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The current status of WASH, its effect on Health and analysis of Biological Contamination of Drinking Water in a village in UP, India

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Abstract:
Background: *The access to safe, adequate amount per person per day and availability of Water with in premises, access to proper Sanitation and good Hygiene is the basic right of Human being. The objective of this study to find the current status of wash in a village, UP, India.*
Methodology: *In this cross-sectional study sample of 202 household selected from a village, UP, India. Sample selected through standard formula and sampling technique used multistage random sampling; questionnaire filled by researcher by asking respondent. The data analyzed through SPSS version 20.*
Result: *All the household has primary source of drinking water tube well or bore well. Most household had access to basic Indian type toilet except 14 (6.9%) household, which were practicing open defecation. Hygiene status was not satisfactory the people were unaware about the importance of hygiene resulted in different type of skin infection. The effect of WASH on health was prominent the response about chronic fever and diarrhea was positive in most cases, the biological contamination of drinking water was positive for primary source in 65 while 41 were negative out of 106 total sample.*
Discussion*: According to the situation which was present in the village the literacy rate was low due to which the awareness of people was low about the importance of WASH in disease spreading. The recommendation is to work on the awareness about WASH in the village.*
Key words: *WASH, Health, Biological contamination, Hydrogen SulphideStrips and KherliBhavMozampur village.*

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I. Introduction

WASH is acronym used for water, sanitation and hygiene. Water is the basic and vital requirement of life, without water life is impossible. Human being needs safe water to live a life free of diseases, which are due to unsafe water. In the world about 2 billion people has no access to safe water (safe water means water protected from biological as well as chemical contamination at the source, collection, transport, storage and up to usage point). In 2015 according to WHO and UNICEF JMP 91 % people have access to safe water. The diseases which are spreading from the contaminated water especially fecal contamination most common is diarrhea which is killing more than half of the people dying in developing countries. An estimation made by WHO/UNICEF that 768 million people around the world are using unsafe water for their daily uses. (1) In India there are about 82.7 % rural and 91.4 % in urban area have sustainable access to safe drinking water (census of India 2011). (4)

Sanitation is also very important in reducing the feco oral route transmitting infection; if the water is not protected from fecal contamination it will cause different type of diseases like bacterial and parasitic infection. Diarrhea is a disease which is more common and even lethal in children if left untreated within a day or two in developing countries is due to poor sanitation and proper disposal of human excreta. Improved sanitation by itself can reduce the diarrheal diseases by third of it and if it combines with good hygiene practices it will reduce these diseases two third of its incidence. (4,5)

Now after MDGs which is not achieved we have to work consistently and effectively to achieve the SDGs from 2015 to 2030, there are a lot of challenges which have to defeat and achieve the targets in 2030,

some of these challenge are due to excessive urbanization and climate changes which are affecting the rural people mostly, disturbing the access to safe water and improved sanitation. About 68% of India population is living in rural areas. Due to open defecation there is spillage of human excreta in the environment which is again a challenge to reduce it (3)

WASH play an important role in reduction of poverty, improvement of socioeconomic status and equality promotion. That's why it is put in MDG's up to 2015 and then in SDG's up to 2030. (2,3) A study estimate that in 2012 842,000 deaths were from diarrheal diseases, out of which 502000 were due to inadequate water, 28000 were due to inadequate sanitation and 297000 were due to inadequate hand hygiene. Major share to the above data is from Southeast Asia and sub-Saharan Africa. (6)

According to a study which compared WASH status of Uttar Pradesh with whole India, says that Uttar Pradesh is one of the populous states having the largest urban system in the country with 628 municipalities. However, its rank 18th in the level of urbanization. When we compare Uttar Pradesh with India the situation is worse here about 95 % people in Uttar Pradesh have no access to pipe water they are using well and tube well for drinking water, but in all India pipe water is the common source of drinking water. There are disparities present in Uttar Pradesh in west region 95% people have access to safe drinking water, while Bundelkhand region only 11.3 % people have access to safe drinking water. About 36.6 % people have access to latrine in Uttar Pradesh in 2011, while in all India this number is 49.5 %. The situation is worse in east region only 21% people have access to sanitation and only one fifth people have toilet facilities. West region is a developed region where these facilities are more 55 % people have access to toilets. (8,9)

Objective of the study:

- To find out the current status about WASH (water, sanitation and hygiene) in KherliBhavMozampur village,
- To explore the effects of WASH on health in KherliBhavMozampur village residents.
- To find out the biological contamination of drinking water by using hydrogen sulphide strips method in KherliBhavMozampur village.

