



COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Research Dissertation

**HANDWASHING PRACTICES AMONG PREGNANT WOMEN
AND MOTHERS OF UNDER FIVE YEARS CHILDREN IN
EIGHT DISTRICTS OF RWANDA**

**A SECONDARY DATA ANALYSIS FROM THE ENDLINE SURVEY OF
EKN – NUTRITION PROGRAM (2016/2017)**

This Thesis is submitted in partial fulfilment of the requirements for the degree of
MASTER OF PUBLIC HEALTH

By

Betty INGABIRE

Registration Number: **218014265**

Supervisor: Ass. Prof. **Théonèste NTAKIRUTIMANA**

Co-Supervisor: **Mr. Patrick KARAKWENDE**

September, 2019

Declaration

Declaration

I Betty INGABIRE, hereby confirm that this thesis is my original work and contains no unacknowledged materials, and it has not been presented to any other institution for evaluation nor previously published. All readings were quoted and referenced.

Student' names: Betty INGABIRE

Signature: 

Date: 30/09/2019

Declaration by the supervisor

I confirm that the work reported in this thesis was carried out by the candidate under my supervision:

Ass. Prof. Theoneste NTAKIRUTIMANA

Signature.......... Date30/09/2019

Dedication

First of all, I dedicate this dissertation to My Family and friends.

Also, it is dedicated to the College of Medicine and Health Sciences' staff.

Acknowledgement

I would like to express my special thanks to My Lovely Husband for his continuous support in all this process. May God bless Him.

I would like to acknowledge the valuable support to all staff in the School of Public Health, UR-CMHS for their significant assistance throughout the whole process.

I would like to thank the staff of the department of Human Nutrition and Dietetics for allowing me access to the dataset of the Endline survey of EKN Nutrition program, and all those who have offered help and support during the period of this dissertation.

I wish to express great appreciation to my supervisors, Ass. Professor Théonèste NTAKIRUTIMANA and Mr. Patrick KARAKWENDE, who have given me all the necessary guidance to finalize this work. Their dedication time to meet and guide me has made it possible.

I thank my children, their presence in my life continue to be my greatest inspiration to achieve more. May this achievement be a reminder to them that academic excellence is key in life!

Finally, special thanks go to my whole family and friends for prayers, encouragement and sympathy.

Abstract

Background

Handwashing is an important contributor to the factors of different health outcomes including diarrhea and related diseases that could lead to increased child mortality and morbidity in the world. One of the ways to improve handwashing practices is to better understand different factors contributing to handwashing for more effective action.

Study aim

The main objective of this study was to assess the practices of handwashing in mothers of under five years old children.

Methodology

This study is a secondary data analysis of the endline survey of the EKN Nutrition program 2016/2017. The survey was cross-sectional and it involved 3664 mothers or care givers of under five children from eight districts being Nyamasheke, Nyaruguru, Karongi, Muhanga, Gatsibo, Gicumbi Kamonyi and Gisagara. Descriptive analysis helped to generate information about the characteristics of the mothers and households. Chi-Square and binary logistic regression were performed to determine socio demographic, economic and environmental factors associated with handwashing practices and the strength of the associations or relations.

Results

The results from analysis showed that the majority of respondent mothers wash their hands using soap and water before eating (95.2%) and before feeding the child 74.4%). However, some mothers reported to not wash hands after visiting toilet (40.3%) and after attending defecating child (47.1%). The likelihood of mothers for not washing their hands was 5.625 {95% CI (1.205 - 26.249)} times higher in mothers whose household' heads are above 60 years old than in mothers whose household heads are below 21 years of age ($P \leq 0.05$).

Conclusion

Different illnesses, especially diarrheal related, can be prevented and controlled by appropriate practices of hands hygiene and sanitation including washing the hands effectively with cleansing agent by respecting the critical times. Insufficient hand washing materials are barriers to practice hygiene behaviors.

Recommendation

Proper hygiene and sanitation practices including effective handwashing using water and soap in respect to the critical times can help in prevention of poor hygiene related diseases.

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List of symbols and abbreviations

CBEHPP: Community Based Environmental Health Promotion Program

CDC: Centre for Diseases Control

CDD: Control of Diarrhea Disease

CHWs: Community Health Workers

CMHS: College of Medicine and Health Sciences

DALYs: Disability-Adjusted Life Years

DHS: Demographic Health Survey

DPEM: District Plan to Eliminate Malnutrition

EKN: Embassy of the Kingdom of the Netherlands

FFLS: Farmer Field Learning Schools

GPPD: Global Action Plan for Pneumonia and Diarrhea Control

HH: Household

HW: Hand Washing

HWWS: Hand Washing With Soap

IMCI: Integrated Management of Childhood Illness

LMICs: Low Middle and Income Countries

MDG: Millenium Development Goal

M&E: Monitoring and Evaluation

DPEM: District Plan to Eliminate Malnutrition

NGOs: Non- Government Organizations

RDHS: Rwanda Demographic Health Survey

RHF: Recommended Home Fluid

RPSA: Regional Programme Southern Africa

SPH: School of Public Health

UNICEF: United Nations International Children's Emergency Fund

UR: University of Rwanda

USAID: United State Agency for International Development

WASH: Water Sanitation and Hygiene

WBDP: World Bank Development Partners

WHO: World Health Organization

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Chapter 1: Introduction

1.1. Definition of Key Terms

Handwashing: The act of cleaning hands with or without use of water and/or other liquid and/or with use of soap, to remove dirt, soil and microorganisms (1).

Prevalence: Number of people or individuals in a certain population who have a disease or health condition at some specific period, mostly expressed as percentage of population.

Community: Group of individuals living in a defined geographical area, sharing common culture, norms and values, and who are organized in a social structure based on relationships developed over some time (2).

Hygiene: According to WHO, hygiene is considered as the situations and ways of self-conduct that helps to keep and preserve the health and then prevent the spread of different diseases (1).

Sanitation: The practice of maintaining oneself and the surroundings clean.

Diarrhea: According to WHO diarrhea a passage or loosing liquid stools for three or more times a day and/ or when it is frequent than normal. Among children, diarrhea is known as the excessive stool volume per day, especially when it is more than 10g/kg per day (3).

Risk factor: Exposure, attribute or characteristic of a person or individual which increases the chances of having a certain injury or disease.

Epidemiology: Study of the distribution or prevalence and determinants of any health related situation or events and the ways of controlling the events or diseases (4).

1.2 Study Background

One of the major contributor to the poor hygiene related diseases among under five children is poor handwashing. Inadequate handwashing can lead to different health issues including diarrhea, which is one of top three killers worldwide in the children. Globally, diarrhea remains a major public health threat and it can occur in different age categories. However, it is more frequent and painful among children especially among babies who are bottle fed and among children who are malnourished (5). It accounts for about one in nine deaths among under five years old children killing about 2195 children every day worldwide, which makes diarrhea the second major cause of death among children who are under five years old (6)(7). In 2010, worldwide, there were more than 1.7 billion issues of diarrhea among under five years old children, which resulted in in 700, 000 deaths in the year of 2013 (8).

According to the WHO report of 2012, diarrheal diseases affect about two billions globally every year, and kill around 1.9 million of under five years old children each year, most commonly in developing counties. This accounts for around eighteen percent of the deaths of children who are under five years of age from diarrheal related diseases (9).

78% of the different child deaths caused by diarrheal related diseases, happen in the regions of Africa and South-East Asia and different diarrheal related infectious agents are generally transmitted by fecal-oral route (9). Around 94% of the diarrheal related diseases are generally attributed to environmental factors such as inadequate handwashing, unsafe drinking water, poor socio economic status, lack of proper sanitation, lack of latrines and its facilities, open defecation and poor personal hygiene (7).

842000 deaths in low and middle income countries are attributed to lack of adequate water hygiene and sanitation which represents 58% of the diarrheal related deaths and 1.5% of the total disease burden (10). In addition, it is widely recognized that being exposed to diarrheal pathogens in developing countries is associated with factors that include handwashing, child age, quality and quantity of water, housing conditions, level of education, and availability of toilet facilities, household economic status and the general conditions of the sanitary facilities. Moreover, risk aspects such as behavior, nutrition, environment and demography can be affected directly and/or indirectly by socio economic factors (11).

In Africa, 62% of all deaths have been known to cause increasing of mortality and morbidity among school age children and are attributed to dirty hands (12). In Sub-Saharan Africa, it has been found that diarrhea is the main contributor to death and illness particularly in children who are below five years old, which exposes them to malnutrition and then makes them vulnerable to other different diseases (11). It is estimated that by 2030, around 4.4 million under five years old children may die annually because of different infectious diseases and 60% of them may be from the region of sub-Saharan Africa (13).

