	NS
12	Sep28	Mwinaguri/ Kokrajhar	NDFB IKS	0	0	4	4	NS
13	Oct8	Kokrajhar	NDFB IKS	0	0	4	4	NS

Such continual increase and spread of terrorist attacks across Assam indicates ineffectiveness of measure and investment made towards security in recent years. Terrorism has significant impact on percapita growth. Terrorists have damaged infrastructure- not only to create anxiety in a targeted audience but also disrupt the economy through a number of ways.

- I. Terrorist attacks may enhance uncertainty which limits investment and diverts public investment to safer venues.
- II. Augmented security outlays by government may crowd out productive public and private investment.
- III. A terrorist campaign raises the cost of doing business through higher wages, large insurance premium and greater security expenditure which in turn decrease profits, productivity and growth.
- IV. Terrorist attacks may dampen growth by destroying or degrading social overhead capital that facilitates commerce and daily routines.
- V. Terrorism impacts specific industries- e.g. airlines and tourism which in turn limit economic growth.

On a smaller scale, terrorism adversely affects the economy of the state for many of the same reasons---- e.g. capital flight, increased uncertainty, destroyed infrastructure and increased security spending.

A stagnant economy, rising unemployment, proximity to foreign neighbours across porous borders like Bangladesh, Bhutan and Myanmar and growing feeling of alienation from the Indian mainstream are construed to be some of the significant insurgency in Assam. Assam like the other six states in the region is caught in a vicious cycle--- with lack of opportunity breeding insurgency and insurgency impeding economic growth.

The primary economic impact of terrorism in Assam refers to the effects arising from the immediate aftermath of a terrorist event. These effects include the physical destruction of urban objects and the human casualties (injuries and loss of human life). On a micro level terrorist events influence three main types of economic factors namely individual households, the private sector (companies), the public authorities. Due to terrorist event, these economic agents suffer from impact through losses in human and physical capital and at the same time, they themselves may influence the economy through their immediate response to the violent shock that occurred.

Terrorism will not only cause primary economic impact but also produces considerable secondary impact on the economy of Assam. Terrorism in Assam influences tourists' choice of destination. It also affects consumption and saving rates. Economic stability and political stability are generally recognised as the most important factors that determine investment in a local economy. Not only are the amounts of investments influenced by terrorist events but also the investment composition. The impact of terrorist events on financial market is a famous phenomenon. Since Share prices reflect expected future gains of a company, a terrorist attack will negatively influence the share price. Since expected profits will decline if security measures increases the cost of production and consumer will decrease their consumption. The risk premium will increase due to increased due to increases uncertainty about a firm's prospect on the market. Terrorist events not only increase the sense of insecurity and uncertainty for foreign traders, but also increase transaction costs. The overall effect of terrorism on the economy of Assam can only be determined when it is known how an economy would have developed without the terrorist event.

Proper measures should be taken into account to stop terrorism. Existing system is woefully inadequate and does not take into account the role of the private sector and civil society in fighting terror. Terrorist not only kill people but also seriously damage infrastructure, industry and ultimately destroy confidence of both the common man and the investor.

A long term solution that ensures Assam's rapid economic growth that is sustainable and inclusive for its largely population. Issue of land reform and redistribution should be addressed to prevent the spread of terrorism to the vast tribal areas. Upgradation of education, health care and general infrastructure at the village level should be made.

Conclusion: Despite efforts made by successive state governments to hammer out an amicable solution of insurgences, it continues, causing law and order problems frequently. The present government, therefore has taken a hardline approach to the problem of insurgency in order to bring about an improvement on the law and order front by coming down heavily on the extremist outfits.

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Variation of pH and Fluoride (F⁻) content in the different sources of water in the coal mining area of Assam, India

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Abstract:

water samples from ground water, pond water and river water (10 each) were collected from the coalmining area within a radius of 25 km around the Makum coalmine of the North-eastern Coalfields, Assam, for three seasons namely pre monsoon (January-March), monsoon (May-July) and Post monsoon (Oct- Dec) seasons and for the period of three years. These Samples were analyzed for pH and the content of Fluoride (F⁻) and the results were compared among the types of sources and with WHO (1994) guideline values.

