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ASSESSMENT OF ASSOCIATION BETWEEN THE QUALITY OF WATER AND DISEASE OCCURANCE IN THE RURAL AREAS OF GUNTUR: ACROSS SECTIONAL STUDY

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ABSTRACT

Background: Water is essential in day-to-day life for every individual, drinking water supply has a primary objective of protecting human health, to ensure that the sufficient quantities of safe water is available across the globe. Most of the population in the world is facing scarcity of the safer water to drink and it majorly leads to the different water ion imbalances in the body and in the long run it affects the health severely and causes the various diseases. Aim: To assess the association between the quality of water and disease occurrence in the rural areas of Guntur. Objective: To monitor safety of water and secondary objective is assess the disease which is mostly prevailing due to lack of water quality and also create awareness on association between quality of water and disease occurrence. Methodology: A cross sectional study, people are screened based on inclusion and exclusion criteria and information had taken from the villagers by survey forms. The self-designed and validated questionnaire was used to access the data regarding the health issues like tooth discoloration, cardiovascular diseases, joint pains and central nervous system. Collected data was tabulated and interpreted using statistical software. Results: Tooth discoloration was associated with the fluorine concentration of daily usage water because in OBP (F-0.09mg/L). The composition of daily usage water is associated with the various diseases in Krosuru the usage water composition was not good because of that prevalence was high with various disease and disorders like joint related problems, CVS related etc. Conclusion: As a consequence of the aforementioned findings, the current study concluded that tooth discolouration was related to the fluorine content of water used on a daily basis (OBP; F-0.09mg/L). The composition of the water used on a daily basis in Krosuru is linked to a number of ailments, and as a result, the prevalence of numerous diseases and disorders, such as joint-related issues and CVS, was high.

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INTRODUCTION

The drinking water is the major problem throughout the globe, the mainly exposure to the metals occurs in different ways and it is very dangerous when it comes to exposure to carcinogenic metals and it leads to varies types of cancer like skin, bladder, lung etc... Even though there is developing risks of cancer with the metal contamination, there is no clear-cut mechanism of carcinogenicity. The metals like trivalent arsenic and hexavalent chromium are responsible for the tumorigenesis colitis-associated colorectal cancer model [1]. The various previous studies states that there is chance of increase in respiratory cancer when we exposed to compounds like chromate, and there is a risk of skin cancers when we exposed to hexavalent chromium and to UV for some period of time of 8 months at a time. The trivalent and hexavalent are of two forms which causes different toxicities [2].

Every nation is trying very hard to control the water-borne infections which were caused by drinking water. The serious affects occurred when we expose to the arsenic it leads to diabetic epidemic. There is no strong evidence that relates with the ground water arsenic levels and with other chemicals present and fasting blood glucose [3]. The long-time exposure to arsenic in water leads to the various health related problems to be faced and health of individual will be affected severely. It is responsible for the defects in the development of cardiovascular, diabetogenic, respiratory etc. There is no certainty of health risks from arsenic of low doses and to life time exposure to arsenic on death from cancer and to chronic diseases [4]. The studies are very limited when it comes to arsenic exposure to drinking water and their metabolites. Inorganic arsenic was available in various regions across the world which affecting the huge number of population and the urinary metabolites with the reproducibility and related to arsenic associated prone to the cancer [5]. Cadmium is the responsible for the respiratory, hepatic, renal problems and serious effects are observed like urinary, prostate, breast cancers. It is also affecting the development of the various human disorders and by altering of the gene expression and effects the cell function and organs and it leads to the developmental defects of the overall individual [6]. The levels of cadmium and aluminium are detected by the micro extraction and these increased levels causes the mainly the chronic kidney disorders. Aluminium causes the severe health problems like Parkinson's, Alzheimer's diseases [9]. Zinc deficiency and taking the contaminated water was the major problem which leads to diarrhoea occurs in the children and it is more common in infants. The dietary intake also effects the individual and it is very hazardous risks to the human health [11]. The copper that is having the activity of the antimicrobial and acts on both gram positive and negative bacteria, the main contamination of the copper pipes lining of the drinking water it forms the copper surfaces on bio film formation by the bacteria known as legionella pneumophila in the portable water [13]. Considering these previous results, In the present study we examine the association between the minerals concentration in water and incidence of health issues in that area. The data was collected from various groups of people from different areas. The water sample of both portable and drinking water mineral concentration was analysed. The disease association with water mineral concentration was studied in the present work.

