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PREVALENCE, AWARENESS AND ASSOCIATED RISK FACTORS OF TYPE-2 DIABETES IN RURAL AREAS OF ANANDPUR SAHIB IN PUNJAB

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Abstract

Background: Prevalence of type-2 diabetes mellitus has found to be dramatically increased in India especially Northern Region. In rural areas most of times diabetic patients goes unnoticed and present for first time with many drastic complication, due to less awareness of rural population towards diabetes mellitus. Hence this prevalence of diabetes and its associated risk factors and assessment of awareness regarding diabetes mellitus was undertaken.

Objectives: (1) To determine the prevalence of type-2 diabetes mellitus in rural population of Anandpur Sahib in Punjab. (2) To assess the level of awareness & knowledge regarding diabetes mellitus in a diabetic Population. (3) To determine the associated risk factors for selected type-2 diabetes.

Participants & Methods: A community based cross sectional study conducted on 2000 rural population in Anandpur Sahib by house to house survey involving adults aged>20 years. A structured questionnaire was used to obtain the demographic profiles and knowledge about pre- diabetes among the surveyed population. Capillary blood screening tests had been done to detect the blood sugar level with the help of glucometer.

Results: Out of 2000 subjects 42% were males and 58% were females with mean age 54.1±12 years. The overall prevalence of type-2 diabetes was 16.6%. Male showed higher prevalence rate 20.4% as compared to females. About 20.2% of diabetic population had knowledge that diabetes occur due to lack of insulin. Overweight, hypertension and physical inactivity were the associated risk factors of type-2 diabetes mellitus in rural population.

Conclusion: Prevalence of type-2 diabetes mellitus and its associated risk factors were high in rural population of Anandpur Sahib indicating the impending diabetic epidemic in rural areas. Awareness regarding diabetes were also very poor. Therefore effective health awareness programmes are needed in this population to reduce the disease burden.

Keywords:

- **Diabetes mellitus**
- **awareness**
- **prevalence**
- **management & control**
- **risk factors.**

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STASTICAL ANALYSIS OF DRINKING WATER IN SOAN RIVER SUB WATERSHED CATCHMENT AREA IN UNA, HIMACHAL PRADESH, INDIA

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Abstract- Water is the basic resource for existence of life on earth. Water parameters assessment is a basic tool for diagnosing overall health of aquatic ecosystems. systematic calculation of standard error mean (SEM), statistical study by calculating correlation coefficient (r) between different pairs of parameter and one sample and paired sample t-test was applied for checking significance. Results show variation of parameter with season. One sample t- test shows that there was significant relationship in both the seasons for all parameters the sites. Paired sample t- test shows that there was significant relationship of temperature pH, and TDS with the site 2- site 3 in post monsoon season only while EC had significant relationship in both seasons with the site1-site 3 and site2-site 3. Bicarbonate had significant correlation with the site1- site 3 in post monsoon season while it had significant correlation with site 2 - site 3. DO BOD and COD significant correlation with site1-site 3 and site 2- site 3 in both seasons whereas BOD and COD had significant correlation with site 1- site 2 in post monsoon. Results show significant positive correlation holds for one parameter with the other except temperature with EC, TDS, Bicarbonate, DO, BOD; pH with EC, TDS DO, BOD, COD; EC with COD. Pearson correlation for pre monsoon showed that there was no significant correlation of temperature with any other parameter but pH show significant correlation with the Bicarbonate; Electrical conductivity with the TDS, Bicarbonate, DO, BOD and COD. TDS with the DO, BOD, COD; Bicarbonate with the DO; DO with the BOD and COD while COD with the EC, TDS and DO.