The pH of the water samples varied from acidic to slightly alkaline in nature. The pH value varies from 2.1 to 8.7. The lowest pH value was found 2.1 in all the seasons. The pH exhibited both temporal and spatial variation in the area. The F⁻ concentration was found in the range of 0.3 mg/L to 4.1 mg/L. In most of the water samples fluoride content was found more than the WHO (1994) guideline value of 1.5 mg/L for drinking water. From the study it was found that the water from the study area is largely affected by the coal mining activities and was not suitable for drinking.

Keywords

Coalmining, Acid Mine Drainage, Coal Washeries, water quality, pH, Fluoride (F⁻)

Introduction:

Coal mining generates two major wastes Acid Mine Drainage and Coal Washeries. The coal mining areas of Assam (North East India) are located in the Borail range extending from northeast to southwest direction in the districts of Dibrugarh and Tinsukia and the coal belong to Oligocene tertiary variety. Two important coalfields present in the area are Dilli-Jaipur and Makum fields.

The water system of Assam has been identified as fluoride rich along with the other seventeen states in India. Coal generally contains fluoride along with other impurities. Small

amount of F^- is beneficial for our health but excess amount is hazardous for humans, animals and plants. It may cause fluorosis in humans and animals. Due to the strong electronegativity of fluorine, fluoride is attracted by positively charged calcium in teeth and bones. In bone F^- replaces the hydroxyl ion in hydroxyapatite to form fluorapatite, thus changing the physicochemical properties of the bone and the bone becomes brittle (Grynepas, 1990; Fratzl, 1994; Cauley et al., 1995). Mottling of teeth, changing of teeth colour, increase in porosity and hypoplasia of teeth are caused by Dental fluorosis. Besides this, anemia, loss of weight, anorexia, wasting and cachexia are the common symptoms of chronic fluorosis. F^- can have effects on every tissue and organ of the body leading to death by damaging stomach, kidney and heart when present in high concentration. Excess fluoride also causes respiratory failure; fall in blood pressure and paralysis. According to WHO.1994; the maximum permissible limit for fluoride in drinking water is 1.5 ppm.

Methodology:

30 water samples (Table-1) for ground water, pond water and river water (10 each) were collected from the coalmining area within a radius of 25 km around the Makum coalmine of the North-eastern Coalfields, Assam, for three seasons pre monsoon (January-March), monsoon (May-July) and Post monsoon (Oct- Dec) seasons and for the period of three years. These Samples were analyzed for pH and the content of Fluoride (F^-) using standard method given by APHA (1998). Fluoride (F^-) was determined only for two seasons namely pre monsoon and monsoon seasons. UV Spectrophotometer (Hitachi-3210) was used to determine Fluoride (F^-) content in the water bodies. High purity reagents obtained from E. Mark (India) were only used. Double distilled water and borosil glassware were used throughout the study.

Results:

pH

The pH of the water samples varied from acidic to slightly alkaline in nature (Table 2). In pond water, the values were from 2.1 (P4) to 7.2 (P1). The lowest pH was recorded at P4 in all the seasons among the pond water samples, indicating that this pond was worst affected by AMD from the coal mines.

In ground water, pH varied from 4.3 (G4) to 8.7 (G2). Ground water was comparatively less affected by AMD, but the source G4 had sufficient influence to bring down the pH to 4.3.

The pH in river water also varied from a very low value of 2.1 (R5) to 7.9 (R9). The rivulets close to the coal dumping areas are again worst affected by AMD and the water at R5 was very strongly acidic.

The pH exhibited both temporal and spatial variation in the coal mining area (Fig. 1). For example, the pond and river water showed lower pH during the wet season due to entry of runoff carrying AMD.