MATERIALS AND METHODOLOGY:

Study design: Cross-sectional study
Study site: Krosuru, Tadikonda, Velavarthipadu, Obulnaidupalem.
PERIOD OF STUDY: January 2022 to May 2022 (5 months)
Sample population: Individuals who are willing to participate in the study of respective study area.

Inclusion criteria:

- Subjects are adults and older people.
- Exclusion criteria:
- Subjects those who are pregnant women.
- Childrens are excluded in this study.

Data tools used:

- Data collection by google form.

Study procedure:

Step 1:

- Literature search: we have done the extensive literature search on this predominant quality of water association with diseases. We collected the data by using survey forms
- Designing of data collection form: We collected the data by using survey forms and appropriate general data was collected from the respective villagers.

Step 2:

- Collection of water samples from different rural areas: Drinking water and portable water samples were collected from the various mentioned villages like krosuru, obulreddypalem, Velvarthipadu, Tadikonda required amounts for the analysis.

Step 3:

- Went for the data collection of different areas: Furthermore, To gather information on health conditions such tooth discoloration, cardiovascular disorders, joint aches, and central nervous system, a self-designed and validated questionnaire was employed.

Step 4:

Evaluation of results in statistical analysis:

- Obtained data will be analyzed using appropriate statistical tools. At the conclusion of the study, the mean, two-way ANOVA, and chi square test results were computed and published for all the data that had been collected.

RESULTS

The final cross-sectional study consisted of 1000 subjects from 4 different areas of Guntur district they are Obulanaidupalem, Tadikonda, Krosuru and velavarthipadu. The following results are tabulated and analysed by using specific statistical tools. Descriptive data were expressed as percentage, mean and standard deviation and for continuous data two-way ANOVA test was used for demographic data. For water analysis and disease association Chi-square test was used. The test the level of significance was set at $p<0.05$ with 95% confidence interval.

FIGURE 1: GENDER WISE DISTRIBUTION OF SUBJECTS.

- From the above figure it was found that there are four villages total 1000 subjects' data has been collected and 250 subjects from each village.
- In velavarthipadu Males-125 (50%), Females-125 (50%), Tadikonda Males-131 (52%), Females-119 (48%), Obulnaidupalem total 250 subjects in that there are Males-122 (49%), Females-128 (51%), krosuru total 250 subjects in that there are
- Males-135 (54%), Females-115 (46%).

FIGURE 2: DISTRIBUTION OF SUBJECTS BASED ON BMI.

- In Velavarthipadu total 250 subjects, the maximum number of subjects are Normal weight-139 (56%), and least number of subjects are of obese-9 (4%).
- In Obulnaidupalem total 250 subjects, the maximum number of subjects are Normal weight-175 (70%), and least number of subjects are of Obese-16 (6%).
- In Tadikonda total 250 subjects, the maximum number of subjects are Normal weight-167 (67%), and least number of subjects are of Obese-16 (6%).
- In Krosuru total 250 subjects, the maximum number of subjects are Normal weight-160 (64%), and least number of subjects are of Underweight-15 (6%).

Figure 3: Distribution of Subject Based on No. of Diseased Persons in A Family.

- In Velavarthipadu total 250 subjects, the maximum number of subjects have zero (0) number of diseases (34%), and least number of subjects have >3 disease (3%).
- In Obulnaidupalem total 250 subjects, the maximum number of subjects zero (0) number of disease (59%), and least number of subjects have >3 disease (2%).
- In Tadikonda total 250 subjects, the maximum number of subjects zero (0) number of disease (51%), and least number of subjects have >3 disease (3%).
- In Krosuru total 250 subjects, the maximum number of subjects zero (0) number of disease (53%), and least number of subjects have >3 disease (3%).