II. Methodology

Study setting;This study conducted from December 2018 to April 2019 in a village by name of KherliBhavMozampur, Gautam Buddha Nagar, UP state, India. Total population of 5207 and 424 household.
Study Design: Observational cross-sectional study, with pre tested structured questionnaire used.

Sampling: The data from 2011 census used. 202 sample were taken by using standard formula as shown below. The sample was household, the researcher filled the questionnaire by asking respondent after application of inclusion and exclusion criteria. Multi staged random sampling method was applied, 1st stage was systematic sampling and 2nd stage was simple random sampling technique.

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

Z (1.96), P (0.5), e (0.05) and N (424 household). After using formula, the result comes 201.57 so 202 were taken.

Tools of data collection and data collection procedure:

There were two tools for data collection 1st was pre tested structured questionnaire and 2nd was Hydrogen Sulphide test strips used to check the biological contamination of drinking water.

The collection of study divided into 3 steps 1st step is to select the sample and the respondent after applying the exclusion and inclusion criteria. 2nd step was to sign an informed consent by respondent and filled questionnaire, which was in English translated and filled like an interview by researcher itself. 3rd step was to take water sample from primary source of drinking water and storage source of drinking water. Then incubated at room temperature for 24 to 48 hours in 25 to 35 degree centigrade to see the result. (6)

Data Analysis: After collection of data, codes were made then entered and analyzed through SPSS version 20, while the graphs and tables were processed in MS WORD program.

III. Result of the study

The result of the study analyzed according to the partition of the questionnaire, the questionnaire was divided according to the objective and demographic information. 1st the demographic result shows that 202 people who responded completely no one was missing. Male were 126 (62.4%) While females were 76 (37.6%). Age wise 87 (43.1%) among 18 to 30 years, 52 (25.7%) were among 32 to 42 years, 30 (14.9%) were among 43 to 55 years and 33(16.3%) were above 55 years. Occupation wise most of the respondent were self-employed 57 (28.4%) busy in farming and shop keeping, females were mostly homemaker 71 (35.3%). Among male unemployment was 56 (27.9%). Education 96 (47.5%) were illiterate they were unable to write or read in their own language. 46 (22.8%) were primary school passed and 55 (27.2%) were secondary school passed only 5(2.5%) people had higher graduation degree.

Out of all respondents 94(46.5%) were head of household, 37 (18.3%) were wife/ husband, 63 (31.2%) were children and 8 (4%) were relative means other member than child i.e. daughter in law and nephews. Religion wise 96 (47.5%) were Hindu and 106 (52.5%) were Muslims.As like the Indian societies the family member most of them had 5 to 10 household members 134 (66.3%), 84 (41.6%) were less than 5 members in household and 32 (15.8%) were among 10 to 15 members. Large number of households comes in two categories one was 5000 to 10000 INR monthly income while other were 10000 to 20000 INR monthly income. 1st were 84 (41.3%) the others were 110 (54.7%). The 84(41.3%) respondents were working on daily wages. They were poor according to APL and BPL system we can put them as BPL. All the people were having fields so they were keeping domestic animals 140(69.3%) respondent keeping cow/ buffalo and 32(15.8%) were keeping goats/sheep while 30(14.9%) were had no domestic animals. As shown in table 1.

Table 1: Demographic variables of Water Sanitation and Hygiene

S/number	Characteristics	Response	Frequency	Percentage
1	Gender	Male Female	126 76	62.4 37.6
2	Age	18 to 31 32 to 42 43 to 55 >56 years	87 52 30 33	43.1 25.7 14.9 16.3
3	Occupation	Employed Un employed Self employed Home maker	17 56 57 71	8.5 27.8 28.4 35.3
4	Education	Uneducated Primary school Secondary school Higher graduation	96 46 55 5	47.5 22.8 27.2 2.5
5	Position of respondent	Head of household Wife/husband Child Relative	94 37 63 8	46.5 18.3 31.2 4.0
6	Religion	Hindu Muslim	96 106	47.5 52.5
7	Number of family members	<5 members 6 to 10 11 to 15 > 15 members	32 134 32 4	15.9 66.3 15.8 2.0
8	Monthly household income in INR	5000 to 10000 10001 to 20000 20001 to 30000 >30000 INR	84 110 7 1	41.3 54.7 3.5 0.5
9	Domestic animals	Cow/buffalo Goat/sheep Nodomestic animals	140 32 30	69.3 15.8 14.9

Current status of WASH in village:

The current status of WASH is also divided into Drinking Water, Sanitation and Hygiene. The access to safe drinking water, good sanitation means access to toilet, disposal of excreta of adult and children, and Hygiene which measure by Hand washing and bathing practices, use of water, soap or both. In this village all the people had access to enough quantity of water means water was in their premises but source was only bore or well water extracting through submersible and handpump, most of them were don't had storage for drinking water they were using direct consumption from well by hand pump or submersible. Those who had storage they were treating water with filter. 100% people had primary source for drinking water bore /well there were no

government water supply scheme. Out of 202 household only 14 (6.9%) were using filter to clean water before consumption remaining all 188(93.1%) were directly consuming the drinking water. 45(22.3%) household had storage tank for water storage 147 (72.7%) household were experiencing direct consumption, 4 (2%) and 6 (3%) household were using covered and uncovered vessel for storage. Most of the utensil using for drinking water consumption cleaning everyday 155 (76.7%) while storage tanks were cleaned different times like 22 (10.9%) were cleaning yearly, 21 (10.4%) once a month while 4 (2%) were once a week. As shown in table 2.
All the house hold had toilet facilities but some don't have toilets they were defecating in field or open area. As the people are farmer, they are spending most of their time in fields so they were practicing open defecation in the field.

Table 2: Respondents Accessto Safe Drinking Water.

s/number	Characteristics	Respond	Frequency	Percentage
1	Primary source of drinking water	Tube well/Bore well	202	100
2	Water purification method?	Water filter Direct consumption	14 188	6.9 93.1
3	Drinking water storage method?	Storage tank Covered vessel Uncovered vessel Direct consumption	45 4 6 147	22.3 2 3 72.7
4	How much time ago cleaned the storage source of drinking water?	Everyday Once a week Once a month Once a year	155 4 21 22	76.7 2 10.4 10.9

Respondents Access to Good Sanitation;

Sanitation means the facilities and resources used for safe disposal of human excreta. Out of 202 respondents only 14 (6.9%) were practicing open defecation, when asked about the reason behind this they told me that their economic status is very bad. There was no religious or any other reason behind this. The other who were practicing defecation in toilet all were basic Indian type toilet as shown in the pictures. 187 (92.6%) were using household toilet, these were shared toilet by household members no other from outside was using it. These were basic toilets as stated above. Most of the toilet's excreta disposal were in open drain or Nallah about 109 (54%). Discharging the excreta into Nallah, while 74(36.6%) out of 202 were practicing septic tank method, they were calling the septic evacuation tanker at the time of need. Only 2(1%) out of total were discharging in the pond, river or any other water body. 17(8.4%) out of 202 were discharging the excreta into open pit field or premises of household (open pit). Out of these 17(8.4%) the open defecating people are also included.

Question regarding the excreta disposal of Children, which is very dangerous in spreading feco oral diseases, because of low immunity the infection is more than adults. Out of total 65 (32.2%) house hold had no child below five years, 64 (31.7%) were disposing the excreta of child in the toilets and the remaining 73 (36.1%) were disposing in the Garbage. As shown in the table 3 below;

Table3: Respondents Access to Good Sanitation.

S/number	Characteristics	Respond	Frequency	Percentage
1	Which type of toilet?	Household toilet Open defecation	187 14	93.1 6.9
2	Disposal of Human excreta?	Septic tank Open drain/Nallah Open pit Pond, river, stream, or any other water body	74 109 17 2	36.6 54 8.4 1
3	How do you dispose the child excreta? (child less than 5 years)	Dispose in toilet Burial method Dispose into garbage No child of less than 5 years	64 73 00 65	31.7 36.1 00 32.2

Hygiene (Hand washing practices);

Almost All the respondents respond with yes for washing of their hand, but the next question about when do you wash your hand usually? The 17 (8.4%) responded during food consumption i.e... Before and after food consumption, 19 (9.4%) before cooking and 12 (6.0%) after using toilet while the remaining 154 (76.2%) responded all the time i.e... during food consumption, before cooking and after toilet usage. The respondents were using only water for hand washing were 77 (38.9%) while those who are using water with soap were 125 (61.1%). When further the respondents were asked about Bathing practice the responds were 18 (8.9%) household member, they were taking bath every day, 3 (1.5) twice a day and the 159 (78.7%) were taking bath

on every alternate day. The bad one was that 22 (10.9%) respondents answer that they are taking bath once in a week. As shown in the table;

Table 4: Respondents Status of Hygiene (Hand Washing Practices).