For ground water, the lowest pH was observed in the dry, pre-monsoon season, which might be due to lowering of the water table. When the monsoon was in full swing, water table rose and the dilution decreased the acidity resulting in increase in pH. In general, the ground water had a higher pH than that of pond and river water. It is to be noted that the lowest pH values observed in this work are very similar to the values obtained for AMD-affected water in Spain (pH 1.5 – 5.6), (Charlotte et al., 2003),

Table 1: The sampling stations for water from the coal field area. (Distance and direction are measured with reference to Coal India Limited's residential complex at Margherita)

S.N	Locations	Sources	Distance (km)	Direction
Ground water				
G1	CIL Complex, Srimanta Nagar	Tube well	0	--
G2	Polo field at D duara's residence	Tube well	1	S
G3	At CMPF Office CIL	Tube well	1	W
G4	Near Sarbajanin Kali Mandir	Dug well	20	E
G5	Lalpahar Village, Tipong	Dug well	19	E
G6	No. 2 Tirap Gate	Tube well	18	E
G7	Lekhapani Shiva Temple, Tinali	Dug well	15	S
G8	Lido Itakhola near a bridge	Dug well	9	E

G9	Ledu Bazaar, Barua's Hotel	Tube well	7	E
G10	At the Stadium, Tikok Colliery	Tube well	5	E
Pond water				
P1	Shiva Mandir, Tipong	Pond	20	E
P2	Lalpani Village, Tipong	Pond	19	S
P3	No. 2 Tirap Gate	Pond	18	S
P4	Tirap Colliery, a road side pond	Pond	12	E
P5	Ledo Itakhula, near a bridge	Pond	9	E
P6	Ledo	Pond	8	E
P7	Patkai Stadium	Pond	7	E
P8	Ledu Bazaar	Pond	6	E
P9	Borgolai area	Pond	4	E
P10	Changlang Road, Margherita	Pond	3	N
River water				
R1	Tipong River, Colliery Gate	River	22	E
R2	GE Office under airon bridge	Rivulet	16	E
R3	Lekhapani River, Lekhapani Station	River	15	E
R4	Lekhapani Station, ASEB office	River	14	E
R5	Shiva Mandir, Tirap colliery	Rivulet	11	E
R6	Tirap Colliery near a bridge	Rivulet	10	E
R7	Tikak Colliery under a bridge	Rivulet	5	E
R8	New colony near a bridge	River	2	E
R9	Back side of Borgolai	River	4	E
R10	Margherita	River	3	W

Table 2: The pH of water from the study area (A, B, C respectively represent the mean post-monsoon, monsoon and pre-monsoon results from three measurements in each case)

SN	Pond water				Ground water				River water			
	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
1	7.2	6.0	6.0	6.4	8.4	8.3	8.0	8.2	7.2	6.0	6.7	6.6
2	6.4	6.3	2.9	5.2	8.7	8.0	8.0	8.2	6.7	6.3	6.6	6.5
3	5.4	6.4	5.4	5.7	6.9	6.7	7.6	7.1	6.6	6.4	6.9	6.6
4	2.9	2.1	2.8	2.6	4.5	4.9	4.3	4.6	7.1	6.7	7.5	7.1
5	6.4	2.6	3.1	4.0	5.0	6.8	6.2	6.0	2.6	2.1	3.1	2.6
6	6.4	5.5	6.2	6.0	6.5	5.6	6.0	6.0	3.8	4.1	6.1	4.7
7	6.5	6.6	6.8	6.6	6.3	6.6	6.2	6.4	3.2	3.4	3.0	3.2
8	5.8	6.2	3.9	5.3	6.1	5.6	4.3	5.3	6.6	6.6	7.2	6.8
9	6.0	6.3	5.7	6.0	5.6	5.5	5.8	5.6	7.5	6.5	7.9	7.3
10	6.2	6.8	7.1	6.7	6.4	6.3	7.3	6.7	7.1	6.9	7.8	7.3
Min	2.9	2.1	2.8	2.6	4.5	4.9	4.3	4.6	2.6	2.1	3.0	2.6
Max	7.2	6.8	7.1	6.7	8.7	8.3	8.0	8.2	7.5	6.9	7.9	7.3
SD	1.2	1.7	1.7	1.3	1.3	1.1	1.4	1.2	1.9	1.7	1.8	1.7