The results of a study carried out in Nigeria showed that the risk of diarrhea was high among children whose mothers did not wash hands with soap before preparing food, before feeding children and after using toilets. Hand washing practices can not only just decontaminate hands but also contribute in preventing the transmission of different diseases, effectiveness of washing hands with soap can indeed help reduce the risk of diarrhea by around 42-48% (14).

Kenya Demographic Health Survey shows that 16.6% of children below five years old had been exposed to diarrhea in the two weeks which preceded the survey and about 2.6% had experienced severe diarrhea with blood (15).

The prevalence of handwashing in developing countries, especially with soap, despite the different efforts, remains low with a mean hand washing prevalence ranging between 13% and 17% in low and middle income regions (16).

In Rwanda, 12 % of households reported to have handwashing facilities, and about 37% of them reported to use water and soap while washing hands. The prevalence of diarrhea in that year among under five children was 10% and 13% in urban and rural areas respectively (17).

1.3 Problem Statement

Hand washing is a missed opportunity for public health and inadequate or lack of handwashing may lead to different health issues including diarrhea related death diseases (19). One of the important health burdens that kill children in developing countries worldwide is diarrheal and related diseases where inadequate hand hygiene along with other environmental factors are responsible for 90% of diarrhea. In Rwanda, the prevalence of diarrhea and other poor hand hygiene related diseases remains high but there is limited information on exact hand hygiene practices and limiting factors contributing to not washing hands in mothers of children who are under five years old.

Despite the efforts aiming at promoting handwashing practices in Rwanda, there is still issues of poor hygiene related disease among under five children including diarrhea, which continue to cause death in young children. Therefore, the need for a better understanding of the different factors of poor handwashing in mothers of under five years old children.

The main objective of the endline survey under the EKN Nutrition program was to determine the prevalence of stunting and the underlining factors including socio demographic and economic factors. However, there have not been any deep secondary data analysis study from the EKN endline data looking at other aspects such as handwashing and related factors among the mothers of under-five children. Thus, the need for determining the prevalence of handwashing practices and possible factors associated with handwashing critical moments among mother of under-five children.

1.4 Objectives of the Study

1.4.1 Main objective

To assess handwashing practices among mothers of under five year children.

1.4.2 Specific objectives

- ❖ To determine the prevalence of handwashing among mothers of under five children in relation to handwashing critical moments
- ❖ To identify socio demographic and economic characteristics associated with handwashing practices among pregnant women and mothers of under five years children
- ❖ To determine environmental factors associated with handwashing moments among pregnant women and mothers of under five children

1.5 Research Questions

- ❖ What is the prevalence of handwashing among pregnant women and mothers of under-five children?
- ❖ What are the socio demographic and economic factors of handwashing among pregnant women and mothers of under-five children?
- ❖ What are the environmental factors associated with handwashing among pregnant women and mothers of under-five children?

1.6 Significance of the Study

The findings from this study will contribute to the improvements of the lives of both mothers and under five years old children. In addition, the study data information will be useful in planning for the effective intervention programs aiming at reducing the issues related to handwashing in the communities of the 10 study districts.

Similarly, the policy makers, stakeholders and program initiators may use the study findings on possible and actionable services required to improve the lives of under five years 'children. Furthermore, it will serve as a baseline which other researchers can build on and conduct similar researches or implement different interventions, which are beneficial to the community.

1.6.1. Policy implication

The results of the research will be presented to the University of Rwanda, College of Medicine and Health Sciences, school of public health. These results will also be used by the Ministry of Health, other social cluster aligned ministries including MINALOC, MIGEPROF, MINAGRI, Partners and other stakeholders to inform policy hence make evidence based decisions with regard to curbing poor handwashing aiming at improving the wellbeing of children. Furthermore, the results will be disseminated in key meetings to advocate for improved handwashing practices and a manuscript will be prepared for submission in peer review journal.

Chapter 2: Literature Review

2.1 General Concept of Handwashing

2.1.1 Handwashing

Hand washing is among the most important and effective means for prevention of diarrheal diseases and hand hygiene is the primary measure to reduce infections. Improved handwashing can have significant contribution on public health and reduce significantly diarrheal related diseases and acute respiratory issues. (20)

2.1.1.1 Reasons for washing hands

It is advisable to wash hands regularly for diseases prevention. Many people loose their lives across the globe due to infections occurring when they are receiving the health care and hands are the main route of transmission of germs during health care provision. Washing hands could save lives of millions of children. Therefore, the hygiene of hands is an important step to prevent the transmission of unwanted germs and thus prevent infections (21). Luby said that: “it is remarkable that hand washing with soap led to marked reduction in diarrhea without improving water quality, even among malnourished children who are at increased risk of death from diarrhea.”(20).

There have been some differences observed in the scope of hand washing practices in different areas where washing hands is considered as one of cost-effective practice for the control and prevention of communicable diseases. These differences are related to the knowledge and frequency of using materials of handwashing (22). In order to wash hands effectively, it is advisable to rub all the surfaces of lathered hands vigorously and then rinse them under stream of water. This may then suspend the microorganisms and remove them through rinsing with water and thereafter reduce the microbial loads in the hands (23).

2.1.1.2 Critical times to wash hands

The concept of handwashing critical times is important to break the fecal oral contamination chain, which is one of major causes of diarrheal diseases. It is critically advisable to wash hands after toilet, after cleaning a child who has defecated, before eating, before and after preparing food and before feeding the child. Handwashing is also recommended in moments such as after routine work, after touching nose, sneezing or coughing, after touching animal, pet and pet’s food as well as after touching any garbage (24) (25). In a study conducted I Nigeria in 2015,

about 42.1% of participants reported to have participated in any program of handwashing education in the year preceding the study and 56% to wash regularly their hands in consideration of the critical moments (at least washing hands once after critical activities). Moreover, handwashing after defecation was at 79.6% (23).

Furthermore, in South India, there was more improved handwashing practices (95% CI) in 2011 among mothers with education level of 5-7 standard and above, and family income (per capita) of Rs. 1001-2000. The mothers who were daily laborers were at higher risk of washing their hands (25).

2.1.1.3 Moments of handwashing in healthcare zone

The common moments of handwashing in healthcare zone include, before aseptic task, after touching a patient and her/his surroundings while leaving the side of patient and before touching a patient. They also include cleaning hands after touching any material or furniture in the surroundings of a patient when leaving the patient and after being exposed to the body fluids as well as after removing glove, which is important in self-protection and protection of the healthcare environment from harmful microorganisms. (26)(27).

2.1.1.4 Effectiveness of Handwashing

Using soap and water while washing hands is efficient to remove and reduce microbes on the hands and it is advisable to use, in addition to hand hygiene, hand rubs that is antiseptic alcohol base. The behavior of washing hands can contribute in reducing the occurrence of diarrhea and pneumonia among children (24). The duration of washing hands effectively using soap and water, according to WHO guidelines, is about 40-60 seconds and 20-30 seconds when washing hands with Alcohol-Based Formulation (28).

2.1.1.5 Barriers hindering effective handwashing

Different studies have shown that the constraints of effective handwashing include lack of education, lack of access to the cleaning facilities, some problems of skin caused by some products of hand hygiene, some beliefs and/or behavior that do not support regular hand hygiene, people's attitudes, lack of management or organizational support and workload (12). From a study conducted in Nigeria in 2015, some of the reported reasons for not washing hands regularly were the limited availability of water (13.5%) and soap (17.7%) and the fact of being busy. There was statistically significant association with the diarrhea episodes that were reported among children

and there was no statistical significant relationship between knowledge and practice of washing hands ($X^2 = 3.704, p = 0.054$) (23).

2.1.1.6 Common techniques of handwashing

A common and recognized technique of washing hands involves covering the different surfaces of the hands and ensuring that hands are clean in consideration of the different critical moments. The time of washing hands or duration can be as long as possible or required to make sure that the different surface areas of the hands are touched. While washing hands, the hands are rubbed systematically to make sure that the different parts of hands and wrists are touched and appropriately cleaned (7)(29).