Key words - Fertilizers, Herbicides, Pesticides, sustainability, watershed

I. INTRODUCTION

Water is an essential resource for existence of life on earth, economic development and ecological balance in nature. Water unequally distributed throughout the world, only 2.5% of water available on earth is fresh water while one third available for human use [11]. The primary source of sweet water in India is rainfall, whereas it is erratic in quantity, intensity and distribution. Average annual surface water flow available in the country is estimated at around 1869 billion cubic meter (bcm) but total utilizable water resource in the country is assessed at 1122 bcm [8]. In India 90 percent rainfall occur in monsoon season but there is great variation in nature of rainfall i.e., variation in regional distribution of rainfall. Challenge is to relocate rainfall water for multifaceted uses: drinking, domestic consumption. India shares about 16% of the global population but it has only 4% of the total water resources.

Ground water has immense importance in arid and semi arid region due to erratic nature of monsoon, insufficient surface water. Therefore it is important to ensure good quality of water to society as 30% of urban and 90% of rural households still relied on untreated surface or ground water [9]. Population growth at alarming rate, unplanned urbanization, dumping of the polluted water at inappropriate places enhances the infiltration of harmful compounds to the ground water [10]. Excessive utilization of fertilizers, insecticides in agricultural areas, dispose of untreated or partially treated water to environment, dispose of solid waste to open landfill caused water pollution due to lack of water pollution control measures viz., water proof layer, monitoring of wells, etc. [4]. In India most of the populations utilize ground water as it is only source of water supply. Assessment of water quality plays important role in improvement of agriculture production, poverty reduction and sustainable economic growth. water quality monitoring is one of the major tools for Sustainable

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development and provides important information for water management [14]. Watershed management is the best intervention for natural resource management in rainfed area.

II. MATERIALS AND METHODS

Description of the study area

Una nestles between Shivalik ranges and so lies in lesser Himalaya. The district, with its headquarter at Una town, has a geographical area of 1540 sq km and covers 2.8 % area of the State. It has diverse landscape vary from hilly to terraces. Elevation varies from 340meter in south eastern part to 1041 meter in eastern part of district. Rural population is about 91%, 70% population engaged in the agriculture and allied sector indicating district has a agricultural economy. Ground water (open and dug wells and tube wells) is the major source of water in the district for irrigation and domestic purpose. Ground water occurs in porous unconsolidated or alluvial formation comprising sand, silt, pebbles etc., and forms prolific aquifer. As on March 2011, ground water falls under critical category of development. Soan (swan) river intermittent river, main river of area and maintains base flow, tributary of Satluj, drains major part (80%) of Una district of Himachal Pradesh. Soan (Swan) river lies between northwesterly and southeasterly hill ranges on the both sides. It originates from Daulatpur and leave district near Santokhgarh in southeast and subsequently join Satluj. During monsoon this river gets flooded due to shallow bank heights and large area on both sides gets affected. To control flood hazards and river bank protection Govt. of Himachal Pradesh implemented sub watersheds and river embankments along the river [3]. Pandoga sub watershed was randomly selected among the sub watersheds along the river for water quality assessment.

