

Knowledge, Attitude and Practice on Hygiene and Sanitation among population of selected districts in Province No. 2, Nepal

Khushbu Yadav

Lecturer, Department of Health Science, Mithila Technical Academy, Janakpurdham, Nepal.

Basant Kumar Yadav

Medical Officer,
Department of Surgery,
Janaki Medical College,
Janakpurdham, Nepal

Satyam Prakash

Assistant Professor,
Department of Biochemistry,
Janaki Medical College,
Janakpurdham, Nepal

Proper hygiene and inadequate sanitation has direct effect on health of individual, family, communities and nation as a whole. Provision of accessible, affordable and acceptable safe drinking water facility, optimum hygiene and sanitation to each and every individual of the world regarding to caste, ethnicity, gender, socio-economic status and geographical location is essential. Thus, the objective of this study was designed to assess knowledge, attitude and practice of hygiene and sanitation on population of selected districts of Province No. 2 in Nepal. **Methods** This descriptive cross sectional study was conducted from April to June 2019 in selected districts of Province No. 2, Nepal. 450 study participants were enrolled. Convenient sampling method was applied by designing standard structured questionnaire. Data was entered in SPSS 18 and p-value < 0.05 was considered as statistically significant. **Results** The results of this study reflect 82.22% respondents had knowledge that most of the diseases are caused by the lack of sanitation whereas 51.11% were familiar that the disease are caused by the collection of water around house. 92% respondents had disagreed about open defecation, 96% respondents had agreed about hand should be washed after defecation and 82% respondents had agreed on nail should be trimmed at regular interval. All respondents had brushing habit, 67.78% respondents used brush in their brushing habit, 33.56% had daily bathing habit, 20% washed clothes daily and only 15.55% used soap for washing hands after handling cattle dung. Association between education and using toilet facilities was found to be significant (p-value <0.05) but correlation between using toilet facilities and type of family among community people was statistically insignificant (p-value > 0.05). **Conclusion** The overall knowledge, attitude and practice on hygiene and sanitation among study participants were better, good and satisfactory respectively. Environmental sanitation program, development of household wastes, water treatment procedures and safe water storage should be done in community system and awareness programs should be carried on a regular basis.

KEYWORDS: Attitude, Hygiene, Knowledge, Practice, Sanitation, Unsafe water

INTRODUCTION

Poor hygiene practices and inadequate sanitary conditions play major roles in the increased burden of communicable diseases within developing countries [1, 2]. Proper sanitation is a prerequisite for

improvement in general health standards, the productivity of labour force and good quality of life [3]. Worldwide, 5.3% of all deaths and 6.8% of all disability are caused by poor sanitation, poor hygiene and unsafe water [4]. Every 20 seconds, a child around the world dies as a result of poor sanitation [5]. About 80% of all disease of the developing world is related to unsafe water and inadequate sanitation [6].

Nepal has proposed sustainable development goals (SDG) targets for the year 2030, which includes achieving universal and equitable access to safe and affordable drinking water, sanitation and hygiene for all [7]. According to the Data of Department of Water Supply and Sewerage (DWSS), 2018 shows that about 97% of the total population has access to basic sanitation facilities and 87% have access to primary water supply facility. By the end of 2018, 63 districts of Nepal achieved the status of Open Free Defecation zones [8].

Although Nepal has come a long way in improving its sanitation coverage status, it is still well short of desired levels especially in Province No. 2. Sanitation coverage is 95% in six Provinces and below 90% in Province No. 2 of Nepal [9]. The Chief Minister of Province No. 2, Mohammad Lalbabu Raut launched grand new schemes on sanitation and hygiene with the slogan of "*Clean Madhesh, Prosperous Province*" by sweeping the streets with broomsticks himself with his team members [10] to create awareness towards the path of progress and prosperity. A lot of budgets had been allocated on cleanliness, sanitation and hygiene and waste management in this province. Several programs are also carried out consistently by different clubs, NGOs, INGOs, and young campaigners in this province. However, the results are not satisfactory and optimal. Due to this, hygiene and sanitation have been a topic of importance and not been well documented so far in Province No. 2 of Nepal.

The most critical challenges for the successful implementation of the sanitation programme are unawareness of the linkage between sanitation and health. Because cleanliness, hygiene and sanitation are directly linked with awareness, education, civilization, infrastructure and services which lacks in Nepal. Despite all these consequences, there is a paucity of studies on KAP regarding hygiene and sanitation in the Terai region of Nepal. Thus, the objective of this study was designed to assess knowledge, attitude and practice of hygiene and sanitation on the population of selected districts in Province No. 2.

METHODOLOGY

This descriptive cross-sectional study was carried out at Mahottari, Sarlahi, Dhanusha, Siraha and Bara District of Province No. 2, Nepal from April to June 2019. An approval letter to conduct this research was obtained from Mithila Technical Academy (MTA), Janakpurdharm affiliated to the Council for Technical Education and Vocational Training (CTEVT), Nepal. A total number of 450 study participants were enrolled in this study. Sample size was calculated by using formula, $n = Z^2 pq / e^2$, where $Z = 1.96$ (Standard normal distribution); $P = 50\%$ (proportion of attributes in the sample), $q = 100 - P$ and $e =$ allowable error of 5%. The sample size obtained was 384. Additionally, with 15% non-response, the final sample was 442. However, data was calculated from 450 participants. A self-administered standard structured questionnaire was designed. Pre-test was done in 10% of population before data collection. The informal interview among the study respondents was carried by final year Health Assistant (HA) students of Mithila Technical Academy (MTA), Janakpurdharm. Convenient sampling method was applied.

The questionnaire was prepared in International English language. During the interview, the questions were explained in the local language for the expediency of respondents. Verbal informed consent was taken and the objective of the study was explained to the respondents clearly with an assurance of confidentiality. Orientation was given to all respondents regarding how to fill the questionnaire individually without consulting anybody present there. The data entered in the questionnaire was rechecked for accuracy. Data was entered in SPSS 18 and p -value < 0.05 was considered as statistically significant.

