
Abdelrahim Morsal Nahar Abdelgabar

B.Sc. in public health, University of Upper Nile (2000)

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Blue Nile Institute for Communicable Diseases

November, 2016

Abdelrahim Morsal Nahar Abdelgabar

Supervision Committee:

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<th>Position</th>
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<tr>
<td>Prof .Magda Elhadi Ahmed Yousif</td>
<td>Main Supervisor</td>
<td></td>
</tr>
<tr>
<td>Prof. Bakri Yousif M. Nour</td>
<td>Co- supervisor</td>
<td></td>
</tr>
</tbody>
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Date: November, 2016

Abdelrahim Morsal Nahar Abdelgabar

Examination Committee:

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<th>Position</th>
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<tr>
<td>Prof. Magda Elhadi Ahmed Yousif</td>
<td>Chairperson</td>
<td></td>
</tr>
<tr>
<td>Dr. Osama Abdelrhman Elfaki</td>
<td>External Examiner</td>
<td></td>
</tr>
<tr>
<td>Dr. Amir Mohammed Dafalla</td>
<td>Internal Examiner</td>
<td></td>
</tr>
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Examination Date: 1/11/2016
Dedication

To my parents, (My father / Mother) who support me from my early days, and planted a dream that with their prayers is getting true.

To my family, wife and children, who always light my darkness and help as possible as they could.
Acknowledgement

My thanks go to my supervisor Prof. Magda Elhadi Ahmed Yousif who has guided me through the study process with her advice; Support inspired me throughout the study period. I deeply appreciate her patience, constant motivation and encouragement.

I would like to express my deepest gratitude and appreciation for Prof. Samira Hamid Abdlerahim for her constructive encouragement, support during the thesis.

Many thanks also go to my friends who made this work easy and possible and supported me with their friendship. I would like to register my sincere gratitude to Mr. Adam Yahiya and Mr. Wayel Elamin Mustafa for his support and Thank for Students of Academic of Science and heath of West Darfur in Assisted to collect Questionnaire.

Thanks extend to the internally displaced people, in Ardamata camp for their help and support, without which this work could never be done.
Effect of Improvement of Water Supply, Sanitation and Hygiene Promotion on the Incidence of Faeco-oral Infectious Disease among the Internal Displaced People camps (IDP) in Elgenina Locality, West Darfur State, Sudan (2015)

Abdelrahim Morsal Nahar Abdelgabar

Abstract

Diarrhea remained a leading cause of mortality among children around the world with higher burden in low-and middle-income countries, and it is expected to continue as major cause of IDP camps significantly greater effort are made to control. In different IDP camps of the Sudan, diarrhea has a high prevalence, and is the main killer disease of children under-five. and help age It is assumed to be associated with poor water quality, poor sanitation, hygiene, low awareness about diarrhea risk factors, and bad home-based case management (international year of Sanitation 2008 UN WATER). The study aims to assess health promotion (increase water quality, sanitation and hygiene education and community-based intervention in reduce risks of acute diarrhea among community in IDP Radamta Camps West Darfur State Sudan during 2014–2015. This is also including measuring prevalence and incidence of diarrhea among targeted group in addition to measuring outcome of the interventions. The study too is designed as an interventional pre-post study – community based (intervention). It was conducted in 3 phases: (a) baseline survey, (b) intervention through Water Supply, sanitation health Education, health promotion and hygiene and (c) final survey. A two-stage cluster sampling procedure was used for selecting the eligible households (with IDP in Radamta Camps West Darfur Sudanese residents and which is calculated as (360) households. Variables data (demographic, diarrhea status, drinking water, hygiene practices, and Sanitation is collected in surveys using a reviewed structured questionnaire. Chi square test was performed to calculate the relationship between variables. (BEHAVIOURAL CHANGE for Sustainable action and investments in Sanitation – UNICEF.
ملخص الدراسة

الإسهال بسبب الأمراض المعدية في جميع أنحاء العالم. هناك العديد من الأمراض المعدية، و-third-party on the surface. وفي المعسكرات النازحين المختلفة في السودان، الإسهال يسبب معدلات عالية. ويعتبر المرض القاتل الرئيسي للأطفال دون سن الخامسة، وكذلك المرضى البالغين. تهدف الدائرة إلى تقييم ما إذا كان تحسين الصحة المجتمع (رفع مستوى الإصحاح وجودة المياه والصحة) بناء عليها تدخل مجتمعيًا في مثل هذه المعسكرات النازحين.

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# Table of Contents

Dedication .......................................................................................................................... 4  
Acknowledgement .............................................................................................................. 5  
Abstract ............................................................................................................................... 6  
ملخص الدراسة .................................................................................................................... 7  
Table of Contents ............................................................................................................... 8  
List of Tables ....................................................................................................................... 9  
List of Figures ...................................................................................................................... 11  
Abbreviations ...................................................................................................................... 13  
CHAPTER ONE .................................................................................................................... 1  
1. INTRODUCTION ............................................................................................................ 14  
1.1. Background .................................................................................................................. 14  
1.2. Problem statement ....................................................................................................... 15  
1.3. Rationale and public health importance of the study: .................................................. 16  
1.4. Justification: ............................................................................................................... 17  
CHAPTER TWO .................................................................................................................. 18  
2. OBJECTIVES ................................................................................................................. 18  
2.1. GeneralObjective: ...................................................................................................... 18  
2.2. SpecificObjectives: ..................................................................................................... 18  
2.3. Research question: ..................................................................................................... 18  
CHAPTER THREE ............................................................................................................. 19  
3. LITERATURE REVIEW: ................................................................................................. 19  
3.1. Global/regional situation: .......................................................................................... 19  
3.2. Country situation: ....................................................................................................... 21  
3.3 Health education and community participation: ......................................................... 22  
3.4. Sanitation...................................................................................................................... 22  
3.5. Hygiene Promotion: ..................................................................................................... 23  
3.6. Hygiene Promotion approaches and methods: .......................................................... 23  
3.7. Prevention: .................................................................................................................. 24  
3.8. Previous studies:......................................................................................................... 26
CHAPTER FOUR .................................................................................................................. 28
4. METHODOLOGY .............................................................................................................. 28
   4.1. Methods: .............................................................................................................. 28
   4.2. Study Design: ...................................................................................................... 28
   4.3. Study Area: ......................................................................................................... 28
   4.4. Study period: ....................................................................................................... 29
   4.5. Study Population: .............................................................................................. 29
   4.6. Sampling Techniques: ....................................................................................... 31
   4.7. Sample Size: ....................................................................................................... 31
   4.8. Selection Criteria: ............................................................................................. 31
   4.9. Exclusion Criteria: ............................................................................................ 32
   4.10. Method of Data Collection: ............................................................................... 32
   4.11. Analysis of Data: .............................................................................................. 32
   4.12. Ethical Consideration: ...................................................................................... 32
   4.13. Tools: ................................................................................................................ 33
CHAPTER FIVE ..................................................................................................................... 34
5. RESULTS .......................................................................................................................... 34
CHAPTER SIX ...................................................................................................................... 70
6. DISCUSSION ................................................................................................................... 70
CHAPTER SEVEN ............................................................................................................... 73
7. CONCLUSION AND RECOMMENDATIONS ............................................................... 73
   7.1. Conclusion........................................................................................................... 73
   7.2. Recommendations ............................................................................................. 74
References .......................................................................................................................... 75
Annex 1: Questionnaire: .................................................................................................. 77
Annex 2: Time Frame ........................................................................................................ 80

