Handwashing Station in Nepal: Role of Wealth Status in Establishing a Handwashing Station at Home

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Abstract

Handwashing is effective at preventing several infectious diseases. The study aims to find out the role of wealth status in establishing handwashing stations in the households of Nepal. This study used secondary data from Nepal Demographic Health Survey (NDHS) 2016 to assess the association between households' wealth status to handwashing stations. The findings displayed significant association between age of the household head, residence place, ecological zone, province, wealth status, having of mosquito net, having a radio, and TV at respondents household to fixed handwashing stations at their households at p=<0.001 level. Wealth status has significant effect on fixed handwashing stations adjusted odds ratio (aOR) =12.699; 95% confidence interval (CI) =10.120-15.935, p=<0.001, in the households. The households with poorest wealth status (aOR=9.718; 95% CI=7.387-12.785, p=<0.001), mountain ecological zone (aOR=1.325, 95% CI=1.098-1.599, p=<0.01), Madhesh province (aOR=2.967, 95% CI= 2.405-3.658, p=<0.001), were significant predictors for not having fixed handwashing stations even after inclusion of socio-covariates. Correspondingly, presence of mosquito net (aOR=.795; 95% CI=.692-.913, p=<0.01), presence of a radio (aOR=.758; 95% CI=.671-.857, p=<0.001), and presence of a TV (aOR=.762; 95% CI=.667-.871, p=<0.001) had significant effect on fixed handwashing stations at their households even after inclusion of socio-covariates. The study found households with the poorest wealth quintiles, mountain ecological zone, Madhesh, and Karnali province had low fixed handwashing stations. The study suggests more leading interventions to improve public health in this region.

Keywords: Handwashing station, wealth status, household, Nepal

Introduction

Handwashing refers to the act or process of cleaning one's hands to remove soil, grease, microorganisms, or other unwanted substances Public Health Agency of Canada (PHAC, 2012). It further asserts washing hands with water and ash or water and soap (antimicrobial or non-antimicrobial) or applying an alcohol based hand sanitizer to the hands (Sharma et al., 2021). It has also been recognized as one of the most cost-effective health interventions to reduce the burden of disease (Bartram & Cairncross, 2010). It is one of the most effective processes that consider the key measure to trim down the potential transmission of infection through contact to persons and things.

With the COVID-19 pandemic, the importance of handwashing is strongly advocated by health promoters across the globe because COVID-19 mainly transmits among people through direct (close contact with infected people) and indirect (contaminated objects or surfaces) via mouth and nose secretions. So, washing hands with soap and running water is of critical importance. To stop the spread of ongoing pandemics and encourage appropriate hygiene, the practice of handwashing at regular intervals is beneficial, after coughing or sneezing, when caring for the sick, after using the toilet, before eating, while preparing food and after handling animals or animal waste. Furthermore, handwashing after touching common surfaces such as doorknobs or handles or after visiting a public place will help keep ourselves and others around us safe.

COVID-19, a respiratory infectious disease caused by SARS-CoV-2, is now a major global health crisis (Walker et al., 2020); (Cohen & Correy, 2020). The world faces acute public health emergencies and economic crises globally caused by COVID-19 pandamic (Sharma et al., 2022). Hand hygiene is a critical public health control mechanism to prevent the spread of infectious pathogens, as the most common way many communicable diseases are transmitted is via hands (Herbart et al., 2020). Handwashing with soap often and throughout the day prevents the spread of many diseases, for instance, diarrhoea Cairncross et al. (2010), cholera Hulland et al. (2013), and soil-transmitted helminthiases (Strunz et al., 2014).

It has also been recognized as one of the most cost-effective health interventions to reduce the disease burden (Bartram & Cairncross, 2010). Handwashing may refer to either washing hands with water and soap (antimicrobial or non-antimicrobial) or applying an alcohol-based hand sanitizer to the hands. Handwashing with soap is considered the most effective method for reducing the spread of viral or bacterial infections, however, hands can clean with ash (Boesen et al., 2020).