RESULTS

The socio-demographic characteristics of study population as shown below in table 1.

Age (yrs)	No.	%
<20	279	62
20-40	90	20
>40	81	18
Gender		
Male	290	64.44
Female	160	35.56
Marital status		
Married	270	60
Unmarried	180	40
Family type		
Nuclear	260	57.78
Joint	190	42.22
Religion		
Hindu	388	86.22
Muslim	62	13.78
Caste		
Yadav	196	43.55
Sah	57	12.66
Mahato	46	10.22
Jha	39	8.66
Pandey	34	7.55
Karna	21	4.66
Rajak	8	1.77
Chaurasia	8	1.77
Sahani	13	2.88
Patel	7	1.55
Paswan	6	1.33
Chaudhary	15	3.33
Education		
Illiterate	50	11.11
Primary	120	26.67
Secondary	195	43.33
Higher	85	18.89
Occupation		
Farmer	220	48.89
Service holder	40	8.89
Students	105	23.33
Others	85	18.89
Income per capita (Nrs)		
<5000	100	22.22
5000-10000	290	64.44
>10000	60	13.34
District		
Sarlahi	50	11.11
Dhanusha	135	30
Mahottari	213	47.33
Sirha	30	6.67

Bara	22	4.87
Head of the family		
Father	432	96
Mother	15	3.33
Grand parents	3	0.67
Member number of the family		
<5	158	35.11
5-10	280	62.22
11-15	10	2.22
>15	2	0.45

Table 1. Socio-dem ographic characteristics of the study population (N=450)

Knowledge regarding hygiene and sanitation

Table 2 shows 95.56% of participants had knowledge about hand should be washed before eating. Likewise, 82.22% of participants had knowledge that most of the diseases are caused by the lack of sanitation whereas 51.11% participants were familiar that the disease are caused by the collection of water around the house. 42.67% of participants had knowledge about diarrhoeal diseases which are transmitted by flies. More than 50% of study participants had knowledge about the skin disease, which is transmitted by direct contact. Similarly, 60% respondents were well known about cough and cold diseases are transmitted by respiration. Most of the study participants (50.67%) had the main health problem in their family within the last one year which was other than typhoid and diabetes.

Parameters	No.	%
The Hand should be washed before eating		
Yes	430	95.56
No	18	4
Don't know	2	0.44
Most of the diseases are caused by lack of sanitation		
Yes	340	75.55
No	35	7.77
Don't know	75	16.66
Diseases are caused by the collection of water around the house		
Diarrhoea	158	35.11
Malaria	230	51.11
Cholera	7	1.56
Others	55	12.22
Diarrhoeal diseases are transmitted by		
Water	140	31.11
Flies	192	42.67
Hand	78	17.33
Don't know	40	8.88
Skin diseases are transmitted by		
Direct contact	282	62.67
Indirect contact	81	18
Sin	5	0.11
Don't know	82	18.22
Cough and cold diseases are transmitted by		
Respiration	270	60
Direct contact	68	15.11
Indirect contact	23	5.11

Don't know	89	19.78
Main health problem in family within last one year		
Typhoid	162	36
Diabetes	60	13.33
Others	228	50.67

Table 2. Knowledge regarding hygiene and sanitation

Attitude regarding hygiene and sanitation: Table 3 shows study participants (92%) had disagreed about open defecation and more than one third (96%) of study participants had agreed hand should be washed after defecation. 82% of participants agreed that nail should be trimmed at the regular interval while 97% of respondents agreed that brushing should be done daily. 84.89% of participants had agreed on taking a bath daily. Likewise, the highest number of study participants (98%) agreed that cooked food should be covered whereas (76.89%) participants agreed that stale food should be eaten and (78%) participants had agreed on household waste should be collected in a container.

Parameters	Agree (%)	Disagree (%)
Open defecation should be done	36 (8)	414 (92)
The hand should be washed after defecation	432 (96)	18 (4)
Nail should be trimmed at regular interval	369 (82)	81 (18)
Brush should be done daily	436 (97)	14 (3)
The daily bath should be taken	382 (84.89)	68 (15.11)
Cooked food should be covered	441 (98)	9 (2)
Stale food should be eaten	346 (76.89)	104 (23.11)
Household waste should be collected in a container	351 (78)	99 (22)

Table 3. Attitude regarding hygiene and sanitation

Practice regarding hygiene and sanitation: Majority of the participants (91.11%) used the source of drinking water from hand pipe. Most of the respondents (98%) had sweeping yard daily, 96% respondents defecated in the latrine, 75% respondents used dug well toilet, 80.09% respondents cleaned toilet alternately, 65.56% used soap and water for hand washing after defecation. Similarly, all respondents had brushing habit while 67.78% of respondents used brush in their brushing habit, only 33.56% of respondents had a daily bathing habit, and 20% of respondents washed clothes daily.

Likewise, the highest number of respondents (96.23%) hadn't done treatment of water before consumption at home. 90% of respondents had the habit of cleaning of water carrying vessels daily. Maximum respondents (90%) had a practice of water storage vessel covered. Fewer participants (14.56%) used material to wash the water storage vessel with detergent. 80% respondents used a pot of wide mouth pot for storage of water. Similarly, 75.56% of respondents had a separate kitchen room. One-third of the respondents (77.34%) used firewood as fuel for cooking. 98.89% of respondents used plain water for washing hands before eating by family members, and only 15.55% respondents used soap for washing hands after handling cattle dung as shown in table 4.