List of Tables

Table 1: Gender distribution of the study sample N = 360 .................................................. 36
Table 2: The ownership of agricultural land among the participants N = 360

Table 3: Waiting time per minute before collecting water among the participants N = 360

Table 4: Daily water consumption per Gerkan per household among the participants N = 360

Table 5: Last time of cleaning drinking water container among the participants N = 360

Table 6: Type of latrine shelter among the participants N = 360

Table 7: Adult location of defecation when not at home among the participants N = 360

Table 8: Child location of defecation when not at home among the participants N = 360

Table 9: Time of washing hands among the participants N = 360

Table 10: Diarrheal disease in household among the participants N = 360

Table 11: Treatment of diarrhea among the participants N = 360

Table 12: Knowledge about ORS components among the participants N = 360

Table 13: Animal home breeding among the participants N = 360
List of Figures

Figure 1: Age group distribution of the study sample N=360 ................................. 35
Figure 2: Educational level of the study sample N= 360........................................ 37
Figure 3: Farming by himself among the study sample N = 360 ............................... 39
Figure 4: The main water source for the study sample N = 360 .............................. 40
Figure 5: Distance in meters from water source among the participants N = 360 ....... 42
Figure 6: Problems facing participants when collecting water N = 360....................... 43
Figure 7: Comparison between storing drinking water in separate container before and after the educational program among the participants N = 360 .............................. 45
Figure 8: Owning latrine among the study sample N = 360................................. 47
Figure 9: Type of latrines among the study sample N = 360 ................................. 48
Figure 10: Distance between latrine and house among the study population N = 360... 50
Figure 11: Adult location of defecation when at home among the participants N = 36051
Figure 12: Child location of defecation when at home among the participants N = 36053
Figure 13: Type of cleaning anus among the study sample N = 360 .......................... 55
Figure 14: Type of washing hands among the study sample N = 360 ........................ 57
Figure 15: Reason of hand washing among the study sample N = 360....................... 58
Figure 16: Knowledge about means of transmission of diarrhea among the study sample N = 360 ............................................................................................................. 60
Figure 17: Opinion of participants towards spread of diarrhea N = 360 ...................... 62
Figure 18: Knowledge about prevention of diarrhea among the study sample N = 360 63
Figure 19: Participation in community activities among the study sample N = 360..... 65
Figure 20: Participation in women activities among the study sample N = 360 .......... 66
Figure 21: Types of animal bread by the study sample N = 360 ............................... 68
Figure 22: Site of corral among the study sample N = 360 ................................. 69
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tr>
<td>DF</td>
<td>Degrees of freedom</td>
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<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
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<td>IDP</td>
<td>Internal Displaces people</td>
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<tr>
<td>IMCI</td>
<td>Integrated Management of Child Illness</td>
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<td>MCH</td>
<td>Motherhood and Childhood Health</td>
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<tr>
<td>MDG</td>
<td>Millennium Developmental Goals</td>
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<tr>
<td>MOH</td>
<td>Ministry of Health</td>
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<td>ORS</td>
<td>Oral Rehydration</td>
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<tr>
<td>LSHTM</td>
<td>London School of Hygiene Tropical Medicine</td>
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<td>SHHS</td>
<td>Sudan Household Health Survey</td>
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<tr>
<td>UNICEF</td>
<td>United Nation International Children Emergency Fund</td>
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<td>WES</td>
<td>Water Environmental Sanitation</td>
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<td>WHO</td>
<td>World Health Organization</td>
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CHAPTER ONE

1. INTRODUCTION

1.1. Background

Diarrhea remains a leading cause of mortality among Internal Displaces People (IDP camps around the world. The burden of Diarrheal disease disproportionately affects Aruban in low- and middle-income countries who have higher incidence rates due to inadequate water and sanitation poor mother and child hygiene and nutritional risk factors, Every year, millions of the world’s poorest people die from preventable Disease caused by inadequate water supply and sanitation services. Hundreds of millions more suffer from regular about diarrhea or parasitic worm infections that run their lives woman and children are main victims. Burdened by need to carry water contains long distances every day they are must also endure the indignity, shame, and sickness that result from a lack of hygienic sanitation. Water is the basis of all life. But for millions of children, the water they drink can also be a source of persistent illness, leading to an early grave. A child dies of diarrheal disease every 30 seconds—and for every child who dies of diarrheal disease, three more children die of other diseases passed along by unwashed hands, or made more.

Deadly by chronic malnutrition resulting from constant bouts of diarrheal disease and intestinal parasites. Thus, every 7 seconds, a child in the developing world dies of WASH-related disease or WASH-related malnutrition.

The day, an estimated 1,600 children under five die from diseases linked to water, sanitation and hygiene. For just $1, UNICEF can provide (World vision. Water Sanitation and Hygiene. Sector Case Statement October-2011).

Human feces may contain a range of disease-causing organisms, including viruses, bacteria and eggs or larvae of parasites. The microorganisms contained in human feces, may enter the body through contaminated food, water, eating and cooking utensils and by contact with contaminated objects. Diarrhea, cholera and typhoid are spread in this way and are major causes of sickness and death in disasters and emergencies. (UNICEF Environmental Health EMERGENCIES DISASTERS-2002)
1.2. Problem statement

In Sudan, according to the Sudan Household Health Survey (SHHS) 2006, diarrhea prevalence was very high in different States – Unity State (50.5%), Blue Nile State (51.8%), Gadaref State (41.3%), and lowest in Red Sea State (15.2%). In different Sudan States, diarrhea is the main killer disease of children under-five; 28% of children under two years of age suffered from diarrhea two weeks before death. It kills more young children than AIDS, malaria and measles combined. Based on SHHS 2010, the majority (72%) of under-five death is infant mortality which is 79/1,000 live births. The prevalence of diarrhea among under-five in 2010 is 37%. These reflect high prevalence rate of diarrhea among under five and under 2 years. Great efforts were done in Omdurman area by SMoH to raise the awareness of caretakers about diarrhea risks, but still there is a lack of knowledge, poor hygiene and bad practices.