Currently, it is one of the key cornerstones of COVID-19 prevention and became an integral part of our daily routine and our lives as we live through this pandemic, and beyond, to protect us from diseases. A handwashing station is commonly defined as a device that may be fixed or mobile and includes a sink with tap water, buckets with taps, tippy-taps, and jugs or basins designed for handwashing (JMP, 2019). Analysis suggests that improved hand hygiene practices may reduce rates of gastrointestinal illness by 31% and respiratory disease by 21% (Aiello & Larson, 2008). Although hand hygiene interventions are cost-effective, they are often not sufficiently practiced.

The access to handwashing stations with soap and water on-premises is a global indicator for hygiene in a household setting (UNICEF, 2020). The handwashing station can be temporary or permanent installations, which impacts the selection of materials used for construction as well as

the cost and durability of the station. Temporary solutions can usually be constructed with low-cost materials such as a bucket or a bottle with a tap and are quick and usually simple to build. Permanent handwashing stations may consist of a wood or steel frame or concrete work, depending on materials and skills. In some cases, mobile handwashing stations might be preferable over permanent infrastructure as they can be stored in a secure location when not in use, like at night or during school vacations.

Only around half of all households in Nepal have access to a handwashing facility with water and soap like 46% NDHS (2016) and a more recent study 52.2% (JMP, 2019). Consequently, the risk of infection associated with a lack of handwashing has long been recognized. To better health outcomes for the people beyond the pandemic, handwashing with soap must be a priority now and in the future. This research provides an overview of handwashing stations in households of Nepal and whether wealth status is associated with the availability of handwashing stations.

Methods

The study followed a survey research design. The 2016 NDHS survey data set was used to analyze whether having a handwashing station at home was associated with the household's wealth status. The NDHS is a nationally representative survey that provides current data on basic demographic and health indicators related to access to health services, selected health behaviours, and health outcomes (MoHP, 2019).

Sample and Sampling Procedure

The 2016 NDHS sample was stratified; every 7 provinces (province 1, province 2, province 3, province 4, province 5, province 6, and province 7) were stratified into urban and rural areas, yielding 14 sampling strata. The demarcation of the provinces involves the inclusion of selected districts within their boundaries. Further, the districts are divided into urban and rural locations, which are in turn divided into wards. In rural areas, wards are selected as Primary Sampling Units (PSUs) which consider an average of 104 households sample size. In urban areas, wards were selected as PSUs, regarded as the average sample size of 800 households (NDHS, 2016).

The sample of wards was selected independently in each stratum. Implicit stratification and proportional allocation were achieved at each of the lower administrative levels by sorting the sampling frame within each sampling stratum before sample selection, according to administrative units at different levels, and by using a probability proportional to size selection during the first stage of sampling (NDHS, 2016).

A total of 11,473 households from 7 provinces were selected for the sample, of which 11,203 were occupied. Of the occupied households, 11,040 were successfully interviewed. Of the total, 7581 of the interviews conducted were with men, and 3459 were women, who were the household head and could respond to the survey questionnaire. The response rate was 99% (NDHS, 2016).

Questionnaires

Though six questionnaires were administrated in the 2016 NDHS, researchers adapted only the household questionnaire to reflect the handwashing station issues in Nepal. The NDHS used HHQ to list all household members in selected 11,040 households. Basic demographic

information was obtained on the characteristics of each person listed, including their age, sex, marital status, education, and relationship to the household head. The HHQ collected further information on the household dwelling units, such as the source of water, type of toilet facilities, materials used for the floor of the dwelling unit, and ownership of various durable goods, migration, and food security.