Parameters	No.	%
Source of drinking water		
Hand Pipe water	410	91.11
Well water	38	8.44
Pond Water	2	0.45

Sweeping yard		
Daily	441	98
Alternately	9	2
Place of defecation		
Latrine	432	96
Open	18	4
Use of toilet		
Dug well toilet	342	76
Pit toilet	102	22.66
Others	6	1.33
Toilet cleaned		
Alternately	346	76.88
Weekly	104	23.11
Material used for hand washing after defecation		
Soap & water	295	65.56
Ash & water	135	30
Soil & water	20	4.44
Brushing habit		
Yes	450	100
Material used to brush		
Brush	305	67.78
Dattiwan	145	32.22
Bathing habit		
Daily	151	33.56
Alternately	135	30
Weekly	164	36.44
Washing clothes		
Daily	90	20
Alternately	340	75.56
Weekly	20	4.44
Water treatment before consumption at home		
Boiling	2	0.44
Filtration	15	3.33
Don't treat	433	96.22
Cleaning of water carrying vessels		
Daily	405	90
Alternately	45	10
Water storage vessel covered		
Yes	423	94
No	27	6
Material used to wash the water storage vessel		
Detergent	65	14.44
Ash	360	80
Others (soap)	25	5.56
Type of water storage pot used		
Pot with wide mouth	360	80
Pot with narrow mouth	90	20
Kitchen room separate		
Yes	340	75.56
No	110	24.44
Types of fuel used for cooking		
LP gas	92	20.44

Firewood	348	76.66
Biogas	10	2.22
Materials used to clean pots after cooking and eating		
Ash	345	76.66
Detergent	50	11.11
Others (soap)	55	12.22
Materials used for washing hands before eating by family members		
Plain water	445	98.88
Soap	5	1.11
Materials used for washing hands after handling cattle dung		
Plain	380	84.44
Soap	70	15.55

Table 4. Practice regarding hygiene and sanitation

Association of using toilet facilities with education status and family type

Table 5 shows there was a significant association between education and using toilet facilities (p-value <0.05) but an association between using toilet facilities and type of family among community people was statistically insignificant (p-value > 0.05).

Variables	Using toilet facilities		Total	Statistics
	Yes	No		
Education status				
Illiterate	82	109	191	Chi-square=20.64p=0.003
Literate	167	92	259	
Family type				
Nuclear	135	112	247	Chi-square=1.60p=0.80
Joint	123	80	203	

Table 5. Association of toilet facilities with education status and family type (N = 450)

DISCUSSION

Proper hygiene and inadequate sanitation had direct effect on the health of individual, family, communities, and nation. Various studies have shown that different types of diseases were a consequence of poverty, poor hygiene, and environmental contamination [11]. This study depicts 95.56% of respondents had knowledge about hand washing before eating. A study conducted by Vivas et al., in Ethiopia showed the preference for hand washing before eating were 98.8% [12] which is in accord with this study.

Other studies from the Philippines and Colombia indicated that 75.9% and 46.9% of respondents reported washing hands before meals [13] which are indifference with the current study. The reason for the higher frequency of hand washing before meals may be due to traditional practice and understanding the importance of cleaning and washing hands before eating.

Similarly, this study also found 82.22% of respondents had knowledge about most of the diseases are caused by the lack of sanitation. Similar results were also depicted in the study conducted by Shrestha et al., [2] and Sibiya and Gumbo [14]. This may be due to the knowledge of disease related to sanitation.

This study represents 35.11% respondents had knowledge about diarrhoea, 51.11% about malaria, 1.56% about Cholera and 12.22% about other types of diseases respectively which are caused by the collection of water around the house. This may be since diarrhoea is a major cause of morbidity

and mortality in the developing world [15]. Another possibility is that they might be familiar towards water-borne diseases knowing Cholera as an acute diarrhoeal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae* [16] and also understanding the cause of malaria and its prevention.

WHO has attributed 88% of diarrhoeal disease occurred due to unsafe water supply [17]. In this study, 42.67% of respondents had knowledge about diarrhoeal diseases are transmitted by flies, followed by contaminated water with 31.11%. Sah et al., in Dhankuta Municipality, also reported 46.3% of respondents believed unsafe water is responsible for the spread of diarrhoea [18] which is almost analogous with this study. Shrestha et al., found 74.6% of the respondents were familiar and known to diarrhoea as water borne disease [2], which is in contrast with the present outcome. Such differences might be due to the level of education and awareness of water borne diseases. Another panorama may be the societal differences within the rural and urban area.

Likewise, this study depicts more than 50% of respondents had knowledge about the skin disease which are transmitted by direct contact whereas below than 20% of respondents knew skin diseases are transmitted by indirect contact. This might be due to the knowledge of participants having common skin disorders such as acne, cold sore, hives, contact dermatitis, actinic keratosis, rosacea, carbuncle, latex allergy, eczema, psoriasis, cellulitis, measles, basal cell carcinoma, squamous cell carcinoma, lupus, vitiligo, chickenpox, melasma and skin cancers [19].

The current study reports 60%, 15.11% and 5.11% of respondents knew cough and cold diseases are transmitted by respiration, direct contact and indirect contact respectively. They might be well-known with the fact that most episodes of cough are due to the common cold. Causative agents of lower respiratory infections are viral or bacterial. Viruses cause most cases of bronchitis and bronchiolitis. Organisms gain entry to the respiratory tract by inhalation of droplets and invade the mucosa. Epithelial destruction may ensue, along with redness, oedema, haemorrhage and sometimes an exudate [20].

Most of the respondents (50.67%) had knowledge that the main health problem in their family within the last one year was other than typhoid and diabetes. This possibility may be due to the treatment and medication done for associated with other diseases.

The present study shows 92% of respondents disagreed on open defecation whereas 8% agreed on open defecation. The reason behind this may be that the majority has their own latrines for defecation, as the habit of indiscriminate fouling of surrounding of human excreta is generation old and rooted firmly in the cultural behaviour of village people [21]. Open defecation might be due to the lack of space, lack of money, and lack of water connection in the house.

Majority of participants responded that hand should be washed after defecation in this study. A simple measure like hand washing with soap after contact with human excreta prevents transmission of organisms that cause diarrhoea and thus, millions of diarrhoeal deaths can be prevented globally [21].