The World Bank Water, Sanitation Program (WSP) reports that other diarrheal diseases in IDP Camps West Darfur State. These diarrheal prevalence was very high formation from WHO 2014 (83.0%), 2015 (83.9%) in the Ardamata IDP Camps, 2014 (87.4%), 2015 (92.8%) support the conduction of this Survey in Ardamata camp (Ministry of health West Darfur (2014) from EPI Program west Darfur 2014)

- 2.6 billion people—four in ten people in the world—do not have access to a toilet.
- Every day, diarrheal disease kills 5,000 children.
- Every week, it kills 42,000 people. Every one of these deaths is tragic—and preventable.
- Without concerted action, the lack of sanitation will continue to impact the lives of billions of people and impede progress on development.
- Only 27% of people in Sudan use an improved sanitation facility.
- 1.4 million IDPs living in Darfur camps are dependent on life-saving water, sanitation and hygiene services. The need for these services may increase because of new IDPs, due to conflicts in Darfur.
- Need for new or improved water, sanitation and hygiene services for 200,000 returnees (IDPs and refugees) in their areas of origin in Darfur (2010 Sudan Household Health Survey).
- 30% have access to improved sanitation; 70% have no access. 60% have access to drinking water; 40% have no access.

- Strengthen disaster preparedness in Sudan by building the capacity of 1,000 community committees to anticipate and respond to critical water, sanitation and health needs. Work through national partners including the Government’s Water and Environmental Sanitation (WES) department for areas which have accessibility issues.

Promote durable solutions and focus on sustainable alternative technologies. (BEHAVIOURAL CHANGE for Sustainable action and investments in Sanitation – UNICEF.)

1.3. **Rationale and public health importance of the study:**

The diarrheal rate among Sudan Internal Displaces People (IDP) Ardamata camp in west Darfur relatively high comparing to others.

Camps to be associated with poor mother and child hygiene, low awareness of caretakers about diarrhea risk and bad home management of diarrhea also poor sanitation, water supply and bad community practices in the people of IDP camps.

To my knowledge, there is no interventional study was conducted to identify whether good sanitation, water supply and health promotion is effective in controlling acute diarrhea among the IDP Ardatamta camps in ELGeneinal locality.

As such study will contribute to filling the existing gap in literature and will inspire future studies in the area.

Proper planning, effective implementation of community based interventions of household and IDP health promotion activities among proper sanitation and water quality control.

The effectiveness of the household health promotion intervention will be evaluated as well the Risk factors of diarrhea among IDP have been identified. The result of the study will help to identify evidence-based interventions to promote the household health in reduction of the morbidity and mortality of diarrhea among IDP in Sudan.

Raising awareness among the household, caregivers and even medical care providers, who provide the primary health care, in order to strengthen the different community
health promotion activities to reduce child mortality by diarrhea of the new initiative of Global Action Plan to prevent diarrhea (GAPP), which was introduced in Sudan by WHO and National FMOH (Health promotion IMCI) Sudan in Nov 2012, this will help to achieve the MGD regarding reducing child mortality. (World Health organization (WHO))

1.4. Justification:

- Diarrheal Diseases is widely spread among internally displaced people (IDPs).
- There is no previous study conducted before in the selected area.
- Lack of health services.
- Poverty.
- Poor sanitation
- Poor hygiene
- Inadequate water supply
- Environmental pollution
- Insufficient lifestyle
- Socio-economic conditions
- Health and family welfare service
2. OBJECTIVES

2.1. General Objective:
To assess the effect of hygiene promotion program and improvement of the quality of water supply and sanitation on the reduction of the incidence of diarrheal diseases among IDP in Ardamata Camp, Geniena Locality, and West Darfur state.

2.2. Specific Objectives:
1. Determine access of IDPs to safe water supply & sanitary facilities.
2. Identify improvement in personal hygiene practices (with focus on hand washing) after applying the hygiene promotion program.
3. Evaluate the change in the incidence of diarrhea among IDPs following the hygiene promotion program.

2.3. Research question:
If been the improvement of water supply, sanitation and hygiene practices among local communities, and proper home-based case management), as community based interventions, would reduce the risk of developing diarrhea among Ardamata IDP camp.
CHAPTER THREE

3. LITERATURE REVIEW:

3.1. Global/regional situation:
Water-borne diseases are any illness caused by drinking water contaminated by human or animal fases, which contain pathogenic microorganisms. The full picture of water-associated diseases is complex for a number of reasons. Over the past decades, the picture of water-related human health issues has become increasingly comprehensive, with the emergence of new water-related infection diseases and the re-emergence of ones already known. Data are available for some water-, sanitation- and hygiene-related diseases (which include salmonellosis, cholera, shigellosis), but for others such malaria, schistosomiasis or the most modern infections such legionellosis or SARS CoV the analyses remain to be done.

The burden of several disease groups can only partly be attributed to water determinants. Even where water plays an essential role in Read more:

Definition
Diarrhea diseases are diseases that are caused by ingestion of contaminated water either directly by drinking or through the use of contaminated water for preparing food and personal hygiene. Water-borne diseases are diseases which are caused as a result of contamination of water used for household consumption.

How is water contaminated?
Water which is used for household consumption can be contaminated:

At the source such as wells, springs, ponds, rivers, by human or animal wastes if latrines are not commonly used.

During the process of:

• Fetching water from a protected source when unclean containers are used.

• Storing and utilizing water at home when the container is not well protected or covered.

• Hands not clean during food preparation or eating.
Water borne diseases are transmitted primarily by drinking water contaminated by feces. (The spread of guinea worm disease is not transmitted through a fecoral route.) Feces or urine from an infected person may contaminate water supplies. Healthy person acquires the infection by:

- Directly drinking water from the contaminated source
- Consumption of food prepared by contaminated water.
- Using contaminated water for personal hygiene.
- Using contaminated water for recreation (e.g. swimming) (For the Ethiopian Health Center Team)

Water is the basis of all life. However, for millions of children, the water they drink can also be a source of persistent illness, leading to an early grave. A child dies of diarrheal disease every 30 seconds— and for every child who dies of diarrheal disease, three more children die of other diseases passed along by unwashed hands, or made more deadly by chronic malnutrition resulting from constant bouts of diarrheal disease and intestinal parasites. Thus, every 7 seconds, a child in the developing world dies of WASH-related disease or WASH-related malnutrition.

According to the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), 80 percent of all childhood diseases are WASH related. While adults also suffer from WASH-related diseases, 90 percent of those who succumb to them are children under the age of 5. Even more alarming, 70 percent of these don’t survive the first year of life, and 40 percent don’t make it past the first month. Before we can help these children to thrive, we must help them simply to survive. Providing a child with access to safe water, sanitation, and hygiene is one of the most effective ways to ensure his or her survival.