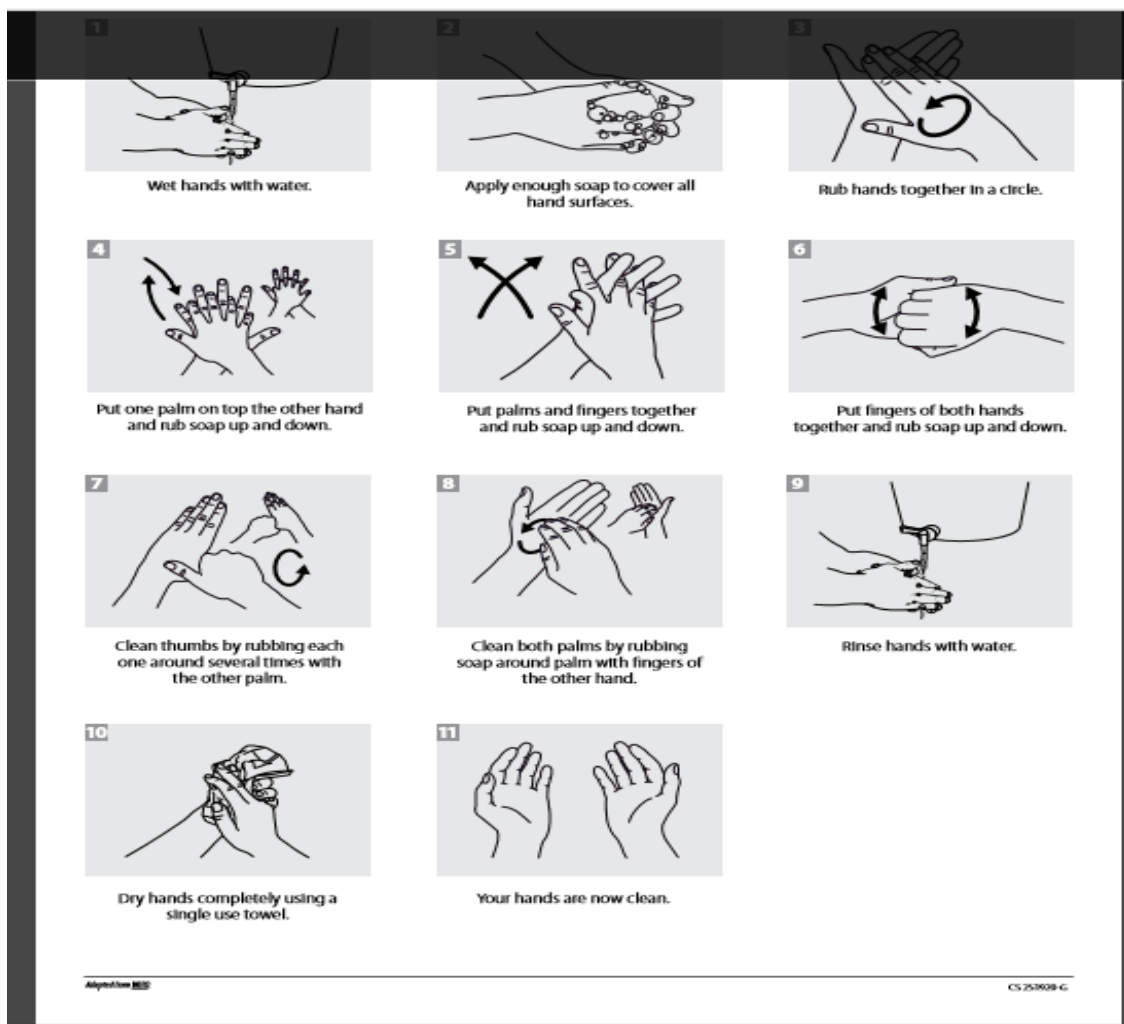


Figure 1. Steps to Washing Hands (28)

2.1.1.7 Products used during hand hygiene

The use of soap and water while washing hands is recommended for ensuring removal of pathogens from hands and preventing poor hygiene diseases such as diarrhea. Liquid soap is more advisable in handwashing. The awareness of enhanced hand hygiene practices is known as an important public health practice and liquid soap is more advisable in handwashing (30).

Alcoholic hand rub is another product used in handwashing and is recommended in different healthcare settings as an effective, short, hands friendly, easy to use and is commonly advisable in health care points. The alcoholic hand rub can be at different areas such as on the side of the bed locker, on the food of the bed or at any other settings where a dispenser can be fixed. This include to the internal wall of the ambulance, on the chair of the patient or it can be carried by the healthcare provider (27).

2.1.1.8 Promotion of handwashing

Promoting use of water and soap while washing hands is crucial in protecting individuals from poor hygiene related diseases and can lead to different other benefits such as improved nutrition status and economic growth. The promotion of hand washing practices contributed in reduction of the diarrhea incidence in schools and day care centers by about one third (1/3) in high income countries, and can similarly reduce diarrhea incidence in low and middle income countries (31).

The major ways of handwashing promotion include advocacy, education and behavior change to achieve better health outcome (7).

Handwashing being a valuable practice in controlling diarrhea diseases; it is in the seven-point plan of WHO/UNICEF 2009 for comprehensive prevention and control of diarrhea diseases. Handwashing requires changes in behavior and infrastructure, which takes time and some resources to be developed. For making handwashing with soap successful, the main emphasis should be on risk practices, behavior change, and how people communicate (12).

For risk practices, it is resourceful and efficient to target the caretaker and/or mothers who take care of the child to have large impact on the reduction of diseases. Promoting washing hands in moments such as after contact with feces in a good way to reduce the risk of fecal-oral transmission. However, handwashing at three critical times is more critical such as after toilet, after cleaning child bottom following defecation, and before preparing food is also highly

recommended. For changing behavior, the following three forces such as drivers, habits and the environment should be involved in order to facilitate or hinder the change. Changing behaviors requires some efforts in lowering barriers in the environment through advocacy, changing old habits to new ones through education and trying to find motivation aspects that can create some new habits through sharing information in the community (12).

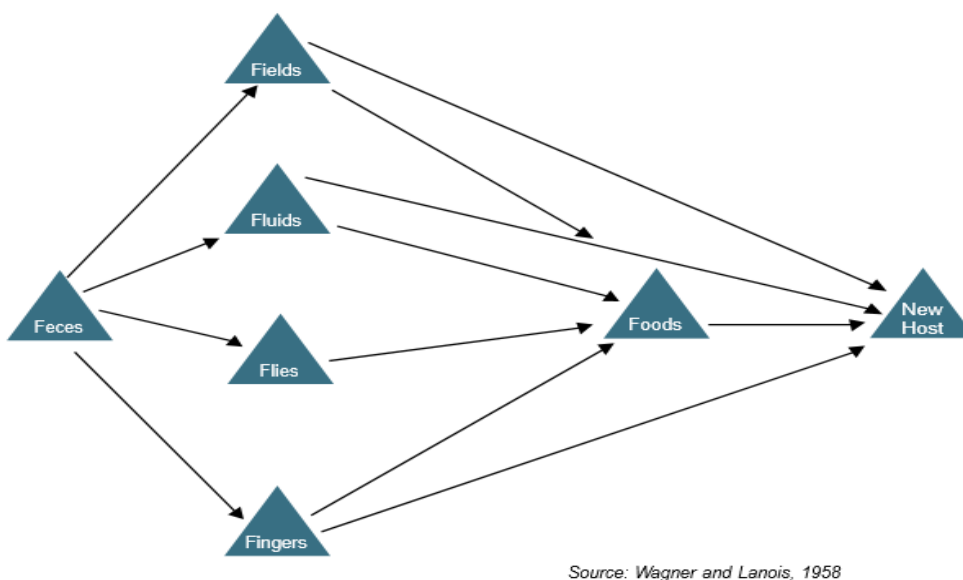


Figure 2: The F-Diagram Showing the Major Transmission routes of Fecal-oral Diseases

Feces are the source of diarrheal pathogens transmissions; they carry germs, bacteria, and worms, larvae, which are spread in following the F-diagram since when they are not disposed of safely as the figure shows. The Fields means eating raw vegetables or half-cooked vegetables that are exposed to feces, Flies can sit on feces and carry bacteria or germs to food and to human mouths, fingers, if not properly washed, can spread germs and worms. When it rain feces can get into water supply systems and the mixed fluid can spread bacteria. Vegetables that are exposed to contaminated water can also spread harmful bacteria to consumers (32).

2.2.4 Seasonality and handwashing linkages to diarrhea

Handwashing has direct causal linkage with the transmission if different pathogens and the promotion of hand hygiene practices is recognized as an important public health practice. Diarrhea being one of major outcome of poor hand hygiene have some seasonality aspect whereby for instance bloody and rotavirus diarrhea are commonly occurring during winter season, and shigellosis is most commonly occurring during dry summer. People are at risk of

diarrheal diseases depends on types of diarrhea and the persons 'years. For instance, cholera affects mostly and easily young infants and it affects also those above two years old.. Young children of below five years can easily be affected by Shigellosis, the diarrhea caused by rotavirus is commonly known also in young infants and children of 1-2 years old. Furthermore, the diarrhea from E. coli can affect people of any age and amoebas if known to be common in adult people (16)(12)(33).

Some of best ways to deal with hand hygiene and diarrhea include providing improved sanitation, with safe waste disposal facilities and practice, use of clean water while preparing food, drinking water, bathing and cleaning. Thus the need for easy access to safe water for diarrheal prevention. It is also important to include health education on spread of infections and prevention (7)(11)(34).

