Water, sanitation, and hygiene (WaSH) practices among people living with HIV/AIDS (PLHA) – need to relook, in the era of COVID-19 pandemic

Kasi Viswanath¹, Ravishekar N. Hiremath¹, Manjunath SR¹, DB Kadam², Rishi Raj³, Smita M Nimbannavar⁴, Mahesh Krishna Kulkarni⁵

¹Department of Community Medicine, AFMS, New Delhi, ²Department of Medicine (Retd), BJ Medical College, Pune, Maharashtra, ³Department of Medical Informatics, AFMS, New Delhi, ⁴Department of Community Medicine, Koppal Institute of Medical Sciences, ⁵Department of Aviation Medicine, AFMS, New Delhi, India

Abstract

Background: Water, sanitation, and hygiene (WaSH) practices always have been neglected among HIV/AIDS (Human immunodeficiency virus/ Acquired immunodeficiency syndrome) programs, even when HIV and WaSH services have robust bearing on each other. With COVID-19 pandemic on the go, it is utmost necessary for the people living with HIV/AIDS (PLHA) to ensure adequate WaSH practices. Objective: This study was carried out with an objective to assess baseline WaSH practices among PLHA and to find out if any association between nutritional status and WaSH parameters so as to identify the shortcomings and highlight the importance of WaSH practices among PLHAs and give suitable recommendations to program managers. Methodology: A cross-sectional study was carried out among PLHA registered in ART centres of western Maharashtra. A sample size of 378 consented to be part of the study were included in the study, by means of systematic random sampling. Data were collected by means of pretested questionnaire prepared from guidelines and previous studies. Institutional ethical clearance was obtained and informed consent was taken from study participants before data collection. Strict confidentiality was maintained throughout the study period. Results: When asked about the water processing method, 76% of them told they do not treat/process the water supplied to them. In contrast, only a few PLHA told they would filter (17%), boil (7%), and use aquaguard (1%). The majority (67%) had their latrines, and while 29% of them were using public latrines and its hygienic sanitation was a concern for them and 4% were still practising open-air defecation in rural areas. Almost all study participants were handwashing after toilet use and handwashing before consuming food. The majority (79%) told they used soap and water, while 20% were using only water, soil and water (1%) and ash and water (1%) which was a concern. Of all the households, 87% cooked their food twice and consumed it thrice a day, while 4% prepared thrice. 10% of them cooked only once and consumed thrice a day; 56% practised consumption of leftover food of the previous night which was a concern. A majority (54%) did not consume street food while remaining said that they used to consume street food. But majority (39%) said they did not follow the habit of checking hygiene or sanitation of hotel where they used to consume food while the remaining 41% did not check the hotel before ordering the food; 50% of them bought packaged milk while 40.9% brought from unpasteurized dairy. On analysis, hygiene and sanitation factors had no statistically significant association with the nutritional status of study participants. Conclusion: WaSH factors act synergistically with other factors to affect the holistic health of PLHA. Information, Education and Communication (IEC) activities (continuous and regular), that focus on improving awareness level on WaSH practices, need to be promoted and integrated into HIV program, including providing basic care packages to PLHA like household water treatment products and soap, etc., Such measures will go a long way in maintaining health of PLHA even during ongoing COVID-19 pandemic scenario.