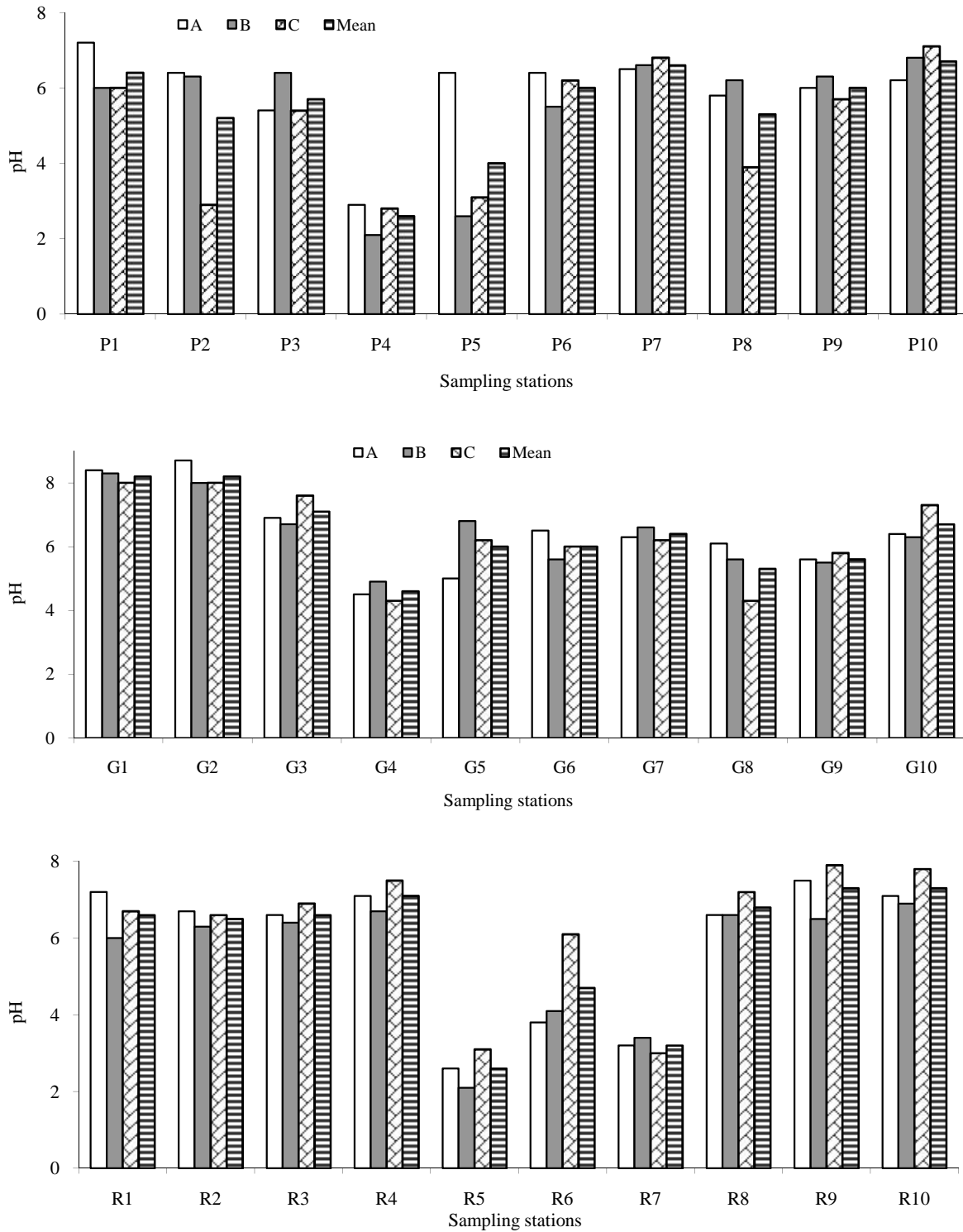


Fig. 1. pH of the water samples: top Pond Water, middle Ground Water, bottom River Water of the coalmining area

(2) Fluoride (F⁻)