Table-1:

Demographics	Obulanaidu Palem	Tadikonda	Krosuru	Velavartipadu	P- value*
Age	40.69±15.56	43.56±12.62	41.72±13.80	41.8±13.70	0.52
BMI	22.62±2.94	21.74±2.14	22.91±3.92	22.81±3.65	0.06
Education	1.3±1.9	1.4±2.6	2.1±1.3	1.1±2.0	0.01
Socio-economic state	2.2±4.6	2.0±1.6	1.9±3.6	2.1±2.8	0.93

P-value for differences between four areas categories based on Two-way ANOVA test for proportions.

- In Velavarthipadu total 250 subjects, the maximum number of subjects are not having any medical conditions (32%), and least number of subjects are having tooth discoloration (4%).
- In Obulnaidupalem total 250 subjects, the maximum number of subjects are have commonly CVS medical conditions 86 (32%), and least number of subjects have tooth discoloration and joint pains (6%).
- In Tadikonda total 250 subjects, the maximum number of subjects are having commonly CVS medical conditions 86 (32%), and least number of subjects have endo (4%).
- In Krosuru total 250 subjects, the maximum number of subjects are have joint pains as medical conditions 64 (26%), and least number of subjects RS (3%).

Table-2: Distribution of subject based on main source of drinking water.

Drinking water source	Obulanaidu Palem (n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)
Public tap/ Stand pipe	12%	9%	6%	10%
Tube well/bore hole	2%	3%	4%	2%
Protected dug well	3%	2%	3%	2%
Bottled water	82%	85%	87%	84%
Tanker- truck	1%	1%	-	2%
Surface water	-	-	-	-
Others	-	-	-	-

In Velavarthipadu, Obulnaidupalem, Tadikonda and Krosuru the maximum number of subjects are using Bottled water as drinking water and least number of subjects are using protected dug well.

Table-3.

House hold water source	Obulanaidu Palem (n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)
Public tap/ Stand pipe	88%	91%	86%	88%
Tube well/bore hole	8%	6%	11%	8%
Protected dug well	3%	2%	3%	2%
Bottled water	-	-	-	-
Tanker- truck	1%	1%	-	2%
Surface water	-	-	-	-
Others	-	-	-	-

Figure-8: Distribution of Subject Based on Safer Methods Used Drinking Water.

- In Velavarthipadu, Obulnaidupalem, Tadikonda and Krosuru the maximum number of subjects are not treating the water and least number of subjects are using water filters assafer method used for the drinking water.
- In Velavarthipadu total 250 subjects, the maximum number of subjects are using public tap/stand pipes for the household purpose (37%), and least number of subjects are using bottled water (3%).
- In Obulnaidupalem total 250 subjects, the maximum number of subjects are using tube well/bore well for the household purpose (36%), and least number of subjects using bottled water (3%).
- In Tadikonda total 250 subjects, the maximum number of subjects using tube well/bore well for the household purpose (48%), and least number of subjects are using protected dug well (1%).
- In Krosuru total 250 subjects, the maximum number of subjects are using tube well/bore hole for the household purpose (49%), and least number of subjects are using protected dug well (2%).

Table-4: Water analysis of Usage water from various areas.

S.NO	Parameter	Normal Range	Obulnaidupalem	Tadikonda	Krosuru	Velvarthipadu
1	PH	6.5-8.5	7.63	6.80	7.56	6.53
2	Color	5.0	<5.0	<5.0	<5.0	<5.0
3	Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Total dissolved solids	500-2000	652.1	412.3	2564	284.5
5.	Total suspended solids	-	<1.0	5.6	1.2	7.1
6	Alkalinity as CaCo3	200	300.0	175.0	470.0	90.0
7	Total hardness as CaCo3	200	165.0	190.0	1280.0	100.0
8	Calcium as Ca	75	24.04	36.07	196.3	14.02
9	Magnesium as Mg	30	25.51	24.3	191.9	1.79
10	Sodium as Na	20	151.2	63.2	304.0	54.9
11	Potassium as K	-	4.7	1.9	12.6	1.2
12	Chlorides as Cl	250	99.96	59.9	467.3	44.9
13	Sulphates as SO4	200	54.5	58.6	213.0	63.5
14	Nitrate Nitrogen as N	45	2.7	3.6	24.8	1.3
15	Fluorides as F	1.0	0.09	0.05	0.15	<0.06
16	Iron as Fe	0.3	<0.1	<0.1	<0.1	<0.1
17	Total chromium as Cr+6	0.05	<0.01	<0.01	<0.01	<0.01
18	Silica as SiO2	-	<0.5	<0.5	2.1	<0.5
19	Nickel as Ni	0.02	<0.02	<0.02	<0.02	<0.02
20	Cadmium as Cd	0.003	<0.001	<0.001	<0.001	<0.001
21	Zinc as Zn	5.0	<0.5	<0.5	<0.5	<0.5
22	Lead as Pb	0.01	0.001	0.001	0.001	0.001