2.1.2 Strategies for the intervention of EKN

The implementation of the nutrition program – EKN was based on the conceptual framework of UNICEF (Figure 3) and there was multisectoral approach with focus on interventions that are nutrition-sensitive and specific. The programme applied three main strategies, which are increasing the availability, access and utilization of foods that are nutritious through using a number of channels. For example, caregivers of children younger than two were trained on bio-intensive agricultural techniques and kitchen gardens via Farmer Field Learning Schools (FFLS) (35).

Programme beneficiaries were also provided with inputs for establishing kitchen gardens and the poorest households were provided with small livestock to improve household nutrition and income as well as using manure to boost output from the kitchen garden. In addition, programme beneficiaries were enrolled in community-based saving and lending groups providing the members access to micro credits to cover expenses related to e.g. food and health, and to make investments to improve their livelihoods. The second strategy was improve mothers behaviours in relation to feeding and hygiene for infant and young children through '1,000 days in the land of a 1,000 hills' behaviour change communication campaign, including training of frontline health staff such as CHWs on key nutrition practices. Trained frontline health staff in turn frequently shared these messages with the target group, e.g. during monthly growth monitoring and promotion and cooking demonstration sessions which were supported in all villages of the

target area. The third strategy was about improving accessibility and use of health services of the target households through various trainings as well as increased affordability of health services through increase in target households income e.g. via participation in community-based saving and lending groups.

Furthermore, district level capacity in coordination, planning and M&E for nutrition was supported including trainings in results-based planning and on-the-job training and support to monitor implementation of the various District Plans to Eliminate Malnutrition (DPEM).

2.1.3 EKN Implementing partners and their roles

UNICEF collaborated with the following international NGOs to support implementation in the eight districts covered by the program: Catholic Relief Service (CRS) in Muhanga and Karongi, ADRA (Adventist development and relief Agency) in Gatsibo and Kamonyi districts, Concern Worldwide in Nyaruguru and Gisagara districts, and World Vision in Nyamasheke and Gicumbi. The UNICEF in Rwanda was in charge of managing and over all coordination of the program and the department of Human Nutrition and Dietetics of the University of Rwanda was in charge of carrying out research during the program period as well as the baseline-endline surveys (35).

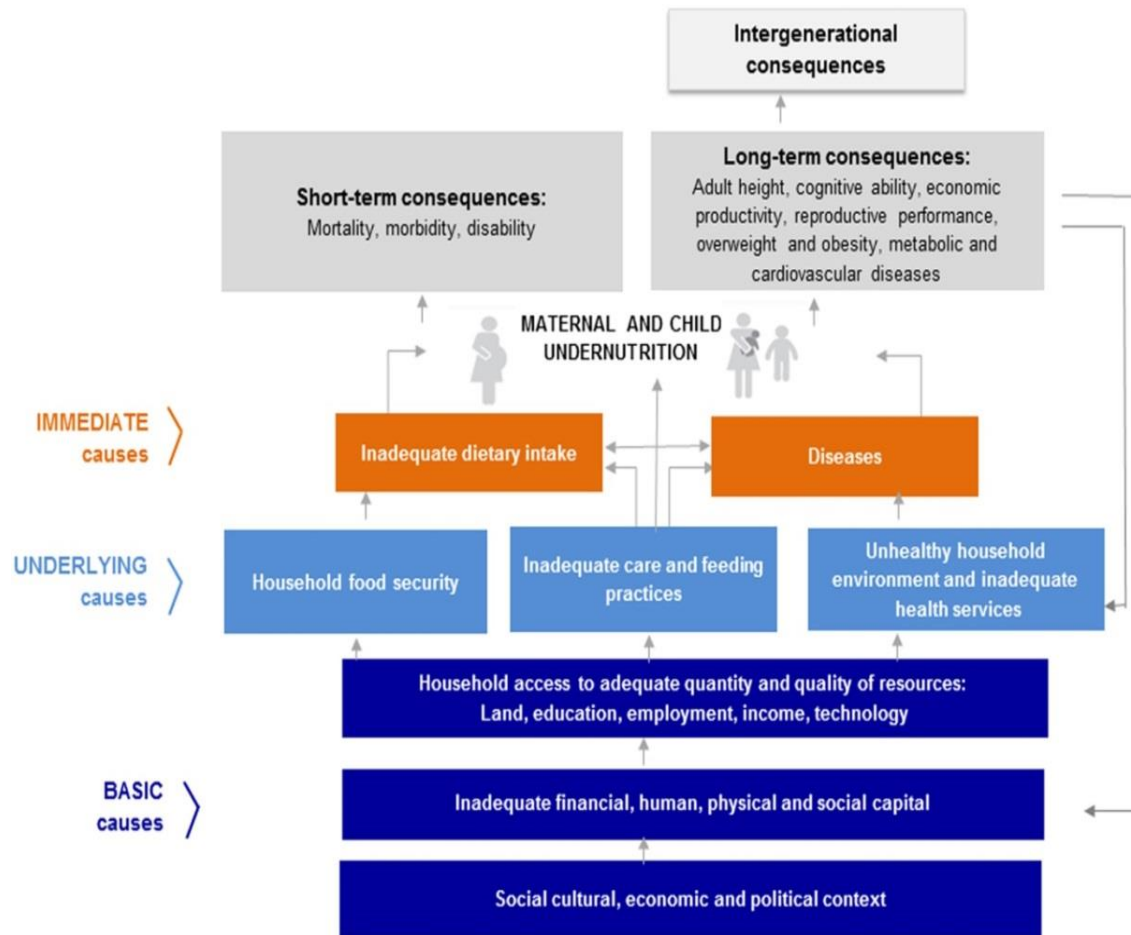


Figure 3: UNICEF conceptual framework.

Chapter 3: Research Methodology

3.1 Study Context and area

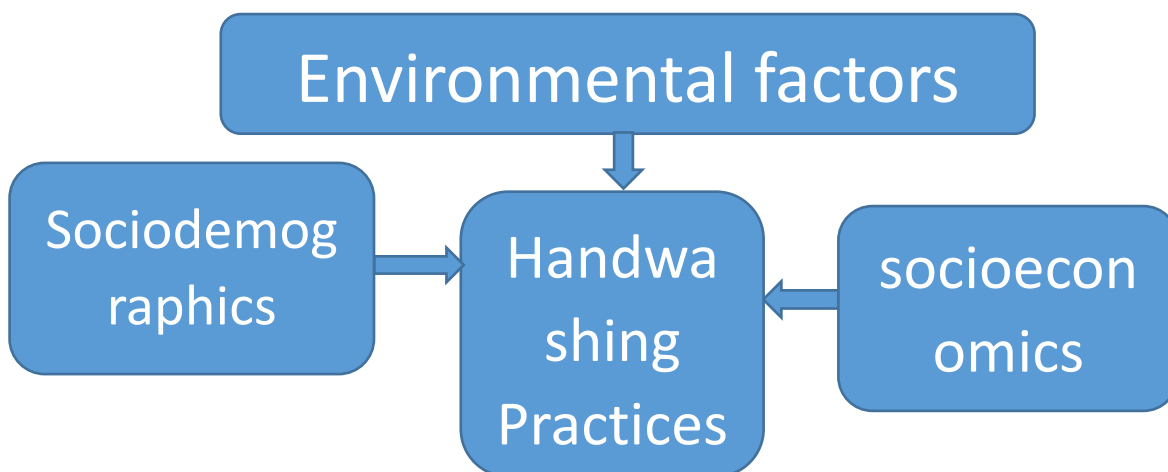
This study used a dataset from a program called EKN Nutrition Program, which was a three year Nutrition program financially supported by the embassy of the Kingdom of the Netherlands (EKN) and implemented by UNICEF from 2014 to 2016 with the goal of contributing to the national objective of reducing stunting among under five years old children in Rwanda. The main specific objective of the program was to reduce stunting among children of below five years in the eight districts where the program was implemented, which are Nyaruguru, Nyamasheke, Kamonyi, Muhanga, Gisagara, Karongi, Gatsibo and Gicumbi. These districts have been selected due to having high levels of stunting, food insecurity and poverty(35).

3.2 Study Design

By the design, this study was based on secondary data analysis using the EKN Endline Survey data (2014-2016). The endline survey of EKN Nutrition program was cross sectional where, pregnant women, lactating women and children younger than five were selected randomly from households from the eight target districts namely Nyaruguru, Muhanga, Nyamasheke, Kamonyi, Gisagara, Gicumbi, Karongi and Gatsibo. The number of surveyed households is 4118 with 3664 mothers of under five years old children and 454 pregnant women. The data were collected during the period of August to September 2016. Trained enumerators supervised by a team from the University of Rwanda collected data and tablets were used for the data collection.