Public health approaches to the prevention and control of water-borne diseases:

Water-borne diseases are one of the major public health threats especially in developing countries, where unsafe water, sanitation problems and poor hygienic practices exist. The public health approach to the prevention and control of water-borne diseases should consist of three basic components:
• Provision of safe and adequate water supply.
• Improved sanitation.
• Hygiene education.

Diarrhea Transmission:

Diarrhea spread by contamination of drinking water systems with the urine and feces of infected animal or people.

This is likely to occur where public and private drinking water systems get their water from surface waters (rain, creeks, rivers, lakes etc.), which can be contaminated by infected animals or people. Runoff from landfills, septic fields, sewer pipes, residential or industrial developments

Can also sometimes contaminate surface water.

This has been the cause of many dramatic outbreaks of faecal-oral diseases such as cholera and typhoid. However, there are many other ways in which fecal material can reach the mouth, for instance on the hands or on contaminated food. In general, contaminated food is the single most common way in which people become infected the ecology of diseases, it may be hard to pinpoint the relative importance of aquatic components of the local ecosystems (Read more:http://www.lenntech.com/library/diseases/diseases/waterborne-diseases.htm#ixzz2tHTmnxhI

3.2. Country situation:

During the mid-1990s the WHO .and UNICEF with many other agencies , institution and individual responded to the challenge of high child morbidity and mortality by developing strategy known as the integrated management of childhood illness.{IMCI} this global strategy focus on preventing and treating illness in children 2-59 months of age. IMCI was designed to cater to the most common causes of child mortality, diarrhea, pneumonia, measles, malaria and maturation. The strategy focused on promoting of health family and community behaviors as community based component. The strategy will improve and strengthen the communication with caretaker and counseling about childhood illness and mother health promotion.Health education is the profession of educating people about health. Prevention of diarrhea and consequences
should receive major emphasis in health education. The joint committee in health education and promotion terminology, defined health education as any combination of planned learning experience based on sound theories that provide individuals, groups and communities the opportunity to acquire information and the skills needed to make quality health decisions. (The Effect of Mother Health Promotion on Acute Diarrhoea among Children Under Two Years of Age at Karary Locality, Khartoum State, Sudan: 2012–2013)

3.3. **Health education and community participation:**

Health education and community participation in interventions play a key role in communicable disease prevention and control. Some areas where health education and community participation can be beneficial

- Improvising recognition of severe disease by the population.
- Improving health-seeking behavior.
- Promotion of early and appropriate use of ORS in treatment of diarrhea disease.
- Promotion of hygiene, hand-washing for prevention of diarrhea disease.
- Promotion of safe water and storage.
- Promotion of appropriate sanitation.

3.4. **Sanitation**

Sanitation includes solid waste disposal (including medical wastes), wastewater disposal, waste water reuse, human excreta disposal, and drainage of surface (rain) water. This Section deals mainly with systems for human excreta disposal, in line with the scope of this document. A distinction is made between systems that do not need water (dry systems) and systems that need water to function (waterborne systems). The following systems are described in the Fact Sheets, and they cover a wide range of technologies for Disposing of human excreta, from simple improved traditional latrines, to complex sewerage Systems:

- Basic improved traditional latrine;
- Ventilated improved pit latrine;
- Double-vault compost latrine;
• Bored whole latrine;
• Pour-flush latrine with leaching pit;
• Septic tank and aqua privy;
• Vacuum tanker;
• Manual latrine-pit emptying technology (MAPET);
• Soak away;
• Drainage field;
• Small-bore or settled sewerage

Water and sanitation –pdf – (SECURED).

3.5. **Hygiene Promotion:**

Hygiene Promotion is the planned, systematic attempt to enable people to take action to prevent or mitigate water, sanitation, and hygiene related diseases and provides a practical way to facilitate community participation and accountability in emergencies.

The priority focus of Hygiene Promotion in an emergency is the prevention of diarrhoea through:

• Safe disposal of excreta
• Effective hand washing.
• Reducing the contamination of household drinking water.

3.6. **Hygiene Promotion approaches and methods:**

The most commonly used approach to access the population in emergencies is that of identifying and training community outreach workers (volunteers/mobilizes/animators). If the health risks are very acute e.g. high risk of a cholera outbreak, it may be unrealistic to ask people to work for long hours for little remuneration. Payment in kind e.g. bicycle, tee shirts, hygiene items etc. may be an option but some agencies e.g. the government may not have the resources to provide financial or other incentives and unilateral decisions by incoming agencies may undermine efforts to ensure future sustainability. The issue is complex and needs to be addressed through the co-ordination
mechanism. (See summary of advantages and disadvantages of paying volunteers in ‘Generic job descriptions’ paper.)

A cascade system, where outreach workers (at least 1:500 per population or more if intensive work is required or if populations are spread out), are supervised by trained hygiene promoters who are supported by skilled professionals, is the most common model used, but others are possible. A network of peer educators might also be established e.g. teenagers or young mothers. Hygiene clubs could also be established in each affected area. A key aspect of the initial Hygiene Promotion assessment is to identify existing local capacity and skills. It is recommended that both the available mass media (e.g. radio or leaflets) AND other more interactive methods are employed (see orientation workshop). Even in an acute emergency, some initial discussions with individuals and community groups can take place and as the emergency evolves more widespread use of methods that foster discussion should be encouraged. Among the most useful participatory methods are ‘community mapping’ exercises, focus group discussions, exercises using visual aids to stimulate discussion and mobilization activities such as three pile sorting, chain of contamination, and pocket chart voting. An assessment of the existing resources available for hygiene promotion is important as this will help to ensure that culturally appropriate methods and tools are employed.

It is important to note that health benefits are not always the main motivating factor for changes in behavior. The need for privacy and safety, convenience, social status, and esteem may sometimes be stronger driving forces than health arguments. (Best practice materials produced through the WASH Cluster HP project 2007, c/- UNICEF)

3.7. Prevention:

Prevention of disease caused by faecal contamination depends on breaking through the fecal–oral transmission cycle control of diarrheal disease is only possible when the methods of stool disposal are improved use of properly constructed pit latrines in IDP camps or flush toilets, hand washing facilities soap, and water should be provided immediately outside Toilets and Latrines preferably there should be some facility for washing hand with Soap clean running Water, such as metal container with a tap. Wash hand after using the Toilet and always before cooking or eating.

Control Flies by proper refuse and Feces disposal this can be done by constructing ventilated and improved pit latrines sited at a proper distance from stores, storing food
where flies cannot reach it. Proper disposal in a pit away from the living areas spraying with insecticides food should always be properly cooked Raw vegetables and fresh Fruits without in fact skins should only be eaten it they can be thoroughly washed in clean drinking water from in fact fruits. Should be washed and then peeled at the time of eating, Milk should be boiled or pasteurized. Eating utensils should be properly cleaned and dried after use. Public eating places should be in speeded to ensure that the processing preparation and serving of food is done in hygienic manner.