Table:5 Water analysis of Drinking water from various areas.

NO	Parameter	Normal Range	Velvarthipadu	Obulnaidupalem	Tadikonda	Krosuru
1	PH	6.5-8.5	7.22	**6.30**	6.36	6.47
2	Color	5.0	<5.0	<5.0	<5.0	<5.0
3	Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Total dissolved solids	500-2000	307.5	64.9	75.8	167.8
5.	Total suspended solids	-	<1.0	<1.0	<1.0	<1.0
4	Alkalinity as CaCo3	200	105.0	25.0	25.0	55.0
5	Total hardness as CaCo3	200	130.0	15.0	15.0	60.0
6	Calcium as Ca	75	26.05	2.00	2.00	10.0
7	Magnesium as Mg	30	15.79	2.43	2.43	8.5
8	Sodium as Na	20	52.2	16.5	20.6	32.4
9	Potassium as K	-	1.8	0.91	0.81	1.6
10	Chlorides as Cl	250	49.9	12.49	17.4	22.4
11	Sulphates as SO4	200	67.3	**8.2**	9.7	36.8
12	Nitrate Nitrogen as N	45	1.5	0.4	0.6	2.1
13	Fluorides as F	1.0	<0.05	<0.05	<0.05	<0.05
14	Iron as Fe	0.3	<0.1	<0.1	<0.1	<0.1
15	Total chromium as Cr+6	0.05	<0.01	<0.01	<0.01	<0.01
16	Silica as SiO2	-	<0.5	<0.5	<0.5	<0.5
17	Nickel as Ni	0.02	<0.02	<0.02	<0.02	<0.02
18	Cadmium as Cd	0.003	<0.001	<0.001	<0.001	<0.001
19	Zinc as Zn	5.0	<0.5	<0.5	<0.5	<0.5
20	Lead as Pb	0.01	< 0.001	<0.001	<0.001	<0.001

In Velavarthipadu, Obulnaidupalem, Tadikonda and Krosuru the maximum number of subjects are using bleaching powder and chlorination to clean portable water.

Table-6: Distribution of subject based on Medical co-morbid associated.

Medical co-morbids	Obulanaidu Palem (n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)
CNS	2%	3%	2%	2%
CVS	12%	9%	16%	7%
RS	3%	2%	5%	3%
GI	13%	10%	18%	07%
ORTHO	6%	4%	10%	7%
DENTAL	16%	2%	13%	3%
Endocrine	11%	14%	8%	12%
DERM	1%	4%	0%	5%
Renal	3%	2%	11%	1%
Infectious	6%	9%	2%	13%
others	-	1%	-	-
No medical history	30%	31%	36%	32%

Dental problems.

Dental problems	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	16%	2%	13%	3%	
Fluorine	0.09	0.05	0.15	<0.06	0.002

P-value for differences between four areas categories based on chi-square test for proportions
Fluorine content in hose hold water is statistically associated with tooth discoloration of P-vale 0.002.