In this particular secondary data analysis study, we were interested in the mothers of under-five children and secondary data analysis was done to inform us on the factors associated with handwashing after the identified critical moments of handwashing. Those critical moments of mothers washing their hands in this study were washing hands after toilet, after cleaning child bottom following child defecation as well as before eating meals and before feeding the child. However, the handwashing moment of washing the hands before preparation of food or washing hands before preparing food was not considered in the study analysis because there was no stated question about it in the EKN Nutrition endline survey database.

3.2.1. Conceptual Framework



3.2.2. Dataset and measurements

This study concentrated mainly on mothers of under-five children and the dataset enclose different quantitative data pertaining to handwashing, socio demographic economic characteristics, and environmental or background characteristics as well.

3.2.2.1. Specification of variables

In this study, the followings were predictor and outcome variables under consideration

Table 1 Study variable list and their definitions

Variable	Names of measures	Definition	Variable(s) required from EKN
Outcome variable (s)	Handwashing moments (after toilet, after child defecation, before eating and before feeding the child). (Categorical variable)	Those mothers who reported to wash their hands or not after toilet, after cleaning the bottom of the child, following child defecating, before eating and/or before feeding the child	1. Prevalence of handwashing after toilet and after child defecation among mothers of U5 2. Prevalence of mothers handwashing before eating and before feeding child
Predictors	Social demographic and economic status	1. Age: Mother and head of HH' age in years at time of data collection	1. Mother's date of birth and enrollment / admission date
		2. Marital status	2. Civil status
		3. Main occupation	3. Source of income
		4. Education level	4. Reading and write, highest education level
		5. Wealth category	5. Ubudehe categories, access to agriculture land, livestock
		6.	6.

Variable	Names of measures	Definition	Variable(s) required from EKN
	Environmental or background characteristics	1. Buying water in HH	1. Water for home use
		2. Time to collect water	2. Duration for fetching water (in minutes or hours)
		3. Water treatment prior to drinking	3. Treatment methods for water or not
		4. Amount of water used in HH	4. Number of cans (20 Litter each)
		5. Hand washing stations	5. Present or not
		6. Toilet facilities	6. Present or not, types and shared or not
		7. Bathing child	7. Number of times or frequency
		8. Participate in deworming	8. Yes or not
		9. Participate in WASH/CBEHPP	9. Yes or not

3.3. Data analysis

Using the existing data under the EKN Nutrition endline survey database, we have described the socio demographic, economic and environmental characteristics of the selected households, mothers and household heads. The distribution of handwashing among mothers considering four hand washing critical moments was identified. Those four handwashing critical moments are after using toilet, after cleaning child bottom following child defecation, before eating and before feeding the child. The factors associated with handwashing moments, following their high prevalence of mothers who do not wash hands, were also identified.

For data analysis, we used an IBM SPSS Statistics version 21 and described predictor variables using frequency and percentage and outcome of interest using tables.

To assess the association between predictor variables and outcome of interest we performed a bivariate analysis using chi squared test. Predictors were put together in multivariable analysis, using a binary logistic regression model to assess the direction of association between variable of interest and the explanatory variables.

3.4 Specific objectives achievement

Descriptive statistics were conducted to determine the prevalence of handwashing considering the four critical handwashing moments identified in the dataset (Table 2), a computed variable named “Handwashing moments” of washing hands considering the critical moments was created, and its prevalence determined (see Table 3). To find out the explanatory factors associated with handwashing moments, a χ^2 test was applied. Only the variables, which were statistically associated with the outcome variable (handwashing moments with $\chi^2 p < .05$) were sent to the binary logistic regression model. This was to test the strength of the association and identify the independent determinants of mothers washing or not their hands considering handwashing moments. The cutoff point for statistical significance (p value) was at least 0.05.

3.5 Ethical consideration

The present study used a database from EKN Nutrition Endline Survey. An approval to access the database was provided by the department of Human Nutrition and Dietetics at the University of Rwanda, College of Medicine and Health Sciences, school of Public Health (see Appendix 1). As requested by owners, the database was confidentially treated and no effort was made to trackback individual participants.

Chapter 4: Results

4.1 Distribution of handwashing practices and Moments (Prevalence)

Household characteristics comprise of the characteristics of handwashing and of the mother and head of households, Socio demographic and economic characteristics, and environmental characteristics and mothers characteristics.

Table 2 Distribution of handwashing moments among mothers considering the time of washing hands

	Frequency	Percentage
Time to wash child hands: Before eating (Mother)		
No	177	4.8%
Yes	3487	95.2%
Time to wash hands: Before feeding the child		
No	937	25.6%
Yes	2727	74.4%
Time to wash child hands: After using toilet		
No	1476	40.3%
Yes	2188	59.7%
Time to wash hands: After attending a defecating child		
No	1725	47.1%
Yes	1939	52.9%

Note: The questions were asked to the 3664 mothers of children below five years old

Table 2 of the distribution of handwashing among mothers considering the time of washing hands descriptive summarizes the percentage of those who reported to wash their hands either before eating, before feeding the child, after using toilet and/or after attending a defecating child. Some mothers responded either “Yes” or “No” to more than one points/sub-question. For instance responding “Yes” to washing child hands before eating and after child defecation.

Some respondents reported to wash their hands before eating (95.2%) and before feeding the child (74.4%). However, some mothers reported to not wash their hands after toilet (40.3%), after attending a defecating child (47.1%), before feeding the child (25.6%) and before eating (4.8%).

Table 3 Distribution of Handwashing moments

	Frequency	Percentage
Handwashing moments		
Yes	1476	40.3 %
No	2188	59.7 %

Table 3 summarizes the percentage of handwashing either after toilet and/or after cleaning child bottom following child defecation, before eating and/or before feeding the child). 59.7% of the mothers reported not to wash their hands considering the critical handwashing moments while 43.4% reported to wash their hands.

Table 4 Practice of handwashing among mothers of under five years children with handwashing critical moments

Handwashing practices of mothers	With water only		With water and soap		Total N
	N	Percentage	N	Percentage	
Before eating					
No					
Yes	631	22.5%	2703	77.5%	3487
Before feeding the child					
No					
Yes	495	18.2%	2232	81.8%	2727
After using toilet					
No					
Yes	327	38.5%	1861	66.1%	2188
After attending a defecating child					
No					
Yes	274	14.1%	1663	85.9%	1937

From table 4, 77.5% of mothers who reported to wash their hands before eating use water and soap. The mothers who reported to use water and soap among those who reported to wash hands before feeding child are 81.8%. 66.1% of those who reported to wash hands after using toilet, use water and soap. Furthermore, 85.9% of mother who reported to wash hands after child defecation use water and soap and 77.5% of mothers reported to wash hands before eating using water and soap.

Table 5 Household characteristics

	Frequency	Percentage
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Household Size		
3 or Less	356	19.1
4 to 5	768	41.2
More than 5	742	39.8
Total	1866	100.0
Ubudehe Category		
Poorer	599	15.7
Poor	1432	37.6
Richer	1773	46.6
Total	3804	100.0
Floor of the house		
Soil or Cow dung	3528	85.7
Cemented, bricks or other	590	14.3
Total	4118	100.0
Access to agricultural land		
Yes	3298	80.1
No	820	19.9
Total	4118	100.0
HH own any livestock		
Yes	2371	57.6
No	1745	42.4
Total	4116	100.0

Table 5 of household characteristics summarizes the size of households, wealth categories, the floor of households by observation, access to agricultural land and owning livestock. 41.2% of the surveyed households were composed of 4 to 5 individuals per household, 39.8% had more than 5 people living in the household and only 19.1% had 3 or less people living in the household. 85.7% of the household floors were either covered by soil or cow dung while only 14.3% were cemented or covered by bricks. Moreover, 19.9% of the households did not own any agricultural land while 80.1% own some agricultural land. Furthermore, 42.4% households did not own any livestock while 57.6% reported to own livestock.

Table 6 Household heads characteristics

	Frequency	Percentage
Sex of the HH head		
Male	3814	92.6
Female	304	7.4
Total	4118	100.0
Age of the HH head		

< 21	21	.5
21-35	2255	55.4
36-59	1593	39.2
60 +	198	4.9
Total	4067	100.0
Marital status of the HH head		
Married/ Living with a partner	3726	90.5
Divorced, widowed, never married	390	9.5
Total	4116	100.0
Husband has another household		
Yes	350	8.5
No	3213	78.0
HHH Ever been to school		
Yes	3159	76.7
No	959	23.3
Total	4118	100.0
HHH highest school level		
None	959	23.3
Primary incomplete	1577	38.3
Primary complete	1291	31.4
Any secondary or higher	291	7.1
Total	4118	100.0
Main occupation (HH Head)		
Farmer	3486	84.8
Off farm	625	15.2
Total	4111	100.0

Table 6 summarizes the household head characteristics where the results show that, females headed 7.4% households and males headed 92.6% households.