S/ Number	Characteristics	Respond	Frequency	Percentage
1	Do you wash your hand?	Yes No	202 000	100 000
2	When do you wash your hand usually?	During food consumption Before cooking After using toilet Wash every time	17 19 12 157	8.4 9.4 6.0 76.2
3	What are your family members using to wash hand?	Only water Water with soap	77 125	38.9 61.1
4	How often do your family members take bath?	Once a day Twice a day Alternate day Once a week	18 3 159 22	8.9 1.5 78.7 10.9

Effect of Water, Sanitation and Hygiene status on the Health of Respondents

There were three question regarding effect of WASH on health of residents. First, they were askedabout any diarrheal diseases' history in household for last four weeks which remained for more than one week. The responds were yes 73 (36.1%) and no 129 (63.9%), which show significance of this status of WASH which are affecting the people health. And the next question responds were for fever which remained for long time yes were 129 (63.9%) and no were 73 (36.1%), which again show significance but the time of data collection was in changes of season it might be due to seasonal effect but shows more significance to act. The presence of any skin disease in household id answered 103 (51%) yes while 99 (49%) with no, when examined by the researcher out of 98 total examined cases of skin diseases 73(74.5%) were Ringworm cases,20(20.4%) were scabies infestation while 5 (5.1%) were Allergic. Some cases were on whole body of scabies in adult the history of that household was no use of soap and taking bath once a week. There were some cases of genital ringworm infection.as shown in table below;

Table 5: The Effect of Water, Sanitation and Hygiene Status on Health of Respondents

S/ Number	Characteristics	Respond	Frequency	Percentage
1	Has anyone in your house hold had diarrheain the past four weeks?	Yes No	73 129	36.1 63.9
2	Has anyone in your house hold had unusual fever in past four week?	Yes No	129 73	63.9 36.1
3	Do you have any member in your family who is suffering from skin disease?	Yes No	103 99	51 49
4	What type of skin disease? (Show to the researcher)	Scabies Ring worm Allergy	20 73 5	20.4 74.5 5.1

The result of biological contamination of drinking water by using hydrogen sulphide strips;

Hydrogen sulphide is a simple test used on field only 20ml water is needed to check the water for biological contamination esp. coliform bacteria the main sources of which are feces of human and animals. The details of test strips are already given in tools part. The result conducted by the researcher itself, the sample taken at two points i.e... source and storage of drinking water but most of the household don't had the storage they were directly consuming the water that's why most are missing. Total 106 samples were taken from both points out of which 65(61.3%) were positive while 41(38.7%) were negative at primary source of drinking water, (positive means presence of Bacteria while negative means absence of bacteria) some household had shared primary source of drinking water. The storage source result was out of 5, positive were 3(60%) while 2(40%) were negative. As shown in table below;

Table 6: Test result of Hydrogen SulphideStrips

S/ Number	Characteristics	Result	Frequency	percentage
1	Source of drinking water?	Positive Negative	65 41	61.3 38.7
2	Storage of drinking water?	Positive Negative	3 2	60 40

Chi square result:

There was no significant relation among Genders, Age, marital status, position of respondent in the household, religion, number of family members and presence of domestic animals in household to use of any method to purify water before drinking so these are independent variables. While there was a relation between Occupation (p 0.057) economic status (p 0.000) and literacy status (p 0.001.) to the use of method to purify the water before drinking.

The relation between the demographic variables and disposal of human excreta from toilet. TheChi square result shows the there is no significant association among demographic variables and the disposal of human excreta only the Members of Household (p 0.01) and Presence of Domestic animals (p 0.017) shows the significant relation.

The relation between the demographic variables and Bathing is not significant. Except Occupation (p0.016), Literacy rate (p 0.000) and Presence of Domestic Animals (p 0.000) to the bathing is significant.
As shown in the tables below.

Table 7: Chi square Test among Demographic variables and water purification methods

Question	Option	Water purification method			Chi square value	Degree of freedom	p-value
		Water filter	Direct consumption	Total			
Occupation	Employed	2	15	17	7.52	3	0.057
	Self employed	7	49	56			
	Unemployed	00	57	57			
	Home maker	5	66	71			
Education	Uneducated	7	89	96	23.25	3	.000
	Primary school	2	44	46			
	Secondary school	2	53	55			
	Higher graduation	3	2	5			
Household monthly income in INR?	5000 to 10000	3	81	84	15.752	3	.001
	10001 to 20000	9	101	110			
	20001 to 30000	1	6	7			
	> 30000	1	0	1			

Table 7: Chi square test among Demographic variables and the disposal of human excreta.