Cardiovascular system (CVS):

CVS	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	12%	9%	16%	7%	
Total dissolved solids	652.1	412.3	2564	284.5	0.004
sodium	151.2	63.2	304.0	54.9	0.009
Potassium	4.7	1.9	12.6	1.2	0.01

P-value for differences between four areas categories based on chi-square test for proportions

Central nervous system (CNS):

CNS	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	2%	3%	2%	2%	
sodium	151.2	63.2	304.0	54.9	0.08
Magnesium as Mg	1.79	25.51	24.3	191.9	0.09
Total dissolved solids	652.1	412.3	2564	284.5	0.9

Gastrointestinal track (GI):

GI	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	13%	10%	18%	7%	
sodium	151.2	63.2	304.0	54.9	0.01
Magnesium	25.51	24.3	191.9	15.79	0.03
Sulphates as SO4	54.5	58.6	213.0	63.5	0.04
Total dissolved solids	652.1	412.3	2564	284.5	0.009

Endocrine:

Endocrine	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	11%	14%	8%	12%	
Total dissolved solids	652.1	412.3	2564	284.5	0.01
sodium	151.2	63.2	304.0	54.9	0.09
Potassium	4.7	1.9	12.6	1.2	0.01
Magnesium as Mg	1.79	25.51	24.3	191.9	0.05

Ortho:

Ortho	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	6%	4%	10%	7%	
Total dissolved solids	652.1	412.3	2564	284.5	0.081
Sodium	151.2	63.2	304.0	54.9	0.091
Sulphates as SO4 (200-400 mg/L)	54.5	58.6	213.0	63.5	0.032
Silica as SiO2	<0.5	<0.5	2.1	<0.5	0.013

Renal:

Renal	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	3%	2%	11%	1%	
Total dissolved solids	652.1	412.3	2564	284.5	0.081
Sodium ()	151.2	63.2	304.0	54.9	0.091
Sulphates as SO4 (200-400)	54.5	58.6	213.0	63.5	0.032
Magnesium as Mg	1.79	25.51	24.3	191.9	0.05

Infections:

Infection	Obulanaidu Palem(n=250)	Tadikonda (n=250)	Krosuru (n=250)	Velvarthipadu (n=250)	P- value*
No of subjects	6%	9%	2%	13%	
Total suspended solids	<1.0	5.6	1.2	7.1	0.009

P-value for differences between four areas categories based on chi-square test for proportions

DISCUSSION

A person can live 1 – 2 weeks without water. Human body is having almost 70% of water, if it has to be used for the drinking purposes, the treatment would include removal of objectionable colour, pathogenic microorganisms, where the water for industrial use require the removal of dissolved salts if it used or steam generation. However, some observers estimated that by 2025 more than half of the world population will be facing water-based vulnerability.

In a study conducted by shadassa ourshalimian[3], use was among adults >35 years of age [n=6587] participating in the health survey. In the study conducted by Mahhub eunus a well characterised cohort in Bangladesh with >20,000 participants. In the study conducted by the Daniela D Ippoliti the study population consist of 17 municipalities, followed from 1990 until 2010.In a study conducted by the Abdul Haleem panhwar taneem gul in his study 55chronic kidney damage male patients aged 40-60years and 59 male subjects having same age dietary habits as referent group taken. In study with 1000 subjects, we observed that mean age group was 60> yrs. In study conducted by Syed Mushfiqur Rahman indicated that inverse association of high w-mn concentration on birth length, but not birth weight, not even women using water with more than 2.4mg/l cofounders, such as maternal BmI, education, in our study most of the people having BMI in normal range and most of the people are completed their primary education only. Aducabe bancessi in her study analysed those microbial parameters and physicochemical parameter of drinking water. twenty-two sites belonging to different water sources like piped water, tube wells and shallow wells. in our study most off the people used to drink bottled water only. In the study of association between aluminium in drinking water and incident of Alzheimer conducted by Nocole van dyke[21] concluded that as aluminium in drinking water represents 0.008-0.8%.in our study that aluminium concentration was found to be normal range <0.0001. In the study conducted by Pauline F. D scheelbeek, aneire khan concluded that all samples are analysed at university of Dhaka, where sodium was analysed by atomic absorption method mean concentration was exceeding 700mg/Followed by pond water with average concentration of 400mg/L due to this blood pressure is elevated .IN our study at krosuru village sodium concentration in usage water high as304mg/L and drinking water concentration 30 mg/L