Keywords: HIV/AIDS, hygiene, sanitation, water
**Introduction**

Water, sanitation, and hygiene (WaSH) practices always have been neglected among HIV/AIDS programs thinking HIV is not a water-borne disease nor it spreads by poor hygiene-related diseases like diarrhea, cholera, typhoid, etc., thus having no direct link with HIV. HIV/AIDS is an immune-compromised state where in chances of getting opportunistic infections through water and food are very high. It is estimated that diarrhoea rates are 2–6 times and persistent diarrhea two times higher among PLHA than in HIV negative persons. These opportunistic infections degrade the quality of life (QOL) and make the life miserable for PLHA. Therefore, access to good quantity and quality of water, sanitation (proper handling and disposal of all hazardous wastes) and good hygiene practices, especially handwashing in particular, are a must for PLHA to lead a good QOL so that they are protected from common source of opportunistic infections. While developed countries have started to integrate WaSH practices into HIV/AIDS program, at the same time most of the developing countries are yet to integrate. At the household level, adequate WaSH practices have broader socioeconomic impacts. Accordingly when PLHA become bedridden, fragile and incapacitated, they require effective WaSH practices because these practices involve frequent washing of infected linen, clothes, clean hygienic environment, proper segregation, and safe disposal of human wastes including faeces, urine, menstrual blood, sweat, wastewater, and sewage drainage system. It involves effective mosquito and flies control measures too. Handwashing is also very essential for PLHA as handwashing is most appropriately known as “Do it Yourself Vaccine” and has been effective in reducing the diarrhoea incidence to less than 42–44% if practised effectively.

Despite evidence of priority link between HIV and WaSH practices, most countries have not integrated HIV and WaSH practices in HIV programs. In a study carried out by Yallew et al., 67% of PLHA households had poor hygiene practices. There were significant associations between water status and diarrhoea, sanitation status with education and latrine availability, hygiene practice with hand washing machine availability and economic reasons. Even as latest as 2020, a study conducted by Tessema et al. showed that only 68% of PLHA had good hygiene practices, only 37% had basic water facilities, only 58% of them acquired recommended quantity of safe water for drinking. The authors also analyzed the adjusted prevalence ratio, where two-week prevalence of diarrhoea was less by 8%, 7% and 5% in PLHA who practiced good hygiene, washed their hands with soap and consistently used sanitation facility. The authors have asked for effective integration of adequate WaSH services to HIV/AIDS program to increase QOL of PLHA.

**PLHA essential hygiene practices**

Water hygiene and handwashing – Both good quality and adequate quantity of water is essential for PLHA hygiene. At some places, especially in rural areas, the required quantity nor quality of water is not available making PLHA vulnerable to waterborne and hygiene-related illnesses. Public water should be treated with affordable techniques like water chlorination, filtration, proper boiling, solar disinfection, and reverse osmosis/ultraviolet radiation. Boiling is the most used, while variety agents can be used for chlorination like bleaching powder, calcium hypochlorite in terms of powder, liquid, or gas. Latently solar disinfection is coming up very well which uses ultraviolet A radiation which is abundantly available, and it does not affect the taste, color, or odour of water as chlorination does. Handwashing too, is the most important for PLHA, which helps him to prevent contracting various food and waterborne disease, including respiratory illness. PLHA should be aware of steps of handwashing, methods of handwashing, timing, and frequent routine indications of handwashing for effective control.

Sanitation Hygiene – Ideal sanitation setup for PLHA would be the infrastructure with safe, reliable, easily accessible, clean, private, weather protected, ventilation adequate, minimum smells, and minimized the risk of spreading the sanitation-related diseases. Hygiene sanitation ideally required proper segregation and handling, disposal of human excreta including faces, urine, menstrual blood and sweat, efficient management of wastes like wastewater, sewage and hazardous wastes and prevention and control of vectors such as mosquito, flies, etc.

Makaudze et al., in his research, supported by the Water Research Commission in South Africa, demonstrated perceptions of PLHA WaSH practices in three different regions representing...
rural, peri-urban, and urban slums. The study showed, 34% use to wash their body regularly, 32.2% wash their hands before eating, and <10% use to wash hands after toilet use and showed severe lack of awareness during critical times in slum areas. The results showed lack of enough knowledge on handwashing practices and lack of knowledge on the extent of vulnerability to opportunistic infections by PLHA.

Makaudze et al., introduced a new 90-90-90 water-sanitation-hygiene indicator scoreboard like UNAIDS 90-90-90 ambitious targets to end the epidemic of AIDS. The new 90-90-90 water-sanitation-hygiene indicator interprets as 90% of the population have access to clean water, 90% of them use safe sanitation and 90% have hand washing facilities with soap and water in the premises. With COVID-19 pandemic on the go, it is utmost necessary for the PLHA to ensure adequate WaSH practices. Governments at all levels should take steps to integrate all these WaSH interventions into HIV/AIDS programs, because its high time considering COVID-19 pandemic and PLHA are known to get more infections compared to HIV negative, being in immunocompromised state.