55.4% of the household heads are between 21-35 years old and 39.2% have the age between 36-59 years. 9.5% live without partners while 90.5% live with partners either legally or illegally, 23.3% of household heads have never been to school, 38.3% reported that they have not completed primary, 31.4% have completed primary school and only 7.1% reported that they have been at least to high school or higher.

Table 7 Characteristics of the pregnant women and Mothers

	Frequency	Percentage
Age of the mother		
<19	81	2.0
19-35	3028	73.5
36-49	988	24.0

>49	21	.5
Total	4118	100.0
Marital status?		
Married/ Living with a partner	3564	89.1
Divorced, widowed, never married	437	10.9
Total	4001	100.0
Ever attended school		
Yes	3303	80.2
No	697	16.9
Education level		
None	697	17.4
Primary incomplete	1778	44.5
Primary complete	1139	28.5
Any secondary or higher	386	9.7
Able to read and write (Mother)		
Yes	3118	75.8
No	998	24.2
Main occupation		
Farmer	3683	92.1
Off farm	318	7.9
Sex of the First child		
Male	1719	41.7
Female	1835	44.6

The results on pregnant women and mother characteristics depicted in table 7 elucidate that 2.0% were less than 20 years old, 73.5% were between 19 and 35 years old, 24% were between 36 and 49 years old and 0.5% were over 49 years old. Moreover, 10.9% live without partners (Divorced, widowed, never married). 16.9% of mothers reported to have never attended school, 44.5% of mothers did not complete primary school, and 24.2% did not know how to read and to write. 92.1% depend on agriculture as main occupation while only 7.9% have other off farm main occupations. Furthermore, 44.6% of the first children in the families were females.

Table 8 Distribution of environmental characteristics of the Households

	Frequency	Percentage
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Buying water		
Yes	610	15.0
No	3460	85.0
Time spent to collect water		
Less than 30 min	2161	53.1
Between 30-60 min	1313	32.3
Between 1-2 hours	491	12.1
2 hours or more	102	2.5
Number of cans (20 liters yellow can) used per day in HH		
less than 1	77	1.9
1 can	978	24.0
2 cans	1773	43.6
3 cans	859	21.1
4 cans	232	5.7
5 and more	148	3.6
I don't know	2	.0
Total	4070	
Water treatment prior to drinking		
Boil	1324	32.2
Strained through cloth	9	.2
Ceramic, sand or other Filter	85	2.1
Purifying tablets	67	1.6
Nothing	2633	63.9
Total	4118	100.0
Presence of hand washing station at HH		
Yes	656	15.9
No	3461	84.1
Total	4117	100.0
Toilet facility at HH		
Yes	3947	95.8
No	171	4.2
Total	4118	100.0
Type of toilet facilities used at HH		
flush toilet	39	1.0
Pit latrine	3871	98.1
Bucket toilet	3	.1
VIP Latrine	32	.8
Total	3945	100.0
Sharing toilet with other HH		
Yes	341	8.6
No	3606	91.4
Time to wash child hands: Before feeding		

No	848	23.1
Yes	2816	76.9
Total	3664	100.0
Time to wash child hands: After defecation		
No	2045	55.8
Yes	1619	44.2
Total	3664	100.0
Time to wash child hands: When/While washing the body of the child		
No	689	18.8
Yes	2975	81.2
Total	3664	100.0
What do you use to wash your hands with?		
Water only	849	23.2
Water and soap	2813	76.8
Participate in Deworming programs		
Yes	1990	48.3
No	2128	51.7
Total	4118	100.0
Participate in: Community Health Clubs		
Yes	1134	27.5
No	2984	72.5
Total	4118	100.0

The results on environmental characteristics depicted in table 8 elucidate that 15% of mothers reported to buy water for home use, 12.1% spend between one to two hours to get water, 32.3% spend between 30-60 minutes and 53.1% spend less than 30 minutes to get water from water source. 43.6% reported to use two jelly cans of water per day, 84.1% of households did not have handwashing stations, and 95.8% of households had toilet facilities. 23.2% of mothers reported to wash their hands using only water. 51.7% of mothers reported to not have been part of deworming programs and 72.5% reported to not have been part of the community Health clubs.

4.2. Socio demographic and economic characteristics associated with handwashing moments

Table 9 Household characteristics and mothers handwashing

	Not washing hands		Washing hands		Total		P value
	N	Percent (%)	N	Percent (%)	N	Percent (%)	
Household members							
3 or Less	197	18.4	159	20.0	356	19.1	.493
4 to 5	452	42.2	316	39.7	768	41.2	
More than 5	421	39.3	321	40.3	742	39.8	
Wealth category (ubudehe) of the HH							
Poorer	359	17.5	191	14.4	550	16.3	.041
Poor	743	36.1	517	39.0	1260	37.2	
Richer	954	46.4	619	46.6	1573	46.5	
HH floor observation							
Soil or Cow dung	1933	88.3	1222	82.8	3155	86.1	.000
Cemented, bricks or other	255	11.7	254	17.2	509	13.9	
Access to agricultural land (HH)							
Yes	1768	80.8	1173	79.5	2941	80.3	.320
No	420	19.2	303	20.5	723	19.7	

Table 9 shows household characteristics that are associated with the four handwashing moments. The two household characteristic that are associated with the four handwashing moments are the household floor observation and wealth category ($P < 0.05$). The fact of a household having a cemented floor or not is associated with mothers handwashing practices considering the four handwashing moments ($P < 0.05$).

Table 10 Household heads characteristics and mothers handwashing

	Not washing		Washing hands		Total		P value
	N	Percent	N	Percent	N	Percent	

Sex of household head							
Male	1992	91.0%	1388	94.0	3380	92.2	.001
Female	196	9.0	88	6.0	284	7.8	
Age of household head, grouped							
< 21	16	0.7	2	0.1	18	0.5	
21-35	1157	53.6	818	56.1	1975	54.6	.046
36-59	872	40.4	567	38.9	1439	39.8	
60 +	112	5.2	72	4.9	184	5.1	
Marital status of the head of household							
Lives with partner	1968	89.9	1331	90.3	3299	90.1	.726
Lives without partner	220	10.1	143	9.7	363	9.9	
HHH ever attended school							
Yes	1614	73.8	1181	80.0	2795	76.3	.000
No	574	26.2	295	20.0	869	23.7	
Polygamous husband							
Yes	201	9.2	112	7.6	313	8.5	.147
No	1671	76.4	1164	78.9	2835	77.4	
Education of household head							
None	574	26.2	295	20.0	869	23.7	
Primary incomplete	882	40.3	536	36.3	1418	38.7	.000
Primary complete	630	28.8	502	34.0	1132	30.9	
Any secondary or	102	4.7	143	9.7	245	6.7	
Main occupation of HH Head							
Farmer	1886	86.4	1240	84.2	3126	85.5	.067
Off farm	298	13.6	233	15.8	531	14.5	

Table 10 illustrate that some household heads characteristics are associated with handwashing practices considering the four-handwashing moments. Those are sex, age and education of the household head (P value<0.05). The marital status and main occupation of the household head were not associated with handwashing practices considering the four-handwashing moments (P value≥0.05).

Table 11 Mothers characteristics and handwashing considering the four handwashing moments

	Not washing hands		Washing hands		Total		Chi ² P value
	N	Percent	N	Percent	N	Percent	
Age of the mother							
<19	40	1.8	37	2.5	77	2.1	.104
19-35	1582	72.3	1077	73.0	2659	72.6	
36-49	549	25.1	358	24.3	907	24.8	
>49	17	0.8	4	0.3	21	0.6	
Marital status of the mother							
Lives with partner	1872	88.2	1276	89.6	314	88.8	.187
Lives without partner	251	11.8	148	10.4	399	11.2	
Mother ever attended school							
Yes	1716	78.4	1201	81.4	291	79.6	.014
No	407	18.6	222	15.0	629	17.2	
Education of Mothers							
None	407	19.2	222	15.6	629	17.7	.000
Primary incomplete	964	45.4	621	43.6	1585	44.7	
Primary complete	606	28.5	398	28.0	1004	28.3	
Any secondary or	146	6.9	182	12.2	328	9.2	
Able to read and write (Mother)							
Yes	1606	73.5	1158	78.5	2764	75.5	.001
No	580	26.5	318	21.5	898	24.5	
Main occupation of Mother							
Farmer	1965	92.6	1309	91.9	327	92.3	.488
Off farm	158	7.4	115	8.1	273	7.7	

Table 11 illustrates that some mother characteristics are associated with handwashing practices considering the four-handwashing moments. Those are the fact of mother having been attended school, education of the mother and the ability of the mother to read and write (P value \leq 0.05). The marital status and main occupation of the mother were not associated with handwashing moments (P value \geq 0.05).