The effects of cadmium toxicity are a type of study which was done by Dr. Giuseppu Genchi, (8) he concludes that a cigarette contains 1-2% microgram cadmium, adperson smoking 20 cigarettes per a day will absorb about 1 microgram cadmium inhaled cadmium is linked to smoking respiratory diseases such as cancer. In our study all villages which are involved in the study are having normal cadmium levels like <0.001. WHO water quality standards vs synergic effects of fluorides ,heavy metals and hardness in drinking water on kidney tissues is a type of study which was conducted by Hewa M.S. wasana tells that according to WHO standard levels that hardness levels are relatively high Caco3=200.0and Mgco3=185.0mg/L. but in our study hardness levels of usage water IN krosuru reported higher level such as 1280.0Mg/L.so that's why we concluded that most of the people who are living around krosuru facing more problems like chronic kidney damage and kidney stones related problems etc…In the study conducted by Xin Wang[1] he concluded that drinking water contamination by carcinogenic metals like chromium, arsenic remain major health related problem and associated with an enhanced risk of developing various cancers. but in our study, we got normal levels of cadmium concentration in both drinking water and usage water. In the study conducted by Valeria Galette[12] shows that geometric mean (-SD, +SD) FAZ was 7 folds higher from fortified water (65.9%,42.2,102.4) that from fortified maize (9.1%,6.0,13.7 p<0.0001.deu to low levels of zinc concentration in water leads to diarrhoea in children and diarrhoea leads to causing death of children younger than 5 years and accounts for 11% child mortality .in our study we found that normal levels of the zinc in all samples of four villages like < 0.5 Mg/L. In the study conducted by Aducabe Bancessi[19] reported that in Bissau and its surroundings water shows pH range very low (4.87-5.59), due to this low ph of water causes metabolic acidosis, in our study we found that water samples of four villages are in normal level like (approximately 7.5) it was neutral level. Quality assessment of three types of drinking water sources in Guinea - Bissau is type of study which was conducted by Aducabe Bancessi[19] suggested that sulphates (so4) concentrations are in normal ranges (15,14,13 Mg/L-1). But in our study, we got concentrations of sulphates in all villages showing normal ranges with (<200Mg/L) except in krosuru. We had identified that concentration of sulphates 213.0 Mg/L. So, the people who are living in and around krosuru facing more problems related to diarrhoea and dehydration etc…

LIMITATIONS

For accurate association of water and disease burden blood samples was not collected and moreover the study performed in all types of people except pregnancy and paediatrics (excluded) and nevertheless the study conducted for only 6 months.

CONCLUSION

In the Present study which is a cross-sectional study based on findings it was concluded that there is an association between the quality of water and disease occurrence in the rural areas of Guntur. It was mainly of mineral concentration and composition of daily usage water is associated with the various diseases and it severely affects the health in the long run life of every individual. In Obulnaidupalem the tooth discoloration is associated with the fluorine concentration of daily usage water because fluorine range is (F-0.09 mg/L). In Krosuru the composition of usage water is not good because of that prevalence of various diseases and disorders like joint and CVS related problems are founded in many subjects. Not only drinking water, usage water is also associated with various diseases and disorders. Therefore, proper cleaning, filtration process of water and mineral concentration should be maintained in normal ranges. So that, various diseases or disorders can be prevented.

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REFERENCES

1. Wang X, Mandal AK, Saito H, Pulliam JF, Lee EY, Ke ZJ, Lu J, Ding S, Li L, Shelton BJ, Tucker T. Arsenic and chromium in drinking water promote tumorigenesis in a mouse colitis-associated colorectal cancer model and the potential mechanism is ROS-mediated Wnt/β-catenin signaling pathway. Toxicology and applied pharmacology. 2012 Jul 1;262(1):11-21.
2. Davidson T, Kluz T, Burns F, Rossman T, Zhang Q, Uddin A, Nadas A, Costa M. Exposure to chromium (VI) in the drinking water increases susceptibility to UV-induced skin tumors in hairless mice. Toxicology and applied pharmacology. 2004 May 1;196(3):431-7.
3. Ourshalimian S, Naser AM, Rahman M, Doza S, Stowell J, Narayan KV, Shamsudduha M, Gribble MO. Arsenic and fasting blood glucose in the context of other drinking water chemicals: a cross-sectional study in Bangladesh. Environmental research. 2019 May 1;172:249-57.
4. D'Ippoliti D, Santelli E, De Sario M, Scortichini M, Davoli M, Michelozzi P. Arsenic in drinking water and mortality for cancer and chronic diseases in Central Italy, 1990-2010. PLoS One. 2015 Sep 18;10(9):e0138182.
5. Wu F, Chi L, Ru H, Parvez F, Slavkovich V, Eunus M, Ahmed A, Islam T, Rakibuz-Zaman M, Hasan R, Sarwar G. Arsenic exposure from drinking water and urinary metabolomics: associations and long-term reproducibility in Bangladesh adults. Environmental health perspectives. 2018 Jan 12;126(1):017005.