Likewise, 82% of participants responded on a nail should be trimmed at regular interval of time, which help to prevent from several types of food-borne diseases. 97% of respondents had agreed about brush should be done daily, which helps to prevent various types of oral diseases such as oral cancer, dental caries, odontitis etc. Daily brushing habit prevents gums clean and can prevent gum disease, while keeping tooth surfaces clean help to stave off cavities and gum disease [22-24]. 84.89% of respondents agreed on taking a bath daily which gives the people freshness, nice looking and also helps to prevent several types of skin diseases. This might be due to the common thought of means of achieving cleanliness by washing away dead skin cells, dirt, soil and reduce odours as a preventative measure to reduce the incidence and spread of disease.

In this study, the highest number of respondents (98%) responded to cooked food should be

covered whereas 76.89% responded to stale food should be eaten. 78% of participants had agreed on household waste should be collected in a container. The overall attitude of the study participants responded on hygiene, and sanitation was found to be good. The promising clarification might be the literacy rate and awareness towards the waste management in home and community, which prevents environmental hazards and keeping neighbourhood neat and tidy.

With respect to practice, most of the respondents used the source of drinking water from hand pipe which enlightens the feasibility of source of water source is good and hand pipes are practised more in use. There is another possibility that hand pumps continue to be the principal source of drinking water for households in rural areas and commonly used for both community supply and self-supply of water. Maximum respondents had swept yard daily. The perspective might be that sweeping is an effective means of removing the soil and debris to reduce the risk of airborne and contaminated products. Another reason might be that sweeping yard is a traditional habitual behaviour of females which is directly linked to cleanliness and also is a survival tactic, tied to seeing rodents like field mice, swamp rats, snakes and other insects.

The present study explains 96% respondents used latrine, as compared to a related study from Vietnam, Ghana, India, Saptari and Jhapa of Nepal reported that only 30%, 40%, 31.8%, 34.8% and 32% respectively used the latrine for defecation [25-29]. The differences in the present result with earlier studies might be due to variation in the study population. Other reason might be the availability of more latrines in the study area.

In this study, 75% of respondents used dug well toilet, 80.09% cleaned toilet alternately. This might be due to the convenience, acceptable and cheapest for the users. Also, it does not require water so are appropriate in areas where there is no adequate water supply. The practice of cleaning toilet is essential as dirty toilet looks terrible, smell bad and breeds germs and harmful bacteria.

There are various critical times for hand washing like before cooking food, before serving food, after using the toilet, after touching solid and liquid waste, after cleaning child stool etc. The present study reveals 65.56% of respondents used soap and water for hand washing after defecation. A study conducted by Sah et al., reported 56% of respondents used soap and water for hand washing after defecation [25]. A similar study from Nigeria showed 88% of respondents wash hands after defecation [30]. Similarly, studies conducted in Colombia and India reported that 82.5% and 86.4% of respondents, respectively, wash their hands with soap and water after using the toilet [31, 32]. Sah et al., reported 95.3% of respondents to wash hands with soap and water after defecation [18]. The previous results are almost in accordance with the present study.

The results of the similar type of study conducted at Kenya, Ghana and Bangladesh demonstrates that 44%, 20%, 30% respectively used soap and water for hand washing after defecation [27, 28, 33]. Hand-washing with soap after defecation was practised only 22% of households [21].

In contrast, the study conducted by Vivas et al., in Ethiopia showed only 14.8% respondents wash their hands with soap and water after defecation [12], which is lower than our study. Asekun et al., reported 27.3% of respondents used water for hand washing after defecation [30]. The likelihood of soap practice might be due to the fact that soap is the best material and commonly used to wash hand after defecation.

The result of the present study shows all respondents had brushing habit while 67.78% respondents used brush in their brushing habit, only 33.56% respondents had a daily bathing habit and 20% respondents had washing clothes daily. This might be due to the common practice in the family.

Water is an essential component for life which has no substitute. Regarding preventive measures and treatment of drinking water, the highest number of respondents (96.23%) hadn't done treatment of water before consumption at home, 3.33% had done filtration before consumption, and only 0.44% had done traditional method (boiling) before consumption in present study. 73% of

respondents were not using any method to treat the water in a study conducted by Joshi et al., [34], which is in accord with this study.

This perhaps may be due to unknown about drinking water sources are subject to contamination and require appropriate treatment to remove disease-causing agents. The other possibility could be inadequate knowledge about water purification process by which undesired chemical compounds, organic and inorganic materials, and biological contaminants are removed from the water. The additional perspective might be that they hadn't more practice of household water treatment systems such as filtration systems, water softeners, distillation systems, disinfection and boiling water whereas community water systems such as coagulation and flocculation, sedimentation, filtration, disinfection and water fluoridation [35].

In contrast, a similar study conducted by Wright et al., on consumer preferences for household water treatment products showed 15% of the households used boiling, 26% of them used filtration and less than 1% used chemical treatment for drinking water [36]. This indicates that participants were well known to major disease-causing pathogens that can lurk in the water. *Salmonella*, *Campylobacter*, *Shigella*, *E.coli* 10157:H7, *Cryptosporidium*, norovirus and *Giardia* are common and dangerous water-borne pathogens [37,38]. Nitrates, lead, arsenic, glyphosate, trichloroethylene, tetracycline, heavy metals, radiation poisoning and other chemicals present in water can cause cancer and other serious illnesses [39].

A similar study conducted in Pakistan and India also showed that 14.5% and 14.35% of respondent used boiled water respectively [40, 41] which is not in accord with the present study. The prospect may be that they didn't know the benefits of household boiling water treatment system which can prevent from illness.

In this study, 90% of respondents had the habit of cleaning water carrying vessels on a daily basis. Majority of the respondents washed the water storage vessel with ash, but only 14.56% used detergent. The use of ash for cleaning water vessel to disinfect before reusing is a common practice in rural area due to easy accessibility. But, it is not the appropriate process.