Family physicians and primary care physicians are the grass root workers who can always guide PLHAs about importance of WaSH practices. This study was thus carried out to give valuable information to primary care physicians, which they can watch out for proper monitoring of PLHAs with an objective to assess baseline WaSH practices among PLHA and to find out if any association between nutritional status and WaSH parameters so as to identify the shortcomings and highlight the importance of WaSH practices among PLHAs.

**Methodology**

A cross-sectional study was carried out among PLHA registered in ART centres of western Maharashtra. With assumption of 50% of PLHA practicing good WaSH practices for maximum sample size, with type I error of 5% and error of margin 5%, the sample size worked out to be 375, since 378 consented to be part of the study, all were included in the study, by means of systematic random sampling. Data were collected by means of pretested questionnaire prepared from guidelines and previous studies. Height and weight were measured by means of ISAK Standards and body mass index was calculated. Data were entered in excel sheet and analysis was carried out by Epi Info version 7.0. Institutional ethical clearance was obtained and informed consent was taken from study participants before data collection. Strict confidentiality was maintained throughout the study period.

**Results**

**Water usage**

Sociodemographic profile of study subjects is shown in [Table 1, Figure 1 and Figure 2]. Access to good quality of water in good quantity is a must for all PLHA. Our study participants said none of them faced any deficiency of water in terms of quantity or in terms of quality. When asked about the water processing method, 75.9% of them told they do not treat/process the water supplied to them. In contrast, only a few PLHA told they would filter (16.9%), boil (6.6%), and use aquaguard (0.5%) [Table 2]. These results show the risk faced by our study participants by drinking water without any filtration/UV radiation in turn leading them to several waterborne diseases.

**Sanitation practices**

Safe disposal of faeces is one of the most important aspects of sanitation. Accordingly, HIV/AIDS programs should support

---

**Table 1: Sociodemographic profile of study subjects**

| Sociodemographic variables | Frequency (n=378) | Percentage |
|----------------------------|------------------|------------|
| Age category               |                  |            |
| <25 years                  | 24               | 6.3        |
| 26-35 years                | 89               | 23.5       |
| 36-50 years                | 193              | 51.1       |
| 50-60 years                | 46               | 12.2       |
| >60 years                  | 26               | 6.9        |
| Education category         |                  |            |
| Illiterate                 | 80               | 21.2       |
| Up to 10th standard        | 69               | 18.3       |
| 11th and 12th standard     | 169              | 44.7       |
| Graduate and above         | 60               | 15.9       |
| Individual income category |                  |            |
| (Per month, figures in rupees) |          |            |
| Zero                       | 119              | 31.5       |
| <5000                      | 118              | 31.2       |
| 5001-10000                 | 98               | 25.9       |
| 10001-15000                | 21               | 5.6        |
| 15001-20000                | 6                | 1.6        |
| >20000                     | 16               | 4.2        |
| Per-capita category (Based on family income, Modified BG Prasad Scale - Jan 2018) | | |
| Upper class                | 36               | 9.52       |
| Upper-middle class         | 89               | 23.5       |
| Middle class               | 116              | 30.6       |
| Lower-middle class         | 93               | 24.6       |
| Lower class                | 44               | 11.6       |
| Job category               |                  |            |
| Heavy (Construction/agriculture) | 123 | 32.5   |
| Salaried                   | 35               | 9.3        |
| Business                   | 43               | 11.4       |
| Unemployed                 | 114              | 30.2       |
| Driver                     | 28               | 7.4        |
| Others                     | 35               | 9.3        |
| Family                     |                  |            |
| Joint                      | 102              | 27.0       |
| Nuclear                    | 276              | 73.0       |
| Religion                   |                  |            |
| Hindu                      | 363              | 96.0       |
| Muslim                     | 15               | 4.0        |
| Marital status             |                  |            |
| Married                    | 249              | 65.9       |
| Separated                  | 20               | 5.3        |
| Single                     | 27               | 7.1        |
| Widow                      | 82               | 21.7       |