6. Elwej A, Ghorbel I, Chaabane M, Soudani N, Marrekchi R, Jamoussi K, Mnif H, Boudawara T, Zeghal N, Sefi M. Protective effects of dietary selenium and vitamin C in barium-induced cardiotoxicity. Human & experimental toxicology. 2017 Nov;36(11):1146-57.
7. Fiorentino E, Barbiera F, Cabibi D, Pantuso G, Bonventre S, Aiello A, Latteri S, D'Agostino T. Barium study associated with water siphon test in gastroesophageal reflux disease and its complications. La radiologia medica. 2007 Sep 1;112(6):777-86.
8. Genchi G, Sinicropi MS, Lauria G, Carocci A, Catalano A. The effects of cadmium toxicity. International journal of environmental research and public health. 2020 Jun;17(11):3782.
9. Panhwar AH, Kazi TG, Afridi HI, Shah F, Arain MB, Arain SA. Evaluated the adverse effects of cadmium and aluminum via drinking water to kidney disease patients: application of a novel solid phase microextraction method. Environmental Toxicology and Pharmacology. 2016 Apr 1;43:242-7.
10. Fukuyama T, Okada N. Non-thermal Leptogenesis in a simple 5D SO (10) GUT. Journal of Cosmology and Astroparticle Physics. 2010 Sep 21;2010(09):024.
11. Kushkevych I, Cejnar J, Treml J, Dordević D, Kollar P, Vítězová M. Recent advances in metabolic pathways of sulfate reduction in intestinal bacteria. Cells. 2020 Mar 12;9(3):698.
12. Galetti V, Kujinga P, Mitchikpe CE, Zeder C, Tay F, Tossou F, Hounhouigan JD, Zimmermann MB, Moretti D. Efficacy of highly bioavailable zinc from fortified water: a randomized controlled trial in rural Beninese children. The American journal of clinical nutrition. 2015 Nov 1;102(5):1238-48.
13. Yang Y, Jing XP, Zhang SP, Gu RX, Tang FX, Wang XL, Xiong Y, Qiu M, Sun XY, Ke D, Wang JZ. High dose zinc supplementation induces hippocampal zinc deficiency and memory impairment with inhibition of BDNF signaling. PloS one. 2013 Jan 31;8(1):e55384.
14. Scheelbeek PF, Khan AE, Mojumder S, Elliott P, Vineis P. Drinking water sodium and elevated blood pressure of healthy pregnant women in salinity-affected coastal areas. Hypertension. 2016 Aug;68(2):464-70.
15. Gião MS, Wilks SA, Keevil CW. Influence of copper surfaces on biofilm formation by Legionella pneumophila in potable water. Biometals. 2015 Apr;28:329-39.
16. Turkalj M, Drkulec V, Haider S, Plavec D, Banić I, Malev O, Erceg D, Woodcock A, Nogalo B, Custovic A. Association of bacterial load in drinking water and allergic diseases in childhood. Clinical & Experimental Allergy. 2020 Jun;50(6):733-40.
17. Camargo JA, Alonso Á. Ecological and toxicological effects of inorganic nitrogen pollution in aquatic ecosystems: a global assessment. Environment international. 2006 Aug 1;32(6):831-49.
18. Rahman SM, Kippler M, Ahmed S, Palm B, El Arifeen S, Vahter M. Manganese exposure through drinking water during pregnancy and size at birth: A prospective cohort study. Reproductive toxicology. 2015 Jun 1;53:68-74.
19. Bancessi A, Catarino L, José Silva M, Ferreira A, Duarte E, Nazareth T. Quality assessment of three types of drinking water sources in Guinea-Bissau. International Journal of Environmental Research and Public Health. 2020 Oct;17(19):7254.
20. Wasana HM, Perera GD, Gunawardena PD, Fernando PS, Bandara J. WHO water quality standards Vs Synergic effect (s) of fluoride, heavy metals and hardness in drinking water on kidney tissues. Scientific Reports. 2017 Feb 14;7(1):42516.