Data analysis methods

The analysis was confined to the 11040 households data were weighted to represent the structure of the Nepali population using weighting factors provided with the 2016 NDHS. The study performed three different types of analysis: univariate, bivariate, and multivariate analysis. Initially, univariate or descriptive analysis was used to describe the percent and frequency of respondents according to background characteristics. The bivariate (chi-square test) analysis was conducted to show the association between variables and multivariate (logistic regression) among variables to examine the determination of the handwashing station. Further, a chi-square test (bivariate analysis) was carried out to evaluate the association between independent and dependent variables (Adhikari, 2020). After the bivariate analysis, multicollinearity was tested for the independent variables. In the bivariate analysis, a statistically significant association was considered (p<0.05) level (cross-tabulation) (Arkkelin, 2014). Those that were not multicollinear were then considered for the multivariate analysis. All analysis in this study was conducted with Statistical Package for Social Science (SPSS) software pro 20.0 version (Landau & Crc, 2004). The variables with a statistically significant p-value (p<0.05) in the bivariate and multivariate analysis (adjusted odds ratio) are discussed in this study.

Results

The below section outlines the key results including background characteristics of household, handwashing station, presence of water/soap, factors associated with handwashing stations, and predictors for not having fixed handwashing stations in homes in Nepal.

Background characteristics of household

Table 1 presents the background characteristics of households' handwashing station using 2016 NDHS data. It includes sex of the household head, age of household, place of residence, ecological zone, province, wealth status, migrated household members in the past 10 years, presence of a mosquito net, presence of radio, and presence of a TV in households.

More than twice as many men (68.7%) were household heads as women (31.3%). The highest proportion age of the household head was (23.2%) of those surveyed had a household head that was in the highest age range (age 35-44) compared to 5.7% who had a household head in the lowest age range (15-24 years). Concerning the residence groups, the largest majority of (61.4%) households were urban residences, whereas (38.6%) represented rural. Analysis showed almost the same proportion of respondents in Hill (46.5%) and Terai (46.4%) parentheses and very few (7.1%) in the mountain ecological zone. Concerning the province, Bagmati province had the highest proportion (22.8%), and Karnali province is the least proportion only with 5.6% respondents in this study. Province 1 and Madhesh province were the similar proportion (18.2%) respondents where Lumbini province found with (16.2%) respondents and the Sudur-paschip province had the least (8.3%) respondents for this study.

Wealth status was categorized as richest, richer, poor and poorest, and they had an approximately equal number of survey respondents. More than half (53.5%) of the total respondents had not migrated within the last 10 years. In addition, three-fourth (75.9%) of households had mosquito nets, 70.7% had a radio, and 51.6% had a TV in their household (see table 1).

Handwashing station, present of water/soap

Table 2 details the availability of handwashing stations in the household categorized into 4 sub-sections. First, a place where household members wash their hands, second, the presence of water at handwashing place, third, the presence of soap or detergent, and last, the presence of ash, mud, and sand. Our analysis revealed that handwashing places were fixed for 80.9% of households and were mobile for 18%. Likewise, very few households have no handwashing place.

In total, 77.3% of the respondents' handwashing stations in their households had water available. Interestingly, slightly more than half (51.8%) of households were found to have no soap or detergent at their handwashing station (see table 2).

Factors associated with handwashing stations

Table 3 further explores the correlations between the background characteristics of households about their presence of fixed handwashing stations. Furthermore, this table displays the associations between age of the household head, place of residence, ecological zone, province, wealth status, migrated household members in the past 10 years, presence of a mosquito net, presence of a radio, and presence of a TV at their households to fixed place handwashing stations at their households. On the contrary, the sex of the household heads and household members who migrated in the past 10 years had no association to fixed handwashing stations at their households.

From the data analysis, we found that the age of household head, place of residence, province, wealth status of the household, availability of misquoting net, and availability of a radio in their household were significant to fixed handwashing stations where household members wash their hands. There was a significantly higher proportion (82.2%) of those who had a fixed handwashing place where household members had a household head who was 25-34 years of age. In addition, the urban residence had a higher proportion (84.9%) of fixed handwashing locations compared to rural residences (74.7%). Among the ecological zones, the hill was associated with the highest likelihood (83.9%) of fixed handwashing stations in the respondents' households. In addition, (79.6%) of Terai ecological zones, and (70.4%) of mountain ecological zones had fixed handwashing stations at their households.

Gandaki province had the highest proportion (91.5%) of fixed handwashing stations. Following this, Bagmati province had the second highest (86.5%). Madhesh province had the lowest likelihood of fixed handwashing stations (67.6%). The analysis also showed that the richest wealth status of households was most likely to have fixed handwashing stations (96.0%) (p=<0.001).