Cooking, food consumption, and WaSH (Water, sanitation, and hygiene) practices
Table 2: WaSH practices of study subjects

| Frequency | Percentage |
|-----------|------------|
| Aquaguard | 2          | 0.5        |
| Boil      | 25         | 6.6        |
| Filter    | 64         | 16.9       |
| Water used without any pretreatment | 287 | 75.9 |

Table 3: Nutritional status of study subjects

| BMI category (Asians classification) | Frequency (n=378) | Percentage |
|-------------------------------------|-------------------|------------|
| Underweight (BMI <18.5)             | 132               | 34.9       |
| Normal (BMI 18.5-22.9)              | 127               | 33.6       |
| At risk (Overweight), BMI 23-24.9   | 53                | 14.0       |
| Obese (BMI >25)                     | 66                | 17.5       |

Discussion

Viswanath, et al.: The perceptions and acceptance of vaccination among health care workers

Table 2: WaSH practices of study subjects

| Frequency | Percentage |
|-----------|------------|
| Aquaguard | 2          | 0.5        |
| Boil      | 25         | 6.6        |
| Filter    | 64         | 16.9       |
| Water used without any pretreatment | 287 | 75.9 |

Table 3: Nutritional status of study subjects

| BMI category (Asians classification) | Frequency (n=378) | Percentage |
|-------------------------------------|-------------------|------------|
| Underweight (BMI <18.5)             | 132               | 34.9       |
| Normal (BMI 18.5-22.9)              | 127               | 33.6       |
| At risk (Overweight), BMI 23-24.9   | 53                | 14.0       |
| Obese (BMI >25)                     | 66                | 17.5       |

Good sanitation practices as water and foodborne infections can further deteriorate PLHA health. It is also essential that PLHA who do not have bowel control should be aware of safe handling and disposal of defeces in hospital and community setting. In our study, the majority (67%) had their latrines, and while 29% of them were using public latrines and its hygienic sanitation was a concern for them and 4% were still practising open-air defecation in rural areas, which is a risk for them and the community.

Handwashing

Handwashing as often called as Do-It your vaccine for preventing many water and foodborne diseases is an important determinant for PLHA to prevent opportunistic infections and maintain their QOL. Various studies have shown beneficial effects of handwashing in reducing/or occurrence of infections/diarrheal episodes. In our study, almost all study participants were handwashing after toilet use and handwashing before consuming food. However, when asked about the materials used for handwashing, the majority (79%) told they used soap and water, while 20% were using only water, soil and water (1%) and ash and water (1%) which was a concern.

Cooking practices

Good cooking and storing food practices helps PLHA households to increase the nutritional quality of their food as well as prevent food and waterborne diseases. Nutritional status of study subjects are shown in [Table 3]. In our study, 87% of households cooked their food twice and consumed it thrice a day, while 4% prepared thrice; 10% of them cooked only once and consumed thrice a day which may affect the health of individual if not stored properly or temperature is not maintained. One positive practice observed by almost all was, they kept food covered after preparing.

Food consumption practices

These are of vital importance both while eating outside the house as well as inside. Usually, consumption of leftover food of the previous night is the practice in rural households, but consuming overnight food is of high risk for PLHA since the chances of it getting contamination and rotten is very high. Although 87% of PLHA cooked fresh food twice daily, 56% practised consumption of leftover food of the previous night which was a concern. A majority (54%) did not consume street food while remaining said that they used to consume street food. But majority (59%) said they did not follow the habit of checking hygiene or sanitation of hotel where they used to consume food while the remaining 41% did not check the hotel before ordering the food [Table 4]. Although being of a high biological value, milk simultaneously is a potential substrate for developing microorganisms if not appropriately treated. Therefore, the source of milk and its processing plays an important role, especially among PLHA. In our study, the majority (50%) bought packaged milk while 40.9% brought from unpasteurized dairy. However, 91% said that they boiled milk before consumption and there is a need for remaining to educate about using pasteurized and boiling of milk before consumption.