Table 12 Logistic regression model for Socio demographic and economic characteristics, and handwashing critical moments

	OR	95% C.I. for OR	P value
Sex of household head			
Male	1		

Female	0.690	[0.509 - 0.936]	0.17
Age of HH head			
< 21	1		.131
21-35	4.489	[0.996 - 20.236]	.051
36-59	4.407	[0.976 - 19.890]	.054
60 +	5.625	[1.205 - 26.249]	.028
HH Head ever attended school			
Yes	1		
No	0.562	[0.395-0.801]	≤0.001
Education of household head			
None	1		.002
Primary incomplete	0.617	[0.441-0.864]	.005
Primary complete	0.796	[0.570 – 1.111]	.179
Mother ever attended school			
Yes	1		
No	1.617	[1.414-1.921]	0.018
Education of the mother			
None			.001
Primary incomplete	0.636	[0.477 – 0.847]	.002
Primary complete	0.584	[0.437 – 0.780]	.000
Mother' ability to read and write			
Yes	1		
No	0.899	[0.691 – 1.171]	0.430
Wealth category			
Poorer	1		0.023
Poor	1.302	[1.043-1.623]	0.019
Richer	1.089	[1.043-1.356]	0.444
HH Floor observation			
Soil or cow dung	1		
Cemented, bricks or other	1.293	[1.039-1.608]	0.021

From Table 12 of logistic regression, the odds of not washing hands considering the four handwashing critical moments is 5.625 {95% CI (1.205 - 26.249)} times higher in mothers whose household' heads are above 60 years old than in mothers whose household heads are below 21 years of age ($P \leq 0.05$).

Relative to the mothers whose households heads ever attended school, the odds of not washing hands considering at least one of the four handwashing critical moments was 0.562 {95% CI (0.395-0.801)} times lower among mothers whose household heads have never attended school ($P \leq 0.001$).

The odds of not washing hands considering at least one of the four handwashing critical moments was 0.617 {95% CI (0.441-0.864)} times lower in mothers whose household heads have not completed primary than in mothers whose household heads have not been in primary school ($P \leq 0.05$).

Relative to the education of the mother, the odds of not washing hands considering the handwashing critical moments was 1.617 {95% CI (1.414-1.921)} times higher among mothers who reported to have never attended school than mother who have attended school ($P < 0.05$).

Interestingly, the odds of not washing hands was 1.293 {95% CI (1.039-1.608)} times higher among mothers whose household floor was cemented or made of bricks than mothers whose household floors were just soil or covered by cow dung ($P \leq 0.05$).

4.3. Environmental characteristics associated with handwashing moments

Table 13 Household environmental characteristics and handwashing moments

	Not	washing	Washing	Total	
	N	Percent	N	Percen	N
				Percen	P value

Buying water							.000
Yes	275	12.7	266	18.3	541	14.9	
No	1897	87.3	1189	81.7	3086	85.1	
Time spent to collect water							
Less than 30 min	1189	54.8	737	50.7	1926	53.1	
Between 30-60 min	718	33.1	446	30.7	1164	32.1	.000
Between 1-2 hours	232	10.7	211	14.5	443	12.2	
2 hours or more	31	1.4	60	4.1	91	2.5	
Number of cans (20 liters yellow can) used per day in HH							
less than 1	46	2.1	22	1.5	68	1.9	
1 can	542	25.0	315	21.6	857	23.6	
2 cans	941	43.3	647	44.5	1588	43.8	
3 cans	461	21.2	308	21.2	769	21.2	.004
4 cans	120	5.5	92	6.3	212	5.8	
5 and more	60	2.8	71	4.9	131	3.6	
I don't know	2	0.1	0	0.0	2	0.1	
Water treatment prior to drinking							
Boil	572	26.1	582	39.4	1154	31.5	
Strained through cloth	2	0.1	6	0.4	8	0.2	.000
Ceramic, sand or other Filter	40	1.8	31	2.1	71	1.9	
Purifying tablets	33	1.5	29	2.0	62	1.7	
Nothing	1541	70.4	828	56.1	2369	64.7	
Presence of hand washing station at HH							
Yes	293	13.4	299	20.3	592	16.2	.000
No	1895	86.6	1176	79.7	3071	83.8	
Toilet facility at HH							
Yes	2080	95.1	1430	96.9	3510	95.8	.007
No	108	4.9	46	3.1	154	4.2	
Type of toilet facilities							
Flush toilet	14	0.7	23	1.6	37	1.1	.001
Pit latrine	2055	98.8	1386	97.0	3441	98.1	
Bucket toilet	0	0.0	2	0.1	2	0.1	
VIP Latrine	11	0.5	18	1.3	29	0.8	
Sharing toilet with other HH							
Yes	175	8.4	126	8.8	301	8.6	.679
No	1905	91.6	1304	91.2	3209	91.4	
Time to wash child hands: Before feeding							
No	615	28.1	233	15.8	848	23.1	.000
Yes	1573	71.9	1243	84.2	2816	76.9	
Time to wash child hands: After defecation							
No	1547	70.7	498	33.7	2045	55.8	.000

Yes	641	29.3	978	66.3	1619	44.2	
Time to wash child hands: When/While washing the body of the child							
No	623	28.5	66	4.5	689	18.8	.000
Yes	1565	71.5	1410	95.5	2975	81.2	
Washing hands with							
Water only	681	31.1	168	11.4	849	23.2	.000
Water and soap	1506	68.9	1307	88.6	2813	76.8	
Participate in Deworming programs							
No	1203	55.0	471	31.9	1674	45.7	.000
Yes	985	45.0	1005	68.1	1990	54.3	
Participate in: WASH/CBEHPP							
No	1747	79.8	783	53.0	2530	69.1	.000
Yes	441	20.2	693	47.0	1134	30.9	

Table 13 shows that some environmental characteristics are associated with mothers handwashing practices considering the four handwashing moments (P value <0.05). Those include the fact of buying water, time spent to fetch water, the amount of water used per day, water treatment prior to drinking, presence of hand washing stations, toilet facilities as well as participation in deworming and CBEHPP programs. Sharing toilet with other households was not associated with handwashing moments (P value ≥ 0.05) among mothers of under-five children.

Table 14 Logistic Regression Model for environmental characteristics and handwashing critical moments

	OR	95% C.I. for OR	P value
Buying water for home use			
Yes	1		

No	.593	[0.466 - 0.755]	< 0.001
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Time spent to fetch/collect water

Less than 30 min	1		< 0.001
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between 30-60 min	1.398	[1.152 - 1.696]	≤ 0.001
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between 1-2 hours	1.851	[1.409 - 2.433]	< 0.001
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2 hours or more	2.780	[1.620 - 4.771]	< 0.001
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Water used at HH level per day (cans of 20L)

less than 1	1		.387
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1 can	1.081	[0.557 - 2.096]	.818
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2 cans	1.091	[0.568 - 2.094]	.794
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3 cans	0.872	[0.448 - 1.699]	.687
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4 cans	0.981	[0.474 - 2.030]	.958
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5 and more	1.393	[0.641 - 3.029]	.403
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Water treatment prior to drinking

Boil	1		.018
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Strained through cloth	5.755	[0.680 - 48.684]	.108
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Ceramic, sand or other Filter	0.526	[0.296 - 0.937]	.029
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Purifying tablets	0.909	[0.495 - 1.671]	.759
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Nothing	0.791	[0.653 - 0.959]	.017
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HH having a hand washing station

Yes	1		
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No	0.672	[0.533 - 0.848]	.001
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Type of toilet facilities used by members of the HH

Flush toilet	1		.531
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Pit latrine	0.853	[0.366 - 1.987]	.713
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VIP Latrine	1.699	[0.485 - 5.948]	.407
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Time to wash child hands: Before feeding

No	1		
Yes	1.154	[0.931 - 1.430]	.192
Time to wash child hands: After defecation			
No	1		
Yes	5.079	[4.219 - 6.114]	.000
Time to wash child hands: When washing the body of the child			
No	1		
Yes	11.743	[8.677 - 15.890]	.000
Washing hands with:			
Water only	1		
Water and soap	2.390	[1.906 - 2.997]	.000
Participate in: Deworming programs			
No	1		
Yes	1.591	[1.314 - 1.927]	.000
Participate in: WASH/CBEHPP			
No	1		
Yes	2.293	[1.875 - 2.805]	.000

From Table 14 of logistic regression through binary regression, the odds of not washing hands considering at least one of the four handwashing critical moments is 0.593 {95% CI (0.466 - 0.755)} times lower in mothers who did not buy water for home use than in mothers who reported to buy water ($P \leq 0.001$).