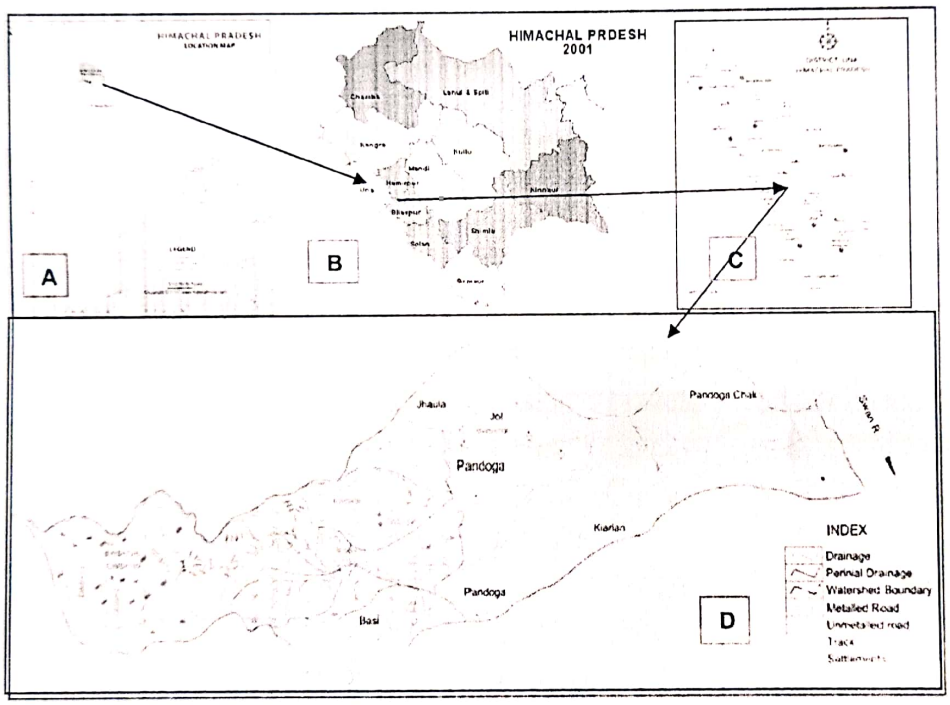

Figure 1: Location map- A. Himachal Pradesh in India; B. Una district in H.P; C swan river drainage map; D Site of pandoga sub watershed

III. MATERIAL AND METHODS

Study area was divided into three sites (site1,site2 and site 3) nine samples points per site, thus total of twenty seven drinking water samples were collected for both seasons (pre monsoon and post monsoon) and then subjected to analysis. Parameters like temperature, pH, Electrical conductivity, TDS and DO were analyzed on the spot using portable water analysis kit. For the assessment of BOD and COD samples were collected in rinsed acid cleaned 15-mL drinking glass bottles and taken to the laboratory within 24hours and were analyzed according to the standard method given by [1-2] but Bicarbonate by[12]. This study envisaged systematic

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calculation of standard error mean (SEM), statistical study by calculating correlation coefficient (r) between different pairs of parameter and one sample and paired sample t-test was applied for checking significance.

IV. RESULTS AND DISCUSSION

Water was one of the most important compounds of ecosystem. Its quality was highly variable with the time due to natural and anthropogenic activities, atmospheric conditions and photosynthetic activities. The quality of water was defined in terms of physico chemical parameter.

4.1 Sem

During present study results show that maximum mean temperature was (27C) in site 3 and minimum mean (22C) in site1; Maximum mean pH was7.10 of site 3 and minimum 6.63 of site 2 ; Maximum mean EC was (725.33 µ mhos/cm) of site 3 while minimum mean (431.66 µ mhos/cm) of site 1; TDS was (723.33mg/l) in site 3 and minimum mean (286.6mg/l) in site 2; Bi carbonate 11.73mg/l in site 3 and minimum mean (5.46 mg/l) in site2; maximum mean dissolved oxygen was 6.76 mg/l in site 3 and minimum mean 4.80 mg/l in site1; maximum mean Biological oxygen demand was 2.80 mg/l and minimum mean 0.56 mg/l in site 1 ; maximum mean chemical oxygen demand was (20.00mg/l) in site 3 and minimum mean 6.00mg/l in site1 during pre monsoon season whereas during post monsoon the maximum mean temperature was 15.33 C was in site 3 and minimum mean temperature (12 C) in site 2; pH 6.76 was in site 3 and minimum mean pH (6.16) site 2; maximum mean electrical conductivity 622.33µmhos/cm was of site 3 and minimum mean 417.66µmhos cm of site 2; TDS was 706.6mg/l in site 3 and minimum mean TDS 280mg/l in site 1; Bi carbonates was 11.33mg l in site3 and minimum mean (5.26mg l) in site 2; maximum mean dissolved oxygen was 6.16mg l and minimum was 4.13 mg/l; maximum mean Biological oxygen demand was 2.03mg/l in site3 and minimum mean 0.33mg/l site 1; maximum mean COD was 18.46mg/l in site3 and minimum mean was 5.33mg/l in site 1(Table 1).