Discussion

To maintain the dignity of PLHA health and life, WaSH practices are very much essential. Some of the WaSH parameters in our study showed alarming practices which needed to be changed. The most important factor, which would have an impact, is the awareness of the individual and the households regarding the good practices, although social and cultural factors do influence the practices. These practices are the “Art of preserving life” in this century where in communicable diseases are at high, especially in developing nations. With the COVID-19 pandemic, and in water and foodborne endemic disease areas, these WaSH and cooking, food consumption practices would play a significant role in maintaining the nutritional status of PLHA and thus affecting the QOL. So, these factors should not be neglected and should be integrated into HIV programs for synergistic benefit.

In India, we could find only a few articles focusing on WaSH practices among PLHA. As per da Cunha et al., after integrative review of the literature found only 16 articles published on these practices which include eight in European countries, two in Brazil, five in the United States, and only one in India, emphasizing the need for in-depth research and integration of these practices in the HIV/AIDS program. Various articles across the world from time to time have highlighted the importance of handwashing before eating food and after defecation, avoid eating...
outside home with questionable cleanliness,\textsuperscript{[10]} use water filtered, boiled or after chlorination,\textsuperscript{[13,14,16‑18]} food not to be kept open for longer duration (>2 hrs),\textsuperscript{[16]} not to consume unpasteurized or unprocessed raw milk,\textsuperscript{[16,19]} avoid eating food from street vendors\textsuperscript{[1,17]} and have own household sewage system.\textsuperscript{[1,14,18]} All these factors play a very significant role in HIV/AIDS patients who are already immunocompromised and have high chances of opportunistic infections getting through.

The multiple logistic regression model was used to assess association between WaSH parameters and nutritional status. On analysis, hygiene and sanitation factors had no statistically significant association with the nutritional status of study participants. However, all these aspects play an essential role on nutritional status of PLHA and act synergistically in improving QOL and thereby reduce chances of opportunistic infections especially in PLHA with reduced CD4 count and increased viral load.

Schilling et al.,\textsuperscript{[20]} in 2018 showed findings of no statistical association of WaSH practices between HIV positive and HIV negative persons. However, there was an association between HIV positive with known HIV status of fewer than 30 days duration and more than 30 days duration, emphasising that people with known HIV status for more than 30 days followed effective water treatment methods and storage techniques. The authors here tried to see the effectiveness of HIV program promoting positive WaSH practices and behaviour among PLHA in Kenya which they have started. Authors in this study also discussed how they have implemented the WaSH practices so effectively, firstly, by stringent pre and post-test counselling toward WaSH practice. Secondly, by integrating WaSH practices into HIV program including providing basic care packages to PLHA\textsuperscript{[21‑23]} like household water treatment products and soap through local Non-governmental organisations (NGOs). However, in our setup, still PLHA has not given much importance to WaSH practices, and there is a need to incorporate and integrate various measures into our programs so that nutritional status and QOL of LHAAs are maintained.

In another study carried out by Yallew et al.,\textsuperscript{[7]} in Ethiopia, 67% of households had unimproved sanitation status, 52% of them had poor hygiene practices, and 43% had unimproved water status when they studied about WaSH practices among the PLHA in-home care system. They also found statistically significant findings of diarrhoea with water status, education, and presence of latrine with sanitation status, hand Washing device presence, and economic reasons for soap affordability with hygiene practices. The authors concluded education and economic factors improvement for better WaSH practices among PLHA which our study participants are also in need, and HIV programs should include measures to improve these factors.