A higher proportion of households (82.8%) with fixed handwashing stations had mosquito nets than those who did not have mosquito nets (75.4%). The proportion of households with a fixed handwashing station was slightly higher (85.5%) in households with radio than those who had

not (79.1%). More households who had a TV (88.7%) had fixed handwashing stations in comparison to those who did not have a TV (72.7%) (see table 3).

Predictors for not having a fixed handwashing station in households in Nepal

Table 4 presents the results of the bivariate and multivariate logistic regressions, which illustrate the odds of not having a fixed handwashing station in a household in Nepal. After an initial bivariate logistic regression, multivariate logistic regression was used to adjust the effects of covariates.

In model I, the poorest wealth status was 2 times more likely (aOR=12.699; 95% CI=10.120-15.935, p=<0.001) to the poorer (aOR=6.416, 95% CI=5.082-8.009, p=<0.001) and middle (aOR=6.882, 95% CI=5.447-8.695, p=<0.001) not having fixed handwashing stations at their households. Similarly, the poorest wealth status was 4 times more likely (aOR=12.699; 95% CI=10.120-15.935, p=<0.001) not having fixed hand washing stations at their households than those who were belonged to richer (aOR=3.856, 95% CI=3.028-4.909, p=<0.001) wealth status. In model II, the poorest wealth status was 2 times more likely (aOR=9.718; 95% CI=7.387-12.785, p=<0.001), than poorer (aOR=4.540, 95% CI=3.505-5.879, p=<0.001) and middle (aOR=4.581, 95% CI=3.563-5.889, p=<0.001) wealth status of not having fixed handwashing stations at their households. Equally, the poorest wealth status was 3 times more likely (aOR=9.718; 95% CI=7.387-12.785, p=<0.001) than richer wealth status (aOR=3.099, 95% CI=2.416-3.976, p=<0.001) of not having a fixed handwashing station at their households, including all socio-covariates.

In addition, Mountain ecological zones had higher odds (aOR=1.325, 95% CI=1.098-1.599, p=<0.001) of not having fixed handwashing stations than those in Hill and Terai ecological zones. Respondents from Madhesh province had higher odds (aOR=2.967, 95% CI = 2.405-3.658, p=<0.001) of not having a fixed handwashing station at their households compared to Gandaki province (aOR=.470, 95% CI=.367-.602, p=<0.001). Respondents who had mosquito nets (aOR=.795; 95% CI=.692-.913, p=<0.01), had a radio (aOR=.758; CI=.671-.857, p=<0.001), and had a TV (aOR=.762; CI=.667-.871, p=<0.001) had a significant effect on fixed handwashing station at their household. (see table 4).

Discussion

The presence of a handwashing station at a household impacts the health of the household. In addition, a fixed handwashing station with soap and water represents the wealthy status of the households. In Nepal, especially in rural areas, most people washed hands near their houses, not inside the house, and some of them had fixed handwashing stations whilst some had not. This study aims to find out the wealth status role in establishing handwashing stations in households. This study intends to inform the policymakers, health experts, and concerned authorities about the significant variables affecting handwashing status in Nepal and potentially lead to more targeted handwashing interventions in Nepal in the future. Thus, it is imperative to explore the role of wealth status in establishing handwashing stations within Nepalese communities.

The present study from Nepal shows that almost all households had a fixed handwashing stations and water available at handwashing places which is consistent with a recent study in Vietnam: findings show that nearly all households had fixed handwashing stations (Kien et al., 2016).

Another study in the Vietnam presents most homes equipped with hand cleaning items: water and soap at the household's handwashing stations (Kumar et al., 2017). Equally, another study from Indonesia also showed that most households had fixed handwashing stations at their households (Hirai et al., 2016). In the same line with present findings, a study in Bangladesh also showed a higher proportion of fixed handwashing stations, and about half had both water and soap (Luby et al., 2009).