Table 1: Variation in water parameters of Pandoga sub watershed catchment area at three study sites during two seasons. Values are mean ± standard error. n=3

Pre monsoon	Max. mean	Min.mean	Max. mean	Min.mean	Max. mean	Min.mean
Temp.	24.33±0.88	22 ±0.577	24.33±0.88	23.33±0.33	27±1.52	23.33±0.33
pH	7.1±0.43	6.916±0.35	6.8±0.35	6.63±0.033	7.10±0.083	6.95±0.032
EC	527±17.57	431.66±9.52	528.66±10.17	432.66±8.21	725.33±36.37	564.33±6.35
TDS	546.66±43.33	296±3.3	396.66±26.03	286.66±24.03	723.33±24.03	410±34.64
Bi carbonate	10.80±0.61	7.33±0.46	8.20 ±0.64	5.46 ±0.24	11.73±0.35	9.20±1.00
DO	6.23±0.18	4.80±0.23	6.40±0.25	5.60±0.26	6.76±0.55	5.86±0.20
BOD	1.30±0.17	0.56± 0.12	1.53±0.17	0.96±0.12	2.80±0.23	2.00±0.11
COD	12.00± 1.15	6.00± 1.15	14.00± 1.54	8.00± 0.57	20.00 ±1.54	16.00± 1.54
Post monsoon						
Temp.	14.33±1.42	12.66±1.76	14±1.54	12±1.154	15.33±0.88	14.33±0.88
pH	6.48±0.24	6.26±0.17	6.18±0.20	6.16±0.083	6.76±0.29	6.53±0.28
EC	502.33±18.76	418.00±6.55	480.66± 10.66	417.66±7.62	622.33±19.54	529.33±4.25
TDS	523.33±43.3	280±5.77	490±57.73	270±25.16	706.66±27.28	393.33±29.62
Bi carbonate	9.33 ± 0.66	6.33±0.88	7.60±0.50	5.26±0.17	11.33±0.33	8.33±0.88
DO	5.26±0.12	4.13±0.35	5.46±0.14	4.66±0.08	6.16±0.40	5.30±0.25
BOD	1.00±0.11	0.33±0.08	1.13±0.17	0.60±0.05	2.03±0.08	1.70±0.15
COD	11.33±0.93	5.33±0.88	12.20±1.33	6.50±0.43	18.46±0.35	14.46±1.23

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4.2 One sample t-test and paired sample t-test ($p<0.05$)

One sample t - test of temperature, pH, EC, TDS and Bicarbonate with the sites (1, 2, 3) (Table 2) shows that there was significant relationship as null hypothesis $1H_0$ was rejected at $p<0.05$ level of significance as Sig. (2 tailed) value was (0.000) respectively in both the seasons.
Paired sample t-test of temperature with the site 1–site 2, site1-site 3 and site 2- site 3 (Table 2) showed that null hypothesis $2H_0$ was accepted at $p<0.05$ level of significance as Sig. (2 tailed) value was higher than $p<0.05$ as shown in (Table 2). It showed that there was no significant relationship between sites and water temperature in both the seasons. Paired sample t-test of pH, TDS and DO show no significant relationship between sites and pH, TDS and DO for both seasons except for site 2- site 3where it had value less than $p<0.05$ so had significant value. Paired sample t test of electrical conductivity, BOD and COD with the site1 - site2 showed that there was no significant relationship as that null hypothesis $6H_0$ was accepted at ($p<0.05$) level of significance as Sig. (2tailed) values were higher than $p<0.05$ for both the seasons whereas for site1-site 3 and site 2- site 3 (Table 3) had significant relationship as Sig. (2tailed) values were 0.000 for both seasons so null hypothesis $6H_0$ was rejected at $p<0.05$ level of significance. Paired sample t-test of Bicarbonate with the site 1–site 2, site1-site 3 (Table 3) showed that null hypothesis $2H_0$ was accepted at $p<0.05$ level of significance as Sig. (2 tailed) value was higher than $p<0.05$. It showed that there was no significant relationship between sites and bicarbonate in both the seasons except for site 2- site 3where it had value less than $p<0.05$ so had significant value (Table3).