Safe storage and handling of water can reduce health problem significantly. Maximum respondents (94%) had a practice of water storage vessel covered, which is similar to the study conducted by Bhattacharya et al., [21]. Most of the respondents used traditional metallic or earthen covered vessels for storing drinking water in both these studies. This might be due to the common traditional practice in a rural area to prevent dust and keeps water cool even in the harshest of summers.

In this study, one-third of the respondents had a separate kitchen room and used firewood as fuel for cooking. This might be due to the fact that the oldest cooking fuel is firewood in the form of logs and branches from trees. Also, wood fuel is a natural, sustainable, and carbon-efficient source of energy.

Regarding the practice of hand washing in this study, 98.89% respondents had used plain water for washing hands before eating by family members, and only 1.11% used soap and water which is in accord with Vivas et al.,; Reilly et al., and Behera et al., [12, 42, 43]. In contrast to the current study, Shrestha et al., reported 94.4% of respondents used soap and water which was similar to the study of Dajaan et al., [44]. This prospect may be due to the fact that washing hands before eating a meal is a simple and effective method of infection prevention and protection against germs and illness. Other common illnesses which can arise from poor handwashing habits before eating include diarrhoea, laryngitis, coughs, colds, and stomach bugs [45]. Critical hand washing was preferred as the best washing practices.

In this study, only 15.55% of respondents had used soap for washing hands after handling cattle dung. This might be due to less health consciousness and may be unknown that several pathogens

naturally occur in cattle dung and under certain circumstances *Cryptosporidium parvum* and *Giardia lamblia* with respect to transmission to humans may pose health risks [46].

The present study reveals there was a significant association between education and toilet facilities but there was a significant difference between toilet facilities and type of family among community people (p -value > 0.05) which is similar to the study conducted by Karn et al., in Katahari VDC of Morang district [47].

CONCLUSION

This study concludes that knowledge was better, the attitude was good and practice was satisfactory on hygiene and sanitation among the study population. The knowledge, attitude and approach on hygiene and sanitation among the study population was not affected due to family type and religion and but affected due to education level.

The proportion of sanitary practices is lower than the knowledge among respondents. This knowledge and practise gap regarding sanitary behaviour can be minimized or obliterated by giving attention toward practices such as toilet utilization, following hygienic measures, and regular cleaning. Public sensitization through mass media and awareness programs should be carried continually, and the government should make consolidated and integrated efforts towards progressive development of hygiene and sanitation coverage in Province No. 2, Nepal.

LIMITATIONS: This study included a small sample size from the selected district and limited geographical location of Province No. 2. So, the results of the study cannot be generalized, and further research should be continued on a large study population.

ACKNOWLEDGEMENTS :

We are thankful to Dr. Jitendra Kumar Singh, Associate Professor, Department of Community Medicine and Public Health, Janaki Medical College, Ramdaiya for all his co-operation during this research. We also acknowledge all the study participants and HA final year students of Mithila Technical Academy for their enthusiastic participation during this study.

Conflict of Interest : The authors declared there is no conflict of interest regarding the publication of this manuscript.

REFERENCES

1. Murray CJL, Lopez AD. The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020. Cambridge: Harvard University Press; 1996. Available at: http://apps.who.int/iris/bitstream/handle/10665/41864/0965546608_eng.pdf?sequence=1&isAllowed=y
2. Shrestha VM, Manandhar N, Joshi KS. Study on Knowledge and Practices of Water, Sanitation and Hygiene among Secondary School Students. Nepal Journal of College of Medical Sci. 2018; (14)3:160-165.
3. Dwivedi P, Sharma AN. A Study on Environmental Sanitation, Sanitary Habits and Personal Hygiene among the Baigas of Samnapur Block of Dindori District, Madhya Pradesh, Journal of Human Ecol. 2007;(1):7-10.
4. Ahmed MF. South Asian Conference on Sanitation, BCHIMES, (Between Census Household Information, Monitoring and Evaluation System; 2001
5. UNDESA. International decade for "Water for life" 2005-2015. Available from: <https://www.un.org/waterforlifedecade/sanitation.shtml>
6. Thapa M, Sharma AP. Study of Bacteriological Treatment of Water for Rural Communities.