The protection purification and chlorination of public water supplies is very important. Water from Wells can be mad safe with chlorinate of time water from deep wells is usually. Uncontaminated if there are no pit Latrines nearby.

Drinking water from other sources should be boiled control of diarrhea or filtered near each house would contribute greatly to general and personal clean lines and diminish the infection from contaminated water.

Heath education is always a helpful preventive measures Educate people about the dangers of bottle feeding and on courage the use of latrines also for children explain the importance of hand washing and cleaning utensils. Demonstrate prevention of dehydration by giving ORS solution and other available fluids Encourage antenatal attendance and immunization of in far its Educate mother about growth monitoring and prepare of food and extra for a child after any illness in order to improve and catch

Trachoma is an example of a disease caused by lack of water. The quantity of water is more important than the quality themost effective way of dealing with the Trachoma problem is to have enough Water near people’s homes if water was supplied to every house Trachoma would be completed eliminated. Cleaning of the Eyes, face and hand with clean water reduces direct transmission and the development of secondary bacterial

Acute Diarrhea is defined as at least 3 liquid stools per day for less than 2 weeks. There are 2 clinical types of acute diarrhea

1- simple diarrhea without blood, caused by Viruses in 6% of cases (Rota virus- enterotox virus) Bacteria (vibrio cholera -enter of oxygenic, Escherichia coli non – Typhus Salmonella Yesinia entercolitis) or parasitic (giardiasis).

Diseases, such as malaria, acute obits media, upper and taw ererespiratory tract infection can be bacteria jejune enterin evasive or enterhemorrhagic, Escherichia coli salmonella)
Infectious diarrheas are of contamination water or food) contact. The high mortality rate from diarrhea disease even benign is due to acute dehydration malnutrition. This can be prevented by adequate rehydration and nutrition. (FMOH, WHO and UNICEF, (SHHS 2006). Sudan Household Health Survey)

Water borne diseases can be prevented by:

- Construction and appropriate use of latrines
- Avoiding open field disposal of wastes.
- Using protected sources of water for household consumption.
- Using clean containers with appropriate coverings for fetching and storing water.
- Boiling water especially consumed by children.
- Hand - washing with soap before eating food, before preparing foods, and after visiting latrine. (For the Ethiopian Health Center Team)

3.8. Previous studies:

A total of 240 water samples were collected during the three seasons of 2009 from different sites and sources in the internally displaced camps (IDP) including bore holes, hand pumps, dug wells, water points, water reservoir and household storage containers. Samples were investigated using the most probable number method to detect and count the total coliform, faecal coliform and faecal enterococci. Enteric bacteria detected were E. coli, Enterococcus faecalis, Klebsiella, Citrobacter and Enterobacter. Household containers showed continuous level of contamination by all different bacteria throughout the three seasons. This was followed by hand pumps, both reservoir and boreholes and dug wells. Water points revealed no level of contamination throughout the three seasons. (Y. M. Eltahir ET AL, 2013)

In WATER, SANITATION, AND HYGIENE, SECTOR CASE STATEMENT: All told, some 5 million children die every year due to WASH-related disease, malnutrition, and their consequences, and at least 4 million are preventable through WASH interventions. More than half of these deaths (2.2M) are preventable with basic WASH interventions such as hand pumps, latrines, and handwashing with soap. To address the remaining 2.0M deaths requires more advanced WASH interventions such as tap water.
and flush toilets in homes, which cost at least three times as much as basic WASH measures. (WASH, 2011).

Diarrheal Infections are the second most common cause of death in children under five. A review of more than 30 studies found that hand washing with soap cuts the incidence of diarrhea by nearly half. Diarrheal diseases are often described as water-related, but more accurately should be known as excreta-related, as the pathogens come from fecal matter. These pathogens make people ill when they enter the mouth via hands that have been in contact with feces, contaminated drinking water, unwashed raw food, unwashed utensils or smears on clothes. Hand washing with soap breaks the cycle. The figure on the following page shows the effectiveness of hand washing with soap for reducing diarrhea morbidity in comparison to other interventions. (Global Hand washing, 2009).

Hand washing with soap is a life-saving intervention within the technological and financial reach of all countries and communities. However, promoting it requires appeals not necessarily to health, but to other things that people value, such as comfort, social status, nurture and a wish to avoid disgust. (Ensink, 2005)

In case the coverage in improved sanitation services is below 98%, it is likely that the fraction of diarrhoea attributable to WSH ranges between 70 and 90%. This is due to the fact that even with only 2% of inadequately disposed excreta, the level of faecal-oral pathogens in the environment is likely to be high enough that water, sanitation and hygiene play the dominant role in disease transmission. Therefore, if access to adequate sanitation is incomplete, it may not be worth refining input data on exposure for the sake of estimating disease burden. For the purpose of estimating the benefit of improving coverage, more refined exposure data would, however, be useful. (Lorna Fewtrell et al, 2007)
CHAPTER FOUR

4. METHODOLOGY

4.1. Methods:
The study was designed as an experimental pre-post study community based (intervention). It is conducted in three phases: (a) baseline survey, (b) intervention, through improvement of water supply, sanitation and hygiene practices among local communities and (c) final evaluation.

(Demographic, diarrhea status, drinking water, hygiene practices, latrines and handwashing practices) was collected in surveys using a reviewed structured questionnaire.

4.2. Study Design:
This study was an experimental pre-post interventional study to assess the effect of health related to diarrheas among Ardamata camp in AlGenena locality, West Darfur state.

4.3. Study Area:
WEST DARFUR
West Darfur state is located in western Sudan, with an area of 1531682 square kilometers bordered by the state of North Darfur and Central Darfur state, in the west by the Republic of Chad, the total population 2036282. The most important symbols of the community is Agriculture, grazing and traders. Education crowned 365 schools 209 primary school and 156 secondary, schools in the IDPs camp there is 21 School. West Darfur state is one of the five states of greater Darfur affected by the events. We have seen the state during the previous ten years and led to the displacement of a large number of population around the big cities and affected a large number of citizens, events caused by the armed conflict. Natural mountainous land sandy

The state shared with the Republic of Chad an open border, which leads to the possibility of the spread of epidemics and diseases and easy the movement of people between these two countries.
Number of the localities in the state is 8 and is considered the El Geneina town is the capital of the state. There are about (8) camps for displaced people around the El Geneina town since beginning of the crisis in 2003. The climate is a savanna region which is hot in summer and dry cool in winter, the mean annual rainfall is 72mm, mean annual humidity is 28%, and the mean annual temperature is 30 degree centigrade, there is rises 800 m above the sea and approximately 1200 km away from Khartoum and 27 km from the border with Chad, has a population of 169,259, among these there are about (8) camps for displaced people around the El Geneina town, since the beginning of the crisis in 2003. The Ardamata camp is located in eastern El Geneina, it about 6 kilometers from Genena town with an area of 10k/M².