Table 2: One sample t-test ($p<0.05$) for comparison between variation in Physico chemical parameter in pre monsoon season and within sites of Pandoga sub watershed catchment area

Parameters	Pre Monsoon Sites Sig.(2 tailed)			Post monsoon Sites Sig.(2 tailed)		
	Site 1	Site 2	Site 3	Site 1	Site 2	Site 3
Temperature	0.000	0.000	0.000	0.000	0.000	0.000
pH	0.000	0.000	0.000	0.000	0.000	0.000
TDS	0.000	0.000	0.000	0.000	0.000	0.000
Bi carbonates	0.000	0.000	0.000	0.000	0.000	0.000
DO	0.000	0.000	0.000	0.000	0.000	0.000
BOD	0.000	0.000	0.000	0.000	0.000	0.000
COD	0.000	0.000	0.000	0.000	0.000	0.000

$1H_0$: There is no significant relationship between the Physico chemical parameters and sites for two different seasons

Table3: Paired sample t-test ($p<0.05$) for comparison between variation in Physico chemical parameter in pre monsoon season and within sites of Pandoga sub watershed catchment area

parameters	Pre Monsoon Sites Sig.(2 tailed)			Post monsoon Sites Sig.(2 tailed)		
	Site 1-Site 2	Site 1-Site 2	Site 1-Site 2	Site 1-Site 2	Site 1-Site 3	Site 2-Site 3
Temperature	0.000	0.000	0.000	0.000	0.000	0.000
pH	0.084	0.053	0.133	0.337	0.144	0.040
EC	0.294	0.000	0.000	0.169	0.000	0.000
TDS	0.508	0.068	0.057	0.227	0.071	0.004
Bi carbonates	0.134	0.067	0.001	0.390	0.013	0.001
DO	0.111	0.031	0.035	0.330	0.014	0.000
BOD	0.071	0.000	0.000	0.046	0.000	0.000
COD	0.015	0.000	0.000	0.048	0.000	0.000

$2H_0$ (null hypothesis): There is no significant relationship between the Physico chemical parameters of water and within sites for two seasons (Post monsoon season, Pre monsoon season)

4.3 Correlation coefficients

In recent years statistical correlation has been used to calculate mathematical relationship for comparison of Physico chemical parameters [13]; its value lies between -1 and +1 and value around zero show no relationship [7]. In the present study Simple correlation coefficient (r) was used computed to identify the highly correlated water quality parameters of water from Pandoga sub watershed catchment area which can be used in selecting the treatments to minimize pollutants. Results of post monsoon for Pearson correlation show that there was a significant correlation between temperature and pH (0.459*), temperature and COD (0.414*). pH show significant positive correlation with the bi carbonate(0.413*) while with other parameters show positive correlation. Electrical conductivity significant positive correlation was with all parameters except temperature, pH that had positive correlation.TDS too show positive correlation with the temperature, pH while with other parameters higher significant positive co relationship. Total dissolved solids show significant correlation with the electrical conductivity (0.746**), with bicarbonate (0.445*), DO (.588*), BOD (0.586), COD (0.642**). Same results were found in the study of [6] as conductivity depends upon total dissolved solids and other mineral constituents. Bi-Carbonate show higher significant positive co relationship between with pH (0.413**),

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EC (0.554**), TDS (0.445**), DO (0.455**), BOD (0.452**), COD (0.482**). Dissolved oxygen show significant positive correlation with the EC (0.733**), TDS (0.588**), Bi carbonate (0.455*), DO (0.578**), BOD (0.635).BOD show significant positive co relationship with all parameter except temperature and pH.COD show similar trend but had significant positive correlation ship with the temperature (0.414*). Table 4. There was a significant positive correlation with the pH and both the biological oxygen demand and chemical oxygen demand [5].