Our handwashing findings more observed fixed handwashing places is contrary to those in Ethiopia and Rwanda because people think that researcher can expose their unhygienic practices within the households, Ethiopia had a higher proportion not to let watch handwashing stations and Rwanda had about half (Kumar et al., 2017). However some of these differences may be due to cultural norms where researchers were not allowed to observe handwashing practices as often in those countries. The proportion of water availability at handwashing stations of Nepal with soap and water is observed similar to other several Low-Income Countries (LIC); the water availability range was very low to nearly half in 42 LIC countries (JMP, 2019b).

The present study's findings showed the associations between age of household, place of residence, ecological zone, province, wealth status, presence of a mosquito net, presence of radio, and presence of a TV at their households to fixed handwashing stations in p=<0.001 level. The present study showed that 25 to 34 years of ages household heads were more likely to have fixed handwashing stations is consistent with a recent study in Ghana (Martin et al., 2018). The study revealed that the household heads at least 30 years of age were more likely to have the economic and financial capability to provide necessary and enough hand hygiene infrastructures than their counterparts (Martin et al., 2018). The study further found the age of the household head is significant predictor for a household's access to hand hygiene resources. In the present Nepal study though the household head's age had a significant association to fixed handwashing stations, it is not a significant predictor for the fixed handwashing stations at their households.

The study in Ghana by Martin et al. (2018) further stated that wealthier households were more likely to have found hand washing resources. It is consistent with the present findings that wealth quintile households had more likely fixed handwashing stations, including running water and soap. Equally, another study from Ghana showed households' wealth as a key variable for establishing handwashing stations with necessary materials: soap, water, and other cleaning agents (Agbadi, Darkwah, & Kenney, 2019). Providing handwashing stations with appropriate cleaning materials comes with some cost implications that may be a barrier to experiencing poverty. The data presented from this study is inconsistent with Martin et al. (2018) in the multivariable model because that study found urban residency negatively affected households' access to handwashing resources. This is an interesting contrast. The Ghana study noted many households in Ghana lack access to basic social amenities such as pipe-borne water at their dwelling. Still, urban areas are more likely to have access to water. Adams (2016) stated it could massively hinder to households' access to handwashing resources.

The present study's findings showed that not having a fixed handwashing station in the poorest household was 2 times more likely to poorer and middle and 3 times more likely to richer wealth status households after inclusion of all socio-demographic covariates. It is consistent with a study in Indonesia (Hirai et al., 2016) that showed wealth status was significantly associated with handwashing behaviour and the availability of a handwashing station with soap and water. Another study from Bangladesh also showed, in line with present findings, that a fixed

handwashing station with soap was more likely higher with the top two quintiles than those with the poorest quintile wealth status (Luby et al., 2009). Evidence from Western Kenya also showed fixed handwashing stations with water and soap in lower wealth quintiles were less likely to be compared to higher wealth quintiles households (Kamm et al., 2014). The poorest households, and those in rural areas, may have not fixed handwashing stations with water and soap for various reasons: difficulty to afford required material's cost, poor access to materials in local markets, inadequate knowledge, negligence to handwashing behaviour (in some cases), and dynamic family requirements.

The current study showed that having mosquito nets, radio, and television at home had a significant association on fixed handwashing stations. This finding is supported by previous literature (White et al., 2020). This is plausible, and interesting findings in that radio and television are a foundation for effective and efficient means to undertake a coordinated nationwide hygiene awareness program. Further, these means are the foundation for information that weighs the advantages and disadvantages of washing hands in fixed places and develop behaviour towards the practice. Moreover, these are the significant variables to predict/influence future behavioral change interventions.

Conclusion and Implication

This study shows that age of the households, place of residence, ecological zone, province, wealth status, presence of a mosquito net, having a radio, and a TV in respondents' households was significantly associated with a fixed handwashing station at households. In contrast, sex of the households head and households' members migrated in the past 10 years had no association with fixed handwashing stations at the households. The study further concluded that wealth status, province, ecological zone, and having mosquito nets, a radio, and a TV were significant predictors for establishing of a fixed handwashing station at their households in Nepal.