- Nepal Journal of Science and Technology. Royal Nepal; Academy of Science and Technology, Kathmandu.1999; (1):27-33.
7. National Planning Commission. Nepal's Sustainable Development Goals, Baseline Report, 2017. Government of Nepal, National Planning Commission, Kathmandu, Nepal. Available at: [https:// www.npc.gov.np/images/category/](https://www.npc.gov.np/images/category/)
 8. DWSS. Sanitation status of Nepal: Factsheet. Government of Nepal, Ministry of Water Supply and Sanitation. Department of Water Supply and Sewerage (DWSS), Environmental Sanitation Section. 2018.
 9. Budhathoki BC. Water Supply, Sanitation and Hygiene Situation in Nepal: A Review journal of health promotion. 2019; (70):65-76.
 10. Jha K. Evaluating Province 2. Available at: <https://myrepublica.nagariknetwork.com/news/evaluating-province-2/> Published On: March 6, 2019. (Accessed : 21st march, 2020)
 11. Pokhrel D and Viraraghavan T et al., Diarrhoeal diseases in Nepal vis-à-vis water supply & sanitation status J Water & Health. 2004; 2(2):71-81.
 12. Vivas AP, Gelaye B, Abost N, Kumie A, Berhane Y, Williams MA. Knowledge, attitudes and practices (KAP) of hygiene among school children in Angolela, Ethiopia. J prev med hyg. 2010; (51): 73-79.
 13. Scott B, Curtis C, Rabie T. Health in our hands but not in our heads: understanding hygiene motivation in Ghana. Health Policy and Planning. 2007; (22):225-233.
 14. Sibiya EJ and Gumbo RJ. Knowledge, Attitude and Practices (KAP) Survey on Water, Sanitation and Hygiene in Selected Schools in Vhembe District, Limpopo, South Africa. Int J Environ Res Public Health 2013;(10):2282-2295.
 15. Walsh JA and Warren KS. Selective Primary Health Care: An Interim Strategy of Disease Control in Developing Countries. N Eng J Med. 1970; (301):67-74.
 16. Ghose AC. Lessons from cholera & *Vibrio cholerae*. Indian J Med Res. 2011; 133(2):164-170.
 17. World Health Organization. Water Sanitation and Hygiene Links to Health Facts and Figures. Geneva, World Health Organization; 2004. Available from: [http://www. Who. Int/water_sanitation_health/factsfigures2005. pdf](http://www.who.int/water_sanitation_health/factsfigures2005.pdf). (Accessed 6th April 2020)
 18. RB Sah, S Bhattarai, DD Baral, PK Pokharel. Knowledge and practice towards Hygiene and Sanitation Health Renaissance. 2014; 12(1):44-48.
 19. Alpesh Desai, Current Concepts in Dermatology. Available at: https://cdn.ymaws.com/www.aocd.org/resource/resmgr/meeting_resources/2015fallmeeting/FM15SyllabusBook.pdf
 20. Purushothama V. Dasaraju and Chien Liu. Chapter 93 Infections of the Respiratory System. Medical Microbiology. 4th edition Editor: Samuel Baron. 1996. The University of Texas Medical Branch at Galveston.
 21. M Bhattacharya, V Joon, V Jaiswal. Water handling and sanitation practices in rural community of madhya pradesh: a knowledge, attitude and practice study. Indian journal of preventive social medicine. 2011; 42(1):93-97.
 22. Yadav K and Prakash S. Knowledge, Attitude and Practice on Dental Caries and Oral Hygiene among Medical Students at Janaki Medical College Teaching Hospital. International Journal of Medicine & Biomedical Sciences. 2016; 1(2):25-34.
 23. Yadav K and Prakash S. Dental Caries: A Review Asian Journal of Biomedical and Pharmaceutical Sciences, 2016; 6(53):01-07.
 24. Yadav K and Prakash S. Dental Caries: A Microbiological Approach J Clin Infect Dis Pract. 2017; 2(1):1-15.
 25. Sah KR, Sah KP, Sah KJ, Chiluwal S, Shah KS. Assessment of the Knowledge, Attitude and Practice Regarding Water, Sanitation and Hygiene among Mothers of Under-five Children in Rural Households of Saptari District, Nepal American Journal of Public Health Res. 2017; 5(5): 163-169.
 26. Sah BR, Baral DD, Ghimire A, Pokharel PK. Knowledge & practice of water & sanitation application in Chandragadhi VDC of Jhapa District. Health Renaissance. 2013; 11(3):241-245.

27. Herbst S, Benedikter S, Koester U, Phan N, Berger C, Rechenburg A et al. Perceptions of water, sanitation and health: a case study from the Mekong Delta, Vietnam. *Water Sci Technol*. 2009; 60(3): 699-707.
28. Akuamoah Sarfo LA, Peasah AD and Asamoah F. Millennium Development Goal 4 and the knowledge of mothers on the prevention of diarrhea among children under five years. *International Research Journal of Medicine and Medical Sciences*. 2013; 1(3): 80-84.
29. Malik MB, Kumar V, Verma R, Chawla S and Sachdeva S. Knowledge Attitude and Practices Regarding Water Handling and Water Quality Assessment in a Rural Block of Haryana. *International Journal of Basic and Applied Medical Sciences*. 2013; 3(2): 243-247.
30. Esther OA, Olubukola O, et al., Hand Washing: Knowledge, Attitude and Practice amongst Mothers of Under-Five Children in Osogbo, Osun State, Nigeria. *Journal of Biology, Agriculture and Healthcare*. 2014; 4(16): 40-49.
31. Lopez-Quintero C, Freeman P, Neumark Y. Hand washing among school children in Bogota, Colombia. *Am J Public Health*. 2009; (99):94-101
32. Banda K, Sarkar R, Gopal S et al. Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. *Trans R Soc Trop Med Hyg* 2007; (101):1124-30.
33. Luby PS, Halder KA, Huda T, Unicomb L, Johnston BR. The Effect of Hand washing at recommended times with water alone and with soap on child Diarrhea in Rural Bangladesh: An Observational Study. *PLoS Medicine*. 2011; 8(6). Page 1-12.
34. Joshi A, Prasad S, Kasav JB, Segan M, Singh AK. Water and sanitation hygiene knowledge attitude practice in urban slum settings. *Glob J Health Sci*. 2013; (6):23-34.
35. Standard Methods for the Examination of Water and Wastewater, 14th ed. 1976. American Public Health Association, Washington, D.C. 1193 pp.
36. Wright JA, Yang H, Walker K, Pedley S, Elliott J & Gundry SW. The H2S test versus standard indicator bacteria tests for faecal contamination of water: systematic review and meta-analysis. *Tropical Medicine & International Health*. 2012; 17(1):94-105.
37. Ramírez-Castillo FY, Loera-Muro A, Jacques M, et al. Water-borne pathogens: detection methods and challenges. *Pathogens*. 2015; 4(2):307-334.
38. Hunter PR, Chalmers RM, Hughes S, Syed Q. Self-reported diarrhea in a control group: A strong association with reporting of low-pressure events in tap water. *Clin Infect Dis*. 2005; (40):e32-e34.
39. Rana MN, Tangpong J, Rahman MM. Toxicodynamics of Lead, Cadmium, Mercury and Arsenic- induced kidney toxicity and treatment strategy: A mini review. *Toxicol Rep*. 2018; (5): 704-713.
40. Mumtaz Y, Zafar M and Mumtaz Z. Knowledge and Attitude towards and Preventive Practices Relating to Diarrhea among Mothers Under Five Years of Children: Findings of a Cross-Sectional Study in Karachi, Pakistan. *Journal of Infectious Disease Therapy*. 2014; 2(1): 3-6.
41. Bandaa K, Sarkarb R, Gopala S, Govindarajana J, Harijana BB, Jeyakumara BM et al . Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 2007; 1124-1130.
42. O'Reilly CE. The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya, 2006. *Epidemiol Infect*. 2008; 136: 80-91.
43. Behera BK, Jena SK, Shakthipriya AM, Behera AA, Samal S. Hygiene practices among rural school children in Puducherry. *Journal of Evolution of Medical and Dental Sciences*. 2013; 2(24): 4363-4372.
44. Dajaan SD, Addo OH, Ojo L, Amegah EK, Loveland F, Bechala DB, Benjamin BB. Hand washing knowledge and practices among public primary schools in the Kintampo Municipality of Ghana. *Int J Community Med Public Health*. 2018; 5(6): 2205-2216.
45. Available from:
<https://www.lifebuoy.co.za/health/infection-and-prevention/health-and-lifestyles/why-do-we-wash-our-hands-before-eating.html>