The number of displaced people about 19,465, with Household (3,244). Services delivered by two main road and (4) primary School the health facilities in the camp, (2) health center to provide primary health care services. The most prevalent diseases are diarrhea, typhoid, dysentery, malaria and conjunctivitis. Water exist (16) hand pumps and (3) a small station for water and (2) open wells.

4.4. Study period:
The study started in October 2014 and completed in October 2015.

4.5. Study Population:
The total number of displaced people about 19,440 with household number of 3,244, the sample size was 360 household of IDP. The main Tribes were coming from different villages the majority are aslelt tribes they were displaced from Krink, Morne, Habila, Aunaim. Tama tribes form Amshalia, Hajar tama. Fur tribe form Morne, Weda, Azouemand other Tribes in Ardamta camp from eastern El Geneina Town. In addition, there were eight camps for displaced people around the El Geneina town since 2003 Darfur crisis.

Phase one (5 days):
It was a baseline assessment phase; Contacting with local authorities to get approval consist, Identification of the Data Collection team, Meeting with assessment team to discuss assessment and share responsibilities. of health centers evaluation visits, water sources exploratory visits, community leaders meetings, women groups and youth centers meetings, Red Crescent center visit and then distribution of pre-questionnaire.
during this phase data was collected through a survey, collected formation from health center, water sources there found the Sanitation and Hygiene Round the water sources.

**Phase two (3 months):**

It was the interventional phase; which consist of training of data collectors, then the interventional program (Health education, hygiene improvement, lectures on health, home visits, chlorination, cleaning of water sources, distribution of soap), this was followed by data collection from health centers and water sources, it with data collection by questionnaire. it was conduction of 10 mobilization going to distribution soap where IDP per months every30 days for 3 month.conduction of health education session at school, Lectures for group woman and community about health education, contained 4 weeks home visit, how to construction and clean latrines also clean and chlorine water points this speared from (WES) water environment sanitation. The team conducted 8 awareness raising sessions for the target group of the study (as Groups) in women centers within 6 weeks. Mini-survey took 2 weeks was conducted after this phase for the follow up by teams and community volunteers. Duration of 2 weeks as interval between phase two (intervention) and next phase 3 second phase:

**Phase three (10 days)**

It is the Contacting the assessment team, evaluation phase, Data Entry and analysis it consist of re-evaluation for the collected data, and post questionnaire data collection. The same baseline questioners were used and the evaluation was conducted by the same assessment team to eliminate the bias. and camper between before and after intervention if there fowling the phase one and phase Tow showing different Result because the Capacity Building of Community health workers in promoting community Clean latrines, water supply clean camping and clean water points and house hold visit. Integrated volunteers management program with an questioner of health, and WASH educational messages towards the community and measures such as high quality management of disposal in community centers, and proper latrines and water supply
4.6. **Sampling Techniques:**

Simple Random sampling was used in this study.

We chose our sampling by simple random sampling technique (5)A two-stage cluster sampling procedure was used for selecting the eligible respondents in the Study.

4.7. **Sample Size:**

The following equation was used to calculate the sample size. Target IDP.

\[ N = \frac{C12 \times PQ}{d^2} \]

Precision

\[ n = \text{sample size} \]

\[ CI = \text{Constant (1.96)} \]

\[ P = \text{prevalence of problem in community or (50%)} \]

\[ Q = 1-q \]

Precision = (0.05)

\[ N = 360.444 \times 0.5 \times 0.5 / 0.0025 = 360 \]

\[ e = \text{marginal error}(0.05) \]

• So that our sample size is 360HH.

The total number families (sample size) is 360 and 4 sample were rejected for mistaking and the selection of house was randomly done (stratified random sampling) using lottery method through pen direction to option the first family and next was determined according to pen direction by adding constant number (9) by divided the total number of families to sample size.

4.8. **Selection Criteria:**

• Internal Displaces People (IDP)
4.9. Exclusion Criteria:

- Population Town because they less Speared of Diarrheal Diseases. Non-Sudanese living in Alrdamta IDP camps will be excluded because the study focus on feeding practice and other believes which different from one country to another.

- Surveys: are studies aiming at accurate description for a group of specific variables.

- Surveys in primary health services are conducted for the following:
  - Collection of data on demographic characteristics like age, sex, etc.
  - Studying health related variables such as maternal mortalities.

4.10. Method of Data Collection:

The study was conducted during of 2014-2015 the diarrhea diseases to avoid the confounders.

The Team of the study were trained on the questionnaire, as well test of questionnaire.

Team members selected from the MOH and Sudanese Red cross staff Ardamata camp of community volunteers were selected to strengthen the community component for the follow up and delivery of interventions throughout the study period.

Community leaders were involved to avoid the opposition and opposes.

- The required data to meet the specified objectives will collect through interviewing questionnaire specially designed to determine socio. Demographical intervention and practices regarding about Water, Sanitation and its relationship to diarrhea of each examine, in addition to socioeconomic factors of their families.

4.11. Analysis of Data:

- The gained data from questionnaire and result analyze by using the statistical package for social sciences (SPSS), and then converted into tables and figures.

4.12. Ethical Consideration:

- A letter from university of Gezira, Blue Nile National Institute for Communicable Disease.

- For the purpose of study research to ministry of Health, administrative and governmental authorities.
• At state level: Clearance was obtain from West Darfur state ministry of Health, Diarrhea control program.

• At locality level: Permission was obtained from ELGenina locality Elrdamata-Camp administration, Health office and other local authorities).

• At IDP Camp and Interview Level: permission was taken from community leader camp managers and acceptances from target group (IDP)

4.13. Tools:
A structured questionnaire was designed using closed-end and as appropriate to collect information on study variables. It was tested through requesting a representative sample of the community to criticize a preliminary version and use of their feedback for review.