This study informs handwashing experts in Nepal on the correlations between a fixed handwashing station at a household and other sociological variables, such as the gender of the head of the household. This can improve public health in this region by leading to more targeted interventions in the future. The study highlights the necessity for interventions in handwashing materials and placement at handwashing locations in the dwelling, particularly in rural areas, Madhesh province and Karnali province, mountain zone, and the poorer and poorest wealth quintile groups. Additional research is necessary to explore these issues entirely.

Limitations and Weakness

This study used the secondary data of the NDHS 2016 survey of Nepal concerning the head of the households, age, and presence of mosquito nets, presence of a radio, and presence of a TV at the households. Of the total households of Nepal, only 11,203 were occupied for the sample size from all 7 provinces of Nepal. Only House Hold Questionnaire (HHQ) reflects the handwashing station issues as a research tool.

Strengths

The study included 11,040 households from all 7 provinces, where 7581 were men and 3459 were women, yielding a response rate of 99%. The sampling procedure was stratified, in which each province was stratified into urban and rural areas, yielding 14 sampling strata. The study

adopted HHQ to reflect the handwashing station issues, including basic demographic information; age, sex, marital status, education, and relationships. Furthermore, the study applied three sorts of analysis; univariate, bivariate, and multivariate. Initially, univariate was used to describe the percentage and number of respondents according to background characteristics. Both bivariate (chi-square test) and multivariate (logistic regression) analyses were performed to show the determination of the handwashing station.

Abbreviations

aOR	Adjusted Odds Ratio
CI	Confidence Interval
DHS	Demographic Health Survey
HHQ	Household Questionnaire
JMP	Joint Monitoring Programme
MoHP	Ministry of Health and Population
NDHS	Nepal Demographic Health Surveys
PHAC	Public Health Agency of Canada
SPSS	Statistical Package for Social Science
TV	Television
UNICEF	United Nations International Children's Fund
WHO	World Health Organization

Declarations

Ethics approval and consent participate

This study used secondary data; the survey protocol was reviewed and approved by the Nepal Health Research Council (NHRC).

Consent for Publication

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the (NDHS PROGRAM) repository, https://dhsprogram.com/data/Using-DataSets-for-Analysis.cfm.

Competing interests

We authors declare that we have no competing interests.

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Table 1. *Background characteristics of household*

Characteristics head of household		Total	
		N	%
Gender	Male	7581	68.7
	Female	3459	31.3
Age	15-24	625	5.7
	25-34	2240	20.3
	35-44	2562	23.2
	45-54	2358	21.4
	55-64	1810	16.4
	65 and above	1445	13.1
Place of residence	Urban	6781	61.4
	Rural	4259	38.6
Ecological zone	Hill	5134	46.5
	Mountain	781	7.1
	Terai	5125	46.4
Province	Bagmati Province	2521	22.8
	Province 1	2004	18.2
	Madhesh Province	2014	18.2
	Gandaki Province	1173	10.6
	Lumbini Province	1793	16.2
	Karnali Province	619	5.6
	Sudur Paschim Province	915	8.3
Wealth status	Poorest	2234	20.2
	Poorer	2225	20.2
	Middle	2065	18.7
	Richer	2240	20.3
	Richest	2276	20.6
Any household member migrated in the past 10 years	No	5911	53.5
	Yes	5129	46.5
Have mosquito net	No	2750	24.9
	Yes	8290	75.1
Has radio in household	No	7811	70.7
	Yes	3229	29.3
Has a TV in the household	No	5346	48.4
	Yes	5694	51.6
Total		11040	100.0

Table 2. *Availability of handwashing station, presence of water and soap in the station*

Handwashing station in household		N	%
Place where household members wash their hands	Observed, fixed place	8936	80.9
	Observed, mobile place	2075	18.8
	Not observed: not in dwelling	22	.2
	Not observed: no permission to see	3	.0
	Not observed: other reason	4	.0
Presence of water at a handwashing place	Water not available	2503	22.7
	Water is available	8508	77.3
Items present: Soap or detergent	No	5707	51.8
	Yes	5304	48.2
Items present: Ash, mud, sand	No	9296	84.4
	Yes	1715	15.6
Total		11011	100.0