46. Daniels ME, Shrivastava A, Smith WA, et al. Cryptosporidium and Giardia in Humans, Domestic Animals, and Village Water Sources in Rural India. *Am J Trop Med Hyg.* 2015; 93(3):596-600.
47. Rajiv Ranjan Karn, Buna Bhandari, and Nilambar Jha. A study on personal hygiene and sanitary practices in a rural village of mornag district of Nepal. *Journal of Nobel Medical College.* 2012; 1(2):39-44.

References

1. Murray CJL, Lopez AD. The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020. Cambridge: Harvard University Press; 1996. Available at: http://apps.who.int/iris/bitstream/handle/10665/41864/0965546608_eng.pdf?sequence=1&isAllowed=y
2. Shrestha VM, Manandhar N, Joshi KS. Study on Knowledge and Practices of Water, Sanitation and Hygiene among Secondary School Students. *Nepal Journal of College of Medical Sci.* 2018; (14)3:160-165.
3. Dwivedi P, Sharma AN. A Study on Environmental Sanitation, Sanitary Habits and Personal Hygiene among the Baigas of Samnapur Block of Dindori District, Madhya Pradesh, *Journal of Human Ecol.* 2007;(1):7-10.
4. Ahmed MF. South Asian Conference on Sanitation, BCHIMES, (Between Census Household Information, Monitoring and Evaluation System; 2001
5. UNDESA. International decade for 'Water for life' 2005-2015. Available from:
6. <https://www.un.org/waterforlifedecade/sanitation.shtml>
7. Thapa M, Sharma AP. Study of Bacteriological Treatment of Water for Rural Communities. *Nepal Journal of Science and Technology.* Royal Nepal; Academy of Science and Technology, Kathmandu.1999; (1):27-33.
8. National Planning Commission. Nepal's Sustainable Development Goals, Baseline Report, 2017. Government of Nepal, National Planning Commission, Kathmandu, Nepal. Available at: [https:// www.npc.gov.np/images/category/](https://www.npc.gov.np/images/category/)
9. DWSS. Sanitation status of Nepal: Factsheet. Government of Nepal, Ministry of Water Supply and Sanitation. Department of Water Supply and Sewerage (DWSS), Environmental Sanitation Section. 2018.
10. Budhathoki BC. Water Supply, Sanitation and Hygiene Situation in Nepal: A Review journal of health promotion. 2019; (70):65-76.
11. Jha K. Evaluating Province 2. Available at: <https://myrepublica.nagariknetwork.com/news/evaluating-province-2/> Published On: March 6, 2019. (Accessed : 21st march, 2020)
12. Pokhrel D and Viraraghavan T et al., Diarrhoeal diseases in Nepal vis-à-vis water supply & sanitation status *J Water & Health.* 2004; 2(2):71-81.
13. Vivas AP, Gelaye B, Abost N, Kumie A, Berhane Y, Williams MA. Knowledge, attitudes and practices (KAP) of hygiene among school children in Angolela, Ethiopia. *J prev med hyg.* 2010; (51): 73-79.
14. Scott B, Curtis C, Rabie T. Health in our hands but not in our heads: understanding hygiene motivation in Ghana. *Health Policy and Planning.* 2007; (22):225-233.
15. Sibiya EJ and Gumbo RJ. Knowledge, Attitude and Practices (KAP) Survey on Water, Sanitation and Hygiene in Selected Schools in Vhembe District, Limpopo, South Africa. *Int J Environ Res Public Health* 2013;(10):2282-2295.
16. Walsh JA and Warren KS. Selective Primary Health Care: An Interim Strategy of Disease Control in Developing Countries. *N Eng J Med.* 1970; (301):67-74.
17. Ghose AC. Lessons from cholera & *Vibrio cholerae*. *Indian J Med Res.* 2011; 133(2):164-170.
18. World Health Organization. Water Sanitation and Hygiene Links to Health Facts and Figures. Geneva, World Health Organization; 2004. Available from: http://www.who.int/water_sanitation_health/factsfigures2005.pdf. (Accessed 6th April 2020)
19. RB Sah, S Bhattarai, DD Baral, PK Pokharel. Knowledge and practice towards Hygiene and