21. Van Dyke N, Yenugadhati N, Birkett NJ, Lindsay J, Turner MC, Willhite CC, Krewski D. Association between aluminum in drinking water and incident Alzheimer's disease in the Canadian Study of Health and Aging cohort. Neurotoxicology. 2021 Mar 1;83:157-65.
22. Liu H, Zhu L, Tian X, Yin Y. Seasonal variation of bacterial community in biological aerated filter for ammonia removal in drinking water treatment. Water Research. 2017 Oct 15;123:668-77.
23. Mohanty JC, Ford TE, Harrington JJ, Lakshmipathy V. A cross-sectional study of enteric disease risks associated with water quality and sanitation in Hyderabad City. Journal of Water Supply: Research and Technology—AQUA. 2002 Aug 1;51(5):239-51.
24. Gebrehiwot T, Geberemariyam BS, Gebretsadik T, Gebresilassie A. Prevalence of diarrheal diseases among schools with and without water, sanitation and hygiene programs in rural communities of north-eastern Ethiopia: a comparative cross-sectional study. Rural and Remote Health. 2020 Dec 1;20(4):1-9.
25. Gebrehiwot T, Geberemariyam BS, Gebretsadik T, Gebresilassie A. Prevalence of diarrheal diseases among schools with and without water, sanitation and hygiene programs in rural communities of north-eastern Ethiopia: a comparative cross-sectional study. Rural and Remote Health. 2020 Dec 1;20(4):1-9.
26. Sedhain P. *Water, sanitation, socioeconomic status and prevalence of waterborne diseases: a cross-sectional study at Makwanpur district, Nepal* (Master's thesis, UiT Norges arktiske universitet).
27. Rahman HH, Niemann D, Munson-McGee SH. Environmental exposure to metals and the risk of high blood pressure: a cross-sectional study from NHANES 2015–2016. Environmental Science and Pollution Research. 2022 Jan;29(1):531-42.
28. Wang Y, Cui Y, Chen C, Duan Y, Wu Y, Li W, Zhang D, Li F, Hou C. Stopping the supply of iodized salt alone is not enough to make iodine nutrition suitable for children in higher water iodine areas: A cross-sectional study in northern China. Ecotoxicology and Environmental Safety. 2020 Jan 30;188:109930.
29. Ohashi Y, Saito A, Yamazaki K, Tai R, Matsukiyo T, Aikawa A, Sakai K. Brain natriuretic peptide and body fluid composition in patients with chronic kidney disease: a cross-sectional study to evaluate the relationship between volume overload and malnutrition. Cardiorenal medicine. 2016 Jun 23;6(4):337-46.
30. Shrestha A, Six J, Dahal D, Marks S, Meierhofer R. Association of nutrition, water, sanitation and hygiene practices with children's nutritional status, intestinal parasitic infections and diarrhoea in rural Nepal: a cross-sectional study. BMC Public Health. 2020 Dec;20(1):1-21.

31. Shrestha A, Six J, Dahal D, Marks S, Meierhofer R. Association of nutrition, water, sanitation and hygiene practices with children's nutritional status, intestinal parasitic infections and diarrhoea in rural Nepal: a cross-sectional study. BMC Public Health. 2020 Dec;20(1):1-21.
32. Jepson WE, Stoler J, Baek J, Martínez JM, Salas FJ, Carrillo G. Cross-sectional study to measure household water insecurity and its health outcomes in urban Mexico. BMJ open. 2021 Mar 1;11(3):e040825.

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