Table 3. *Background characteristics of households by handwashing station*

		Fixed place where household members wash their hands		Total
		Fixed place	Not fixed place	N
Sex of the head of households	Male	81.2	18.8	7581
	Female	80.5	19.5	3459
Age of household ***	15-24	80.7	19.3	625
	25-34	82.2	17.8	2240
	35-44	81.2	18.8	2562
	45-54	82.0	18.0	2358
	55-64	81.3	18.7	1810
	65 and above	76.6	23.4	1445
Place of residence***	Urban	84.9	15.1	6781
	Rural	74.7	25.3	4259
Ecological zone ***	Hill	83.9	16.1	5134
	Mountain	70.4	29.6	781
	Terai	79.6	20.4	5125
Province ***	Bagmati Province	86.5	13.5	2521
	Province 1	82.3	17.7	2004
	Madhesh Province	67.6	32.4	2014
	Gandaki Province	91.5	8.5	1173
	Lumbini Province	83.1	16.9	1793
	Karnali Province	69.8	30.2	619
	Sudur Paschim Province	82.1	17.9	915
Wealth status ***	Poorest	65.4	34.6	2234
	Poorer	78.9	21.1	2225
	Middle	77.7	22.3	2065
	Richer	86.2	13.8	2240
	Richest	96.0	4.0	2276
Any household member migrated in the past 10 years	No	81.1	18.9	5911
	Yes	80.8	19.2	5129
Have mosquito net ***	No	75.4	24.6	2750
	Yes	82.8	17.2	8290
Has radio in household ***	No	79.1	20.9	7811
	Yes	85.5	14.5	3229
Has TV in household ***	No	72.7	27.3	5346
	Yes	88.7	11.3	5694
Total		80.9	19.1	11040

Note: *** Chi square test significant at p < 0.001

Table 4. *Adjusted Odd Ratio (aOR) and 95% Confidence Interval (CI) for not having a fixed handwashing station in households in Nepal*

Predicators		aOR	95% CI Lower	95% CI Upper	aOR	95% CI Lower	95% CI Upper
		Model I			Model II		
Wealth Status	Poorest	12.699***	10.120	15.935	9.718***	7.387	12.785
	Poorer	6.416***	5.082	8.099	4.540***	3.505	5.879
	Middle	6.882***	5.447	8.695	4.581***	3.563	5.889
	Richer	3.856***	3.028	4.909	3.099***	2.416	3.976
	Richest (ref.)	1.00			1.00		
Sex of the head of household	Male (ref.)				1.00		
	Female				1.046	.931	1.174
Age of household head	15-24 (ref.)				1.00		
	25-34				.872	.684	1.110
	35-44				.934	.735	1.187
	45-54				.936	.731	1.198
	55-64				.864	.671	1.113
	65 and above				1.114	.864	1.436
Place of residence	Urban (ref.)				1.00		
	Rural				1.061	.953	1.182
Ecological zone	Hill (ref.)				1.00		
	Mountain				1.325**	1.098	1.599
	Terai				1.014	.858	1.198
Province	Bagmati Province (ref.)				1.00		
	Province 1				1.032	.861	1.236
	Madhesh Province				2.967***	2.405	3.658
	Gandaki Province				.470***	.367	.602
	Lumbini Province				1.140	.938	1.386
	Karnali Province				1.056	.844	1.322
	Sudur Paschim Province				.730	.583	.914
Any household member migrated in the past 10 years	No (ref.)				1.00		
	Yes				.904	.812	1.006
Has mosquito net	No (ref.)				1.00		
	Yes				.795**	.692	.913
Has radio in household	No (ref.)				1.00		
	Yes				.758***	.671	.857
Has a TV in the household	No (ref.)				1.00		
	Yes				.762***	.667	.871
	Constant	.042***			.067***.		
	Cox & Snell R Square	.072			.112		

| | -2 Log likelihood | 9931.7 | 9441.5 |

Note: *** Significant at p < 0.001, ** = p < 0.01