Relative to the mothers whose households spend less than 30 minutes to fetch water, the odds of not washing hands considering at least one of the four handwashing critical moments was 1.398 {95% CI (1.152 - 1.696)} times higher among mothers whose household spend between 30-60 minutes to fetch water ($P \leq 0.001$). The odds of not washing hands was 1.851 {95% CI (1.409 - 2.433)} times higher among mothers whose households spend between 1-2 hours to collect water for home use ($P \leq 0.001$) and 2.780 {95% CI (1.620 - 4.771)} times higher in mothers who spend 2 hours or more to fetch water ($P \leq 0.001$).

Chapter 5. Discussions

The promotion of hand hygiene is an important practice of public health to reduce or prevent different hygiene related diseases including transmission of diarrhea pathogens.

The study was conducted to establish the prevalence of handwashing among mothers of under-five using secondary data analysis from the dataset of the endline of EKN Nutrition program conducted in eight districts.

This study showed that majority of mothers (Table 2) reported to wash hands before having their meals (95.2%) and before feeding the child (74.4%). However, some mothers (Table 2) reported to not wash their hands after toilet (40.3%), after attending a defecating child (47.1%), before feeding the child (25.6%) and before eating (4.8%).

In this study, 81.8% and 85.9% of respondent mothers respectively practiced handwashing with water and soap before giving food to their children and after cleaning child bottom after child defecation, and 77.5% reported to wash hands with water and soap before having food. In addition, 66.1% of respondent mothers reported that they wash their hands with water and soap after visiting toilet (Table 4). Ray et al (2009), in their study among rural and urban Kolkata communities, it was found that 59% and 21% participants reported to wash hands after toilet and after cleaning child bottom respectively with water and soap and 64% of them reported to wash hands before food preparation (36). The prevalence of using soap and water while washing hands after toilet and after cleaning the child, as reported by Scott et al (2003), was only 34% and 35% respectively (37).

There has been prominence of handwashing practices using water and soap in the current years globally and the vision of the global day of handwashing is becoming a culture locally and globally. There is low frequency of washing hands with water and soap and in consideration of handwashing critical moments despite the high prevalence of people who wash hands with water globally. To ensure sustainable and improved practices of handwashing, it is recommended to use multimodal approaches to increase the compliance with hand washing (38).

Analysis of the computed variable named “handwashing moments” combining the four identified handwashing critical moments in this study (before eating, before feeding child, after toilet and after cleaning child who was just defecating) showed that 59.7% of the mothers reported not to wash their hands, considering the critical handwashing moments. Meaning either after toilet and/or after child defecation, before eating or before feeding the child, while 43.4% reported to

wash their hands at least at one of the moments (Table 3). This looks alarming due to the fact that poor or no hand hygiene may result in a number of deadly bacterial transmissions (30) including diarrheal disease pathogens (7)(39) which are usually transmitted through the fecal-oral route, ingestion of food and water contaminated by faecal matter, person-to-person contact, or direct contact with infected feces (7).

The household floor observation was associated with mothers not washing hands after toilet and after child defecation (Table 9), implying that a household having a cemented floor or not is associated with mothers not washing their hands considering the four handwashing critical moments ($P \text{ value} \leq 0.05$). The floor being cemented or not may indicate the presence of some bacterial and make hand hygiene a bit complicated due to frequency required for handwashing (1).

The likelihood of mothers to not wash hands considering at least any of the four handwashing critical moments was 5.625 {95% CI (1.205 - 26.249)} times higher in mothers whose household heads are above 60 years old than in mothers whose household heads are below 21 years of age ($P \leq 0.05$). In addition, the mothers from the households whose heads have been to school were more likely to wash their hands than those from households whose heads have not been to school ($P \leq 0.001$). Moreover, the study showed that mothers who have been at school were more likely to wash their hands than mothers who have not been at school (Table 12) implying that education was associated with handwashing among mothers. There is need to address the issue of hand hygiene combining both knowledge improvement and education in general for better prevention and control of certain communicable diseases specially diarrhea (40)(41).

Water availability in terms of buying water, time spent to fetch water, the amount of water available and water treatment prior to drinking were found associated with mothers washing their hands after at least one of the four handwashing critical moments. Moreover, the presence of hand washing stations, toilet facilities as well as participation in deworming and CBEHPP programs were also strongly associated with mothers handwashing (Table 13). The likelihood of not washing hands considering at least one of the four handwashing critical moments is 0.593 {95% CI (0.466 - 0.755)} times lower in mothers who did not buy water for home use than in mothers who reported to buy water ($P \leq 0.001$). Furthermore, in relation to the mothers whose

households spend less than 30 minutes to fetch water, the likelihood of not washing hands considering at least one of the four handwashing critical moments was 1.398 {95% CI (1.152 - 1.696)} times higher among mothers whose household spend between 30-60 minutes to fetch water ($P \leq 0.001$). The odds of not washing hands was 1.851 {95% CI (1.409 - 2.433)} times higher among mothers whose households spend between 1-2 hours to collect water for home use ($P \leq 0.001$) and 2.780 {95% CI (1.620 - 4.771)} times higher in mothers who spend 2 hours or more to fetch water ($P \leq 0.001$). This means that, the longer the time for household to collect water for home use, the higher the risk of not washing hands among those mothers of under-five children.

Some of the noticeable risk factors of contact with fecal matter are the behaviors of poor disposal of feces, poor hand washing after toilet, after touching feces and before food handling (42). The WHO and the Council of Global Hygiene as well as the International Forum of Hygiene emphasizes o different practices that promote the changes in behavior towards improved practices of handwashing. These include improving the supply of water at the level of household and community with interventions of promoting hygiene (43). Improvement of practices of handwashing in health care has a public health significance in different individuals especially among children of below five years and their mothers and/or caregivers (42)(43).

Chapter 6. Conclusion and Recommendations

6.1. Conclusion

Understanding handwashing practices among mothers of under-five was the major concern of this study.

The household floor observation, sex, age, education, ability to read and write and occupation of the mother and/or of the household head were associated with mothers not washing their hands considering at least one of the four-handwashing critical moments. In addition, other aspects such as buying water, time spent to fetch water, the amount of water used per day, water treatment prior to drinking, presence of hand washing stations, toilet facilities, participating in deworming programs as well as participation in CBEHPP programs were associated with mothers not washing their hands.

Furthermore, the time spent to fetch water for home use was found associated with mothers washing their hands, meaning that the longer time for household to collect water for home use, the higher the risk of not washing hands among those mothers of under-five children.

Hand washing is a recommended practice for reduction of childhood mortality and morbidity and the different communicable diseases such as diarrhea and acute respiratory infections. However, there is still limited knowledge and handwashing practices in consideration of handwashing critical moments in rural mothers. Different diarrheal related illnesses can be prevented through proper practices of hygiene and sanitation that include effective hand washing at critical moments (after toilet, after cleaning child bottom following child defecation, before eating and feeding child, and before food preparation).

6.2. Recommendations

Emphasizing on improvement, sustainability and ownership of sanitation infrastructures may be helpful in improving and increasing awareness on the importance of hand washing for prevention of poor hygiene related diseases and indeed malnutrition.

Long term and extensive initiatives in relation to both changing behavior and improving availability of sanitation facilities should be undertaken to make people aware about the effectiveness of hand washing and have easy and cheap access to hygiene and sanitation facilities.

Deep analysis including qualitative analysis for a better understanding of some aspects such as the fact that mothers who reported not to buy water for home use are less likely to not wash their hands (OR= 0.580, $P \leq 0.001$) than those who reported to buy water for home use. Better understanding of reasons why mothers from households whose heads are young are less likely to not wash their hands compared to mothers from household headed by older household heads. In other words, the younger is the household head; the lower is the risk of mother not washing hands after toilet and after child defecation.

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APPENDICES

APPENDIX I: Approval to use Program data



UNIVERSITY of
RWANDA

SCHOOL OF PUBLIC HEALTH

HUMAN NUTRITION AND DIETETICS

TO WHOM IT MAY CONCERN

Re: Permission for Ms Betty INGABIRE to use EKN dataset for her Master Thesis (MPH)

This is to confirm that Ms Betty INGABIRE was granted permission to use the dataset of the EKN Nutrition program endline survey for her Master thesis entitled “Compliance with Handwashing among Mothers of Under-five Children - A Secondary Data Analysis from the Endline Survey of EKN – Nutrition Program (2016/2017)”.

Herewith this letter is the minute of the HND department meeting, which authorized two MPH students including Betty to work on data set of EKN nutrition endline in their thesis.




Damien IYAKAREMYE
HoD HND Department

Tel. +250788614805

Email. diyakaremye@nursph.org

Email: principal.cmhs@ur.ac.rw

P.O Box 3286 Kigali, Rwanda

www.ur.ac.rw