- Sanitation Health Renaissance. 2014; 12(1):44-48.
20. Alpesh Desai, Current Concepts in Dermatology. Available at: https://cdn.ymaws.com/www.aocd.org/resource/resmgr/meeting_resources/2015fallmeeting/FM15SyllabusBook.pdf
 21. Purushothama V. Dasaraju and Chien Liu. Chapter 93 Infections of the Respiratory System. Medical Microbiology. 4th edition Editor: Samuel Baron. 1996. The University of Texas Medical Branch at Galveston.
 22. M Bhattacharya, V Joon, V Jaiswal. Water handling and sanitation practices in rural community of madhya pradesh: a knowledge, attitude and practice study. Indian journal of preventive social medicine. 2011; 42(1):93-97.
 23. Yadav K and Prakash S. Knowledge, Attitude and Practice on Dental Caries and Oral Hygiene among Medical Students at Janaki Medical College Teaching Hospital. International Journal of Medicine & Biomedical Sciences. 2016; 1(2):25-34.
 24. Yadav K and Prakash S. Dental Caries: A Review Asian Journal of Biomedical and Pharmaceutical Sciences, 2016; 6(53):01-07.
 25. Yadav K and Prakash S. Dental Caries: A Microbiological Approach J Clin Infect Dis Pract. 2017; 2(1):1-15.
 26. Sah KR, Sah KP, Sah KJ, Chiluwal S, Shah KS. Assessment of the Knowledge, Attitude and Practice Regarding Water, Sanitation and Hygiene among Mothers of Under-five Children in Rural Households of Saptari District, Nepal American Journal of Public Health Res. 2017; 5(5): 163-169.
 27. Sah BR, Baral DD, Ghimire A, Pokharel PK. Knowledge & practice of water & sanitation application in Chandragadhi VDC of Jhapa District. Health Renaissance. 2013; 11(3):241-245.
 28. Herbst S, Benedikter S, Koester U, Phan N, Berger C, Rechenburg A et al. Perceptions of water, sanitation and health: a case study from the Mekong Delta, Vietnam. Water Sci Technol. 2009; 60(3): 699-707.
 29. Akuamoah Sarfo LA, Peasah AD and Asamoah F. Millennium Development Goal 4 and the knowledge of mothers on the prevention of diarrhea among children under five years. International Research Journal of Medicine and Medical Sciences. 2013; 1(3): 80-84.
 30. Malik MB, Kumar V, Verma R, Chawla S and Sachdeva S. Knowledge Attitude and Practices Regarding Water Handling and Water Quality Assessment in a Rural Block of Haryana. International Journal of Basic and Applied Medical Sciences. 2013; 3(2): 243-247.
 31. Esther OA, Olubukola O, et al., Hand Washing: Knowledge, Attitude and Practice amongst Mothers of Under-Five Children in Osogbo, Osun State, Nigeria. Journal of Biology, Agriculture and Healthcare. 2014; 4(16): 40-49.
 32. Lopez-Quintero C, Freeman P, Neumark Y. Hand washing among school children in Bogota, Colombia. Am J Public Health. 2009; (99):94-101
 33. Banda K, Sarkar R, Gopal S et al. Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. Trans R Soc Trop Med Hyg 2007; (101):1124-30.
 34. Luby PS, Halder KA, Huda T, Unicomb L, Johnston BR. The Effect of Hand washing at recommended times with water alone and with soap on child Diarrhea in Rural Bangladesh: An Observational Study. PLoS Medicine. 2011; 8(6). Page 1-12.
 35. Joshi A, Prasad S, Kasav JB, Segan M, Singh AK. Water and sanitation hygiene knowledge attitude practice in urban slum settings. Glob J Health Sci. 2013; (6):23-34.
 36. Standard Methods for the Examination of Water and Wastewater, 14th ed. 1976. American Public Health Association, Washington, D.C. 1193 pp.
 37. Wright JA, Yang H, Walker K, Pedley S, Elliott J & Gundry SW. The H2S test versus standard indicator bacteria tests for faecal contamination of water: systematic review and meta-analysis. Tropical Medicine & International Health. 2012; 17(1):94-105.
 38. Ramírez-Castillo FY, Loera-Muro A, Jacques M, et al. Waterborne pathogens: detection methods and challenges. Pathogens. 2015; 4(2):307-334.
 39. Hunter PR, Chalmers RM, Hughes S, Syed Q. Self-reported diarrhea in a control group: A strong association with reporting of low-pressure events in tap water. Clin Infect Dis. 2005; (40):e32-e34.

40. Rana MN, Tangpong J, Rahman MM. Toxicodynamics of Lead, Cadmium, Mercury and Arsenic- induced kidney toxicity and treatment strategy: A mini review. *Toxicol Rep.* 2018; (5): 704-713.
41. Mumtaz Y, Zafar M and Mumtaz Z. Knowledge and Attitude towards and Preventive Practices Relating to Diarrhea among Mothers Under Five Years of Children: Findings of a Cross-Sectional Study in Karachi, Pakistan. *Journal of Infectious Disease Therapy.* 2014; 2(1): 3-6.
42. Bandaa K, Sarkarb R, Gopala S, Govindarajana J, Harijana BB, Jeyakumara BM et al . Water handling, sanitation and defecation practices in rural southern India: a knowledge, attitudes and practices study. *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 2007; 1124-1130.
43. O'Reilly CE. The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya, 2006. *Epidemiol Infect.* 2008; 136: 80-91.
44. Behera BK, Jena SK, Shakthipriya AM, Behera AA, Samal S. Hygiene practices among rural school children in Puducherry. *Journal of Evolution of Medical and Dental Sciences.* 2013; 2(24): 4363-4372.
45. Dajaan SD, Addo OH, Ojo L, Amegah EK, Loveland F, Bechala DB, Benjamin BB. Hand washing knowledge and practices among public primary schools in the Kintampo Municipality of Ghana. *Int J Community Med Public Health.* 2018; 5(6): 2205-2216.
46. Available from: <https://www.lifebuoy.co.za/health/infection-and-prevention/health-and-lifestyles/why-do-we-wash-our-hands-before-eating.html>
47. Daniels ME, Shrivastava A, Smith WA, et al. Cryptosporidium and Giardia in Humans, Domestic Animals, and Village Water Sources in Rural India. *Am J Trop Med Hyg.* 2015; 93(3):596-600.
48. Rajiv Ranjan Karn, Buna Bhandari, and Nilambar Jha. A study on personal hygiene and sanitary practices in a rural village of mornag district of Nepal. *Journal of Nobel Medical College.* 2012; 1(2):39-44.