**HIV/AIDS programs – WaSH interventions**

After an extensive literature review, there is lots of information lacking concerning WaSH practices within the HIV/AIDS program. However, few countries tried to implement WaSH interventions suggested in the HIV/AIDS program. But a significant reason for non-implementation was the non-availability of enough funds. Quintanilla et al., discussed in his article\textsuperscript{[29]} about the three key WaSH interventions which could be integrated into Sub-Saharan Africa regions. Following interventions can be included in HIV programs.

Drinking water treatment interventions such as distribution of water treatment solutions (chlorine products), sand or ceramic filters, storage receptacles, training on solar disinfection of water, and educational or health promotional campaigns on household treatment and safe storage of water. Improved access to water supply is also a necessary intervention which includes focusing on upgrading the source of water like construction of wells, rainwater harvesting, and others.

Hand Washing interventions which can be suggested are distribution of soaps, tippy taps, constructions, and demonstrations of tippy-taps (handsfree device to hand WaSH in areas where there is no running water), social marketing campaigns promoting hand Washing with soap and demonstrations of hand Washing with soap.

Sanitation interventions – Distributions of materials needed for latrine constructions, social marketing campaigns through sanitation promotions, subsidizing the cost of latrine building materials, sensitization and health education on disposal techniques for menstrual blood, modifications of latrines with railing and ropes for PLHA with weak stamina, and ramps constructions to facilitate latrine access.
Conclusion

Although most PLHA still practice poor cooking/eating habits, consume unpasteurized milk from dairy (41%), consume raw water (76%), and do not use soap (22%) for handwashing, no statistical significance with nutritional status was observed on bivariate analysis. However, it is to be noted that all aforementioned factors act synergistically with other factors to affect the holistic health of PLHA. IEC activities (continuous and regular) that focus on improving awareness level on WaSH practices, need to be promoted and integrated into the HIV program, including providing basic care packages to PLHA like household water treatment products, soap, etc.

WaSH practices and strong health campaigns to be integrated in HIV/AIDS programs and improvement in hygiene practices which would provide “Nightingales moment” to PLHA. Such measures will go a long way in maintaining health of PLHA even during ongoing COVID-19 pandemic scenario.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Lule JR, Mermin J, Ekwaru JP, Malamba S, Downing R, Ransom R, et al. Effect of home-based water chlorination and safe storage on diarrhea among persons with human immunodeficiency virus in Uganda. Am J Trop Med Hyg 2005;73:926-33.

2. World Health Organisation. How to Integrate Water, Sanitation and Hygiene into HIV Programs. Geneva: WHO Press. 2010. Available from: https://www.who.int/water_sanitation_health/publications/9789241548014/en/. [Last accessed on 2021 Jan 01].

3. UN water. United Nations. Available from: https://www.unwater.org/water-facts/water-sanitation-and-hygiene/. [Last accessed on 2021 Jan 01].

4. Grafton Q, Daniell A, Nauges C, Rinaudo J, Chan W. Understanding and managing urban water in transition, 2015, Springer, pp.1-30, 2015. Available from: https://hal.archives-ouvertes.fr/hal-01290502/file/Chap%201%20-%20Daniell%20et%20al%20DIFFUSE.pdf. [Last accessed on 2022 Jan 01].

5. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: A systematic review. Lancet Infect Dis 2003;3:275-81.

6. Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung ICH, Schmidt W. Water, sanitation and hygiene for the prevention of diarrhoea. Int J Epidemiol 2010;39:i193-205.

7. Yallew WW, Terefe MW, Herchline TE, Sharma HR, Bitew BD, Kifle MW, et al. Assessment of water, sanitation, and hygiene practice and associated factors among people living with HIV/AIDS home based care services in Gondar city, Ethiopia. BMC Public Health 2012;12:1057. doi: 10.1186/1471-2458-12-1057.

8. Tessema RA, Alemu BM. Adequacy of improved sources of drinking water, sanitation, and hygiene practice for the reduction of diarrheal disease among people living with HIV/AIDS, Harar region, Ethiopia. HIV AIDS (Auckl) 2021;13:1-11. doi: 10.2147/HIV.S286976.