Data management was done at different levels to ensure high quality of data, as follows;

• In-field check
• In-office check
• Data cleaning using random selection of 10% of questionnaires
CHAPTER FIVE

5. RESULTS

Pre-post data:

Data collected from the two health centers for the most prevalent diseases was as followed:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>144</td>
<td>93</td>
</tr>
<tr>
<td>Malaria</td>
<td>112</td>
<td>78</td>
</tr>
<tr>
<td>Trachoma</td>
<td>107</td>
<td>82</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>105</td>
<td>95</td>
</tr>
<tr>
<td>Other Diseases</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>548</td>
<td>448</td>
</tr>
</tbody>
</table>
Questionnaire data:

![Bar Chart: Age Group Distribution](image)

**Figure 1: Age group distribution of the study sample N=360**

The highest age group was 21-30 with 122 participants (33.9%), and the lowest age group was above 60 with 18 participants (5%). The range was 16-72 years and the mean age of the participants was 28.7 ± 5.6 years.
Table 1: Gender distribution of the study sample $N = 360$

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>130</td>
<td>36.2</td>
</tr>
<tr>
<td>Female</td>
<td>230</td>
<td>63.8</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The gender distribution of the study sample, males were 130 (36.2%), while females were 230 (63.8%).
Figure 2: Educational level of the study sample N= 360

The educational level of the study sample showed that more than half of the participants were Khalawa educated (53.1%), while both university and post university were only (0.3%) for each category.
Table 2: The ownership of agricultural land among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Me</td>
<td>220</td>
<td>61.1</td>
</tr>
<tr>
<td>Others</td>
<td>140</td>
<td>38.9</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The agricultural land ownership among the participants, (38.9%) were not owning the land, while (61.1%) were cultivating their own land.
Figure 3: Farming by himself among the study sample $N = 360$

Only (10%) of the participants were working in their land by themselves, while the rest (90%) were not, showing that majority of participants were not working on their land by themselves, this is because it is not safe outside the Ardamata IDP.
Most of the study sample were using hand pumps as the main water source (46.6%) before intervention, they increased to (61.9%) after the educational program. Those who were using donkeys were (3.1%) after the intervention, they reduced to zero. So the control of dihedral diseases should be considered in raising the community awareness.

A chi square test was done to measure the relation between water source and prevalence of diarrheal disease during last month among participant it was very significant (P value = 0.000).

Figure 4: The main water source for the study sample N = 360
Table 3: Waiting time per minute before collecting water among the participants $N = 360$

<table>
<thead>
<tr>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>137</td>
</tr>
<tr>
<td>21-30</td>
<td>33</td>
</tr>
<tr>
<td>31-40</td>
<td>15</td>
</tr>
<tr>
<td>41-50</td>
<td>36</td>
</tr>
<tr>
<td>51-60</td>
<td>9</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>130</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360</strong></td>
</tr>
</tbody>
</table>

More than one third of the participants (38.1%) spend between 10 to 20 minutes to collect their water, while nearly another third (36.1%) took more one hour for water collection, only (2.5%) wait 51-60 minutes to get their water.
One quarter of the participants (25.4%) were getting their water from a source near their home (less than 100 meters), while more this number (27.5%) were getting their water from a source far from their home (more than 500 meter).

*Figure 5: Distance in meters from water source among the participants N = 360*
Figure 6: Problems facing participants when collecting water $N = 360$

The biggest portion of the participants were facing stealing their water (35.8%), while (7.2%) were not facing any type of problems when collecting water.
Table 4: Daily water consumption per Gerkan per household among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>5.6</td>
<td>104</td>
<td>28.9</td>
</tr>
<tr>
<td>10</td>
<td>130</td>
<td>36.1</td>
<td>134</td>
<td>37.2</td>
</tr>
<tr>
<td>5</td>
<td>171</td>
<td>47.5</td>
<td>76</td>
<td>21.1</td>
</tr>
<tr>
<td>&lt; 5</td>
<td>39</td>
<td>10.8</td>
<td>46</td>
<td>12.8</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Those who were using 20 Gerkan of water per day were only (5.6%) before the intervention, after the educational program they became (28.9%), while nearly half of the households (47.5%) were only using 5 Gerkan before the program, after intervention they were reduced to (21.1%) among IDP in Ardamata.

The relation between daily water consumption and prevalence of diarrheal disease during last month among participant was not significant (P value = 0.112).
Only (44%) of the study sample were storing drinking water in separate container before the educational program, they became (65%) after the program.

The relation between type of storing water and prevalence of diarrheal disease during last month among participant was significant (P value = 0.029), after performing a chi square test.

Figure 7: Comparison between storing drinking water in separate container before and after the educational program among the participants N = 360
Table 5: Last time of cleaning drinking water container among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Straw</td>
<td>137</td>
<td>38.1</td>
<td>264</td>
</tr>
<tr>
<td>Plastic</td>
<td>145</td>
<td>40.2</td>
<td>68</td>
</tr>
<tr>
<td>Others</td>
<td>78</td>
<td>21.7</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
</tr>
</tbody>
</table>

(38.1%) of the participants were cleaning their drinking water container in the week of the pre questionnaire, in the week of post questionnaire they jumped to (73.3%). This indicated that there was weakness in IDP behavior for how to clean the water container.

A chi squire test was performed to measure the relation between interval between cleaning water container and prevalence of diarrheal disease during last month among participant was significant (P value = 0.000).
Figure 8: Owning latrine among the study sample N = 360

(79%) were having a latrine inside their house and (21%) were using open defecation before the educational program, those with latrines became (89%) and without became (11%) after the program, which means that the rest were using open defecation.

Chi square test was done to measure the relation between owning of latrines and prevalence of diarrheal disease during last month among participant was not significant (P value = 0.098).
Those who were using concrete latrines before the educational program were only (5.6%), they became (21.7%) after the intervention, showing that the some violable drilled normal (pit).

The relation between type of latrines and prevalence of diarrheal disease during last month among participant was significant (P value = 0.008).

Figure 9: Type of latrines among the study sample N = 360
Table 6: Type of latrine shelter among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Straw</td>
<td>221</td>
<td>61.4</td>
<td>153</td>
<td>42.5</td>
</tr>
<tr>
<td>Plastic</td>
<td>82</td>
<td>22.8</td>
<td>159</td>
<td>44.2</td>
</tr>
<tr>
<td>Others</td>
<td>57</td>
<td>15.8</td>
<td>48</td>
<td>13.3</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Most of the study sample (61.3%) were using straw as a shelter for their latrines roof before the educational program, and after they reduced to (42.5%), while those who were using the plastic were (22.8%) and the became (44.2%).
(80.0%) of the participants were having their latrines 1-5 meters from house, after program they became (69.2%), while only (1.7%) their latrines were more than 11 meters far from the house before the program and it became (21.4%) after intervention.
More than one third of the adult sample (36.7%) were defecate outside the houses when they were at house before intervention, they became (14.7%), while (56.9%) were using latrines before the educational program and they became (73.1%), also after intervention own latrines. The health education of the community to use the latrines.
Table 7: Adult location of defecation when not at home among the participants N = 360

<table>
<thead>
<tr>
<th>Location</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Outdoors</td>
<td>117</td>
<td>32.5</td>
</tr>
<tr>
<td>Near water source</td>
<td>112</td>
<td>31.1</td>
</tr>
<tr>
<td>Public toilet</td>
<td>109</td>
<td>30.3</td>
</tr>
<tr>
<td>Neighbor toilet</td>
<td>22</td>
<td>6.1</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

More than one third of the adult sample (32.5%) were defecate outdoors when they were outside the house before intervention, they became (51.9%), while (6.1%) were using neighbor latrines before the educational program and they became (11.7%) after intervention also in the open. This indicate there is problems in human behaviors.
More than one quarter of the children sample (27.8%) were defecate outside the houses when they were at house before intervention, they became (16.7%), while (62.5%) were using latrines before the educational program and they became (76.1%) after it.