The values of fluoride contents were generally high indicating that the acidic runoff might have dissolved and washed away some of the fluorides (from minerals like fluorspar, cryolite, fluorapatite, hydroxyapatite, etc.) in coal to the water bodies (Agarwal et al., 1997). The range of Fluoride (F⁻) contents were as shown below

Source	Monsoon	Pre-monsoon
Pond water	1.3 -1.7 mg/L	0.5 -3.5 mg/L
Ground water	1.3-1.8 mg/L	0.3-4.1 mg/L
River water	0.7 -1.8 mg/L	1.1 -3.5 mg/L

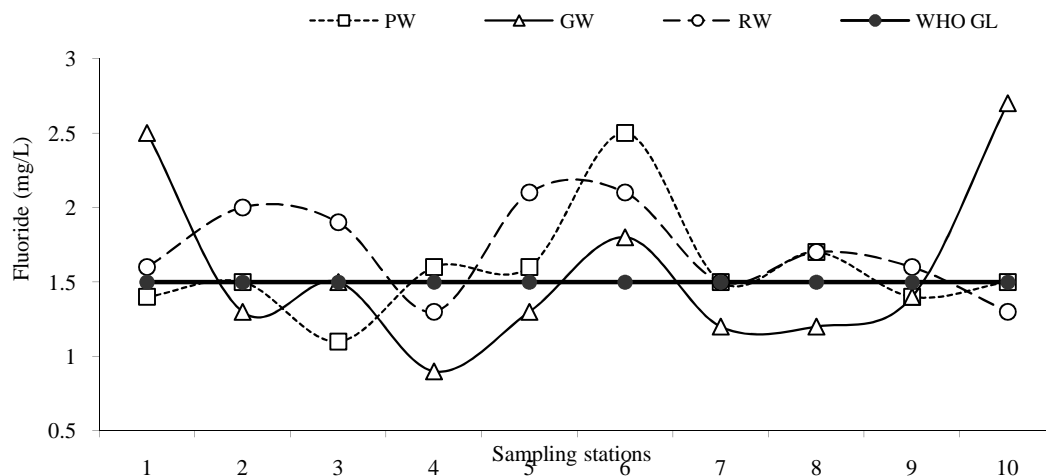


Fig. 2: Spatial variation of the average fluoride contents of pond water (PW), ground water (GW) and river water (RW) for the coalfield water bodies as compared to WHO guideline value.

Most of the water samples had more fluoride than the WHO (1994) guideline value of 1.5 mg/L for drinking water. Generally it was observed that pond and river water was very highly polluted with F⁻ compared to ground water. Fluoride content in water is a function of many factors such as availability and solubility of fluoride minerals, pH, velocity of flowing water, concentration of calcium and bicarbonate ions in water, etc. (Chandra et al., 1981)

In India, the concentration of F⁻ in ground water was found in the range of below 0.5 mg/L to 30 mg/L (Handa, 1975). In this study, the F⁻ concentration was never less than 0.3 mg/L (G4) and greater than 4.1 mg/L (G10). In Haryana, the fluoride concentration in the underground water of some villages varied from 0.3 to 6.9 mg/L (Meenakshi et al., 2004). The concentrations of fluoride in and around mines in Keonjhar District, Orissa were observed in the range of 1.89 to 3.12 mg/L (Das, 2000). In the coal mining area of Assam, the concentration of F⁻ is slightly less than that of Haryana and is slightly more than that of Orissa. It has been reported that in a village of Tamilnadu about 34% of the natives exhibited mild to severe form of dental fluorosis with drinking water having fluoride content 2.0 to 6.4 mg/L (Dwarkanath, 1991).

The spatial variation of the average fluoride contents of the water bodies of the coalfield area is presented in Fig 2 along with the WHO guideline value.

Conclusion:

From the study it was found that pH of Ground water was more than the Pond and River water. River water was very highly polluted with fluoride (F⁻) compared to Pond and Ground water. In most of the water samples fluoride content was more than the WHO (1994) guideline value of 1.5 mg/L for drinking water that makes the water from the area not suitable for drinking.

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