9. Makaudze EM. Understanding the hygiene needs of people living with HIV and AIDS in Southern African developing community (SADC) countries. In: Potgieter N, Hoffman A, N.T, editors. The Relevance of Hygiene to Health in Developing Countries [Internet]. London: IntechOpen; 2019. Available from: https://www.intechopen.com/chapters/63180. [Last accessed on 2022 Jan 01].

10. Hiremath RN, Kotwal A, Kunte R, Hiremath SV, Venkatesh. Hand washing with soap: The most effective “do-it-yourself” vaccine? Natl J Community Med 2012;3:551-4.

11. Leite LHM, Waissmann W. Enteroparasitoses em pacientes ambulatoriais portadores de HIV/AIDS e abastecimento domiciliar de água. Rev Cienc Med 2004;13:363-9.

12. da Cunha GH, de Araujo TL, Lima FE, Cavalcante TF, Galvão MT. Práticas de higiene para pacientes com HIV/AIDS [Hygiene practices for patients with HIV/AIDS]. Rev Gaucha Enferm. 2014;35:137-144.

13. Gould DJ, Moralejo D, Drey N, Chudleigh JH, Taljaard M. Interventions to improve hand hygiene compliance in patient care. Cochrane Database Syst Rev 2017;9:CD005186.

14. Abubakar I, Aliyu SH, Arumugam C, Hunter PR, Usman NK. Prevention and treatment of cryptosporidiosis in immunocompromised patients. Cochrane Database Syst Rev 2007;CD004932.

15. Ejemot-Nwadiaro RI, Ehiri JE, Arikpo D, Meremikwu MM, Critchley JA. Hand washing promotion for preventing diarrhoea. Cochrane Database Syst Rev 2015;2015: CD004265.

16. Leite LH, Waissmann W, Veggi AB. Reprodutibilidade de um questionário para avaliação de conhecimentos, percepções e práticas em segurança sanitária alimentar de portadores de HIV/AIDS ambulatoriais. Cad Saúde Pública 2007;23:971-6.

17. Clasen T, Roberts I, Rabie T, Schmidt W, Cairncross S. Interventions to improve water quality for preventing diarrhea. Cochrane Database Syst Rev 2006;CD004794.

18. Mugambe RK, Tumwesigye NM, Larkan F. Barriers to accessing water, sanitation and hygiene among people living with HIV/AIDS in Gomba and Mpigi districts in Uganda: A qualitative study. J Public Health 2013;21:29-37.

19. Hoffman EW, Bergmann V, Shultz JA, Kendall P, Medeiros LC, Hillers VN. Application of a five-step message development model for food safety education materials targeting people with HIV/AIDS. J Am Diet Assoc 2005;105:1397-604.

20. Schilling KA, Awuor AO, Rajasingham A, Moke F, Omore R, Amollo M, et al. Water, sanitation, and hygiene characteristics among HIV-positive households participating in the global enteric multicenter study in rural Western Kenya, 2008-2012. Am J Trop Med Hyg 2018;99:905-15.

21. World Health Organization. Priority Interventions HIV/AIDS Prevention, Treatment and Care in the Health Sector. Geneva, Switzerland: 2010. Available from: https://www.who.int/hiv/pub/priority_interventions_web.pdf. [Last accessed on 2021 Jan 01].

22. The U.S. President’s Emergency Plan for AIDS Relief Program. Five-Year Strategy Annex: PEPFAR and Prevention, Care, and Treatment. Washington, DC: PEPFAR; 2009. Available from:
https://reliefweb.int/sites/reliefweb.int/files/resources/9593100C2D6946D84925768300116EC9-PEPFAR_Dec2009.pdf. [Last accessed on 2021 Jan 01].

23. Colindres P, Mermin J, Ezati E, Kambabazi S, Buyungo P, Sekabembe L, et al. Utilization of a basic care and prevention package by HIV-infected persons in Uganda. AIDS Care 2008;20:139-45.

24. Quintanilla WE, Graham JP. Integration of WASH interventions into HIV/AIDS programmes in Sub-Saharan Africa. Waterlines 2014;32:168-86.