Results of pre monsoon for Pearson correlation show that there was a positive correlation of temperature with all parameters except dissolved oxygen and total dissolved solids where negative correlation was found . pH show significant correlation with the bi carbonate (0.586**) while other parameters show positive correlation. Electrical conductivity show significant positive correlation with the TDS (0.607**), Bicarbonate (0.434*), DO (0.622**), BOD (0.802**), COD (0.849**).TDS show significant positive correlation with the DO (0.512**), BOD (0.466*), COD (0.596**).Bicarbonate too show significant positive correlation with the DO (0.230*).DO show significant positive correlation with the BOD (0.517**)and COD (0.616**) While, COD show significant correlation with the EC (.849**), TDS (0.596**) and DO (0.616**). (Table5).

Table 4: Pearson correlation matrix for physico chemical parameters of water at Pandoga sub watershed catchment area for post monsoon season

Post monsoon	Tem	pH	EC	TDS	Bi-carbonate	DO	BOD
Temp.	1						
pH	0.459*						
EC	0.332	0.290					
TDS	0.269	0.208	0.746**				
Bi-carbonate	0.257	0.413*	0.554**	0.445*			
DO	0.108	0.203	0.733**	0.588**	0.455*		
BOD	0.329	0.273	0.835**	0.586**	0.452*	0.578**	
COD	0.414*	0.330	0.890	0.642**	0.482	0.635**	0.869**

**significant at P=0.01 level; * significant at P =0.5 level

Table5: Pearson correlation matrix for physico chemical parameters of water at Pandoga sub watershed catchment area for pre monsoon season

Pre monsoon	Temp.	pH	EC	TDS	Bi-carbonate	DO	BOD
Temp.	1						
pH	0.231						
EC	0.094	0.378					
TDS	-0.187	0.174	0.607**				
Bi-carbonate	0.142	0.586**	0.434*	0.295			
DO	-0.014	0.050	0.622**	0.512**	0.230*		
BOD	0.265	0.281	0.802**	0.466*	0.217	0.517**	
COD	0.164	0.373	0.849**	0.596**	0.373	0.616**	0.826

**significant at P=0.01 level; * significant at P =0.5 level

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V. CONCLUSIONS

Study of ground water quality shows that all parameters fluctuated with the seasons and sites. All parameters were within permissible limits as compared to WHO till now. Various anthropogenic activities in catchment area like grazing, farming, livestock raring and allotment of land as industrial area might change or pollute the ground water around watershed catchment area. To control the assimilation of pollutant in aquatic system effective strategy should be enforced and awareness programme should be designed so farmers utilize pesticides, insecticides and fertilizer as required.

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ANNEXURE

1.1 Hypothesis for One Sample t Test for water Analysis

The null hypothesis for two different seasons (Post monsoon season, Pre - monsoon season) formulated for water physicao chemical parameters and three sites (pH,EC, TDS, Bi Carbonate, DO,BOD,COD) as given below

1H0: There is no significant relationship between the physicaochemical parameters of water and sites for two different seasons

H0: (P)i – (Si)j

PC = Physico chemical parameters; S – Sites; i = 1, 2, 3,4,5,6,7,8 (1=Temperature, 2 =pH, 3 =EC,4= TDS,5- Bi carbonate,6=DO,7=BOD,8=COD)

j = 1, 2, 3 (1 = site1, 2 = site 2, 3=site 3)

1.2 Paired Sample t Test Hypothesis for water

The null hypothesis for two different seasons, formulated for correlation between three sites and soil physical parameters (soil texture, bulk density, (soil moisture content) as given below

2H0: There is no significant relationship between the physico chemical parameters and within three sites for two different seasons (Post monsoon season, Pre monsoon season)

2H0: (P)i – (Si)j ; PC = Physico chemical parameters ; S = sites; i = 1, 2, 3,4,5,6,7,8 (1=Temperature, 2 =pH, 3 =EC,4= TDS,5=Bi carbonate,6=DO,7=BOD,8=COD)

j = 1, 2, 3 (1 = site1, 2 = site 2, 3=site 3)

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