Question	Option	How do dispose the human excreta?				Chi square value	Degree of freedom	p-value
		In Toilet	In Garbage 's	No child less than 5 years	Total			
Household members	Less than 5 members	4	9	19	32	23.538	6	.001
	6 to 10 members	45	49	40	134			
	11 to 15 members	11	15	6	32			
	> 15 members	4	0	0	4			
Do you have any domestic animals in your household?	Cow/ buffalo	38	48	54	140	12.080	4	.017
	Goat/ sheep	16	10	6	32			
	No domestic animals	10	15	5	30			

Table 8: Chi square test to see the association among Demographic variables and Hygiene related question "what are your family members using to wash hand"

Question	Option	Whatareyourfamilymembersusingto washhand?			Chi square value	Degree of freedom	p-value
		wate r	Water and soap	Total			
Occupation	Employed	10	7	17	11.644	3	.009
	Self employed	14	42	56			
	Unemployed	29	28	57			
	Home maker	24	47	71			
Household monthly income in INR?	5000 to 10000	42	42	84	11.806	3	.008
	10001 to 20000	35	75	110			
	20001 to 30000	0	7	7			
	> 30001	0	1	1			
Do you have any domestic animals in your household?	Cow/ buffalo	48	92	140	9.775	2	.008
	Goat/ sheep	20	12	32			
	No domestic animals	9	21	30			

Table 9: Chi square test among Demographic variables and Type of skin diseases observed by Rresearcher

Question	Option	Type of skin disease in household observed by researcher.				Chi square value	Degree of freedom	p-value
		Scabies	Ring worm	Allergy	Total			
Household monthly income in INR?	5000 to 10000	13	29	3	45	10.621	4	.031
	10001 to 20000	5	42	1	48			
	20001 to 30000	2	2	1	5			
	>30000	00	00	00	00			

This Chi square test shows that there is no association between demographic variables and the type of skin diseases, except Household Monthly income which has p-value less than0 .05 (0.031)

IV. Discussion

A study conducted in UP by Rashmi Tiwari and SanatanNayak through NFHS-3 shows that 83.1% households are using water from bore well in rural UP, but our study result shows that the 100% household were using bore/tube well.There was no system of pipe water supply in this study while in theRashmi Tiwari and SanatanNayak study the other household were using pipe water 10.3% in UP. (41) Another study shows that in Karnataka 45% household were not treating water before drinking but in our study resultthe situation is very bad only 6.9% household were treating before drinking. (7)

Study conducted by push Panjali Swain state that in a district in UP, 46% household were practicing open defecation, but in our study only 6.9% respondent were practicing open defecation. In rural Up according to Rashmi Tiwari 79% household had no toilet, but our study show that 93.1% household had access to toilet with in their household. Only 6.9% people were practicing open defecation. The excreta drain in open Nallah in our study it was 54% but other studies show more than this. Use of septic tank was 36.6% which is good point. One study by Pushpanjali Swain and SristhiPathela shows that 61% respondent were washing hand regularly, while in our study 76% respondent were washing their hand regularly i.e. during food consumption, before cooking food and after defecation. 29% were using soap and water for hand washing in the above study, while in our study 61.1% respondent were using soap and water for hand washing. 38.9% were using only water for hand washing. About 8.9% respondent were taking bath every day, 78.7% were taking bath regularly on Alternate day, while in the Push Panjali Swain study shows 43% taking bath every day, 47% taking bath on alternate day. (13)

The responses to the presence of illness was more in our study because the weather was changing might be due to this reason, we cannot relate all cases due to WASH status. A study in Karnataka shows that 12.9% cases of diarrhea and 17.6 cases of fever were reported, but in our study, out of all respondent 36.1 percent reported diarrhea while 63,9% reported fever. Which is bad score. (7)

The result of water checking for biological contamination at source shows 61.3% positive, while at the point of consumption only 5 were tested which shows 60% positive and 40% negative. In Karnataka study the positive result at primary source was 88%. So, in our study it is good than other one. (7)

There is need to increase the awareness of people about the cycle of WASH in different diseases, especially Hygiene. Need more awareness about any method prior to use drinking water. The limitation of this study was Time and funding, time was 4 months and funded whole by the researcher with his limited resources. (12)

V. Conclusion

The study shows that the respondents has Access to sufficient water but not safe, most of the response were negative. The sanitation status as compared to other areas of UP is good but need help for improvement. The Hygiene status was bad because the lack of awareness of respondent about the importance of it. WASH effect on Health of respondent was prominent in case of diseases like diarrhea, fever and skin infection. The most important intervention needed to increase awareness of people regarding WASH and its importance in preventing diseases.

Conflict of Interest: No conflict of interest.

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