The relation between child location of defecation when at home and prevalence of diarrheal disease during last month among participant was measure by using chi squire test and it was significant (P value = 0.023).
Table 8: Child location of defecation when not at home among the participants N = 360

<table>
<thead>
<tr>
<th>Location</th>
<th>Pre</th>
<th></th>
<th></th>
<th>Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Outdoors</td>
<td>159</td>
<td>44.2</td>
<td>134</td>
<td>37.2</td>
<td></td>
</tr>
<tr>
<td>Near water source</td>
<td>76</td>
<td>21.1</td>
<td>38</td>
<td>10.6</td>
<td></td>
</tr>
<tr>
<td>Public toilet</td>
<td>85</td>
<td>23.6</td>
<td>111</td>
<td>30.8</td>
<td></td>
</tr>
<tr>
<td>Neighbor toilet</td>
<td>38</td>
<td>10.5</td>
<td>51</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0.6</td>
<td>26</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Nearly half of the children sample (44.2%) were defecate outside the houses when they were outside house before intervention, they became (37.2%), while (23.6%) were using public latrines before the educational program and they became (30.8%) after it.
More than three quarters of the participants (78.2%) were using water to clean their anus after defecation and they became (96.4%), while (5.6%) of them were using other materials and they reduced to (1.4%) after the intervention.

The relation between type of cleaning anus and prevalence of diarrheal disease during last month among participant was very significant (P value = 0.000), as chi squire test showed.

**Figure 13: Type of cleaning anus among the study sample N = 360**
Table 9: Time of washing hands among the participants N = 360

<table>
<thead>
<tr>
<th>Time of washing hands</th>
<th>Pre (No.)</th>
<th>Pre (%)</th>
<th>Post (No.)</th>
<th>Post (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>After bathing kids</td>
<td>65</td>
<td>18.0</td>
<td>46</td>
<td>12.8</td>
</tr>
<tr>
<td>Before food processing</td>
<td>95</td>
<td>26.4</td>
<td>78</td>
<td>21.7</td>
</tr>
<tr>
<td>After touching animals</td>
<td>45</td>
<td>12.5</td>
<td>36</td>
<td>10.0</td>
</tr>
<tr>
<td>Before meals</td>
<td>55</td>
<td>15.3</td>
<td>41</td>
<td>11.4</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>2.2</td>
<td>5</td>
<td>1.4</td>
</tr>
<tr>
<td>1,2,3&amp;4</td>
<td>92</td>
<td>25.6</td>
<td>154</td>
<td>42.8</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

About one quarter of the sample (25.6%) were washing their hands correctly before the educational program, they became (42.8%) after it.

The relation between time of washing hands and prevalence of diarrheal disease during last month among participant was measured by using chi square test and was significant (P value = 0.033).
Nearly one-third (31.1%) of the participants were washing hands with only water they became (19.7%), (68.9%) were using water and soap they became (80.3%) after the educational program. After intervention the same question, this indicates that the community have positive behavior before the intervention.

Chi square test was performed to measure the relation between type of washing hands and prevalence of diarrheal disease during last month among participant and was significant (P value = 0.011).

*Figure 14: Type of washing hands among the study sample N = 360*
Figure 15: Reason of hand washing among the study sample $N = 360$

Those who were washing their hands for prevention were (37.2%) before intervention they became (62.9%) after the program, while those who were washing just to clean their hands were (56.1%) after intervention they became (33.7%).
Table 10: Diarrheal prevalence during last month in household among the participants $N = 360$

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Yes</td>
<td>140</td>
<td>38.9</td>
<td>97</td>
<td>26.9</td>
</tr>
<tr>
<td>No</td>
<td>220</td>
<td>61.1</td>
<td>263</td>
<td>73.1</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

During last month, those who were having diarrhea were (38.9%) and they reduced to (26.9%) after the intervention.
The above figure demonstrate the knowledge about transmission of diarrhea among the participants, more than half of them (51.7%) stated that it is due to contaminated water, after intervention they reduced to only (1.1%) and those who said it is because of flies were (16.7%) they became (40.8%) after the program.

The relation between knowledge about means of transmission of diarrhea and prevalence of diarrheal disease during last month among participant was measured by using chi squire test and was significant (P value = 0.043).

Figure 16: Knowledge about means of transmission of diarrhea among the study sample N = 360

The above figure demonstrate the knowledge about transmission of diarrhea among the participants, more than half of them (51.7%) stated that it is due to contaminated water, after intervention they reduced to only (1.1%) and those who said it is because of flies were (16.7%) they became (40.8%) after the program.

The relation between knowledge about means of transmission of diarrhea and prevalence of diarrheal disease during last month among participant was measured by using chi squire test and was significant (P value = 0.043).
<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Clinic</td>
<td>76</td>
<td>21.1</td>
</tr>
<tr>
<td>Traditional treatment</td>
<td>131</td>
<td>36.4</td>
</tr>
<tr>
<td>Medications at home</td>
<td>148</td>
<td>41.2</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*Table 11: Treatment of diarrhea among the participants N = 360*

Majority of families were using traditional treatment 36.4% before intervention and clinical treatment 53.9% after intervention.
Figure 17: Opinion of participants towards spread of diarrhea N = 360

(55.8%) of the participants stated that diarrhea was spread before intervention and they reduced to (31.9%), while those who stated that it was not spread were (44.2%) and increased to (69.1%) after the educational program.
Figure 18: Knowledge about prevention of diarrhea among the study sample $N = 360$

Those who said that hand wash is preventing diarrhea were (18.3%) before the educational program in they increased to (20.3%) after it, while those who thought healthy toilet were (38.1%) and reduced to (36.4%) after intervention.

The relation between knowledge about prevention of diarrhea and prevalence of diarrheal disease during last month among participant was measured by using chi square test and was very significant ($P$ value = 0.000).
Table 12: Knowledge about ORS components among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Knowledgeable</td>
<td>85</td>
<td>23.6</td>
<td>187</td>
<td>51.9</td>
</tr>
<tr>
<td>Not knowledgeable</td>
<td>275</td>
<td>76.4</td>
<td>173</td>
<td>48.1</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Less than one quarter were knowledgeable about ORS components before the educational program, they increased to (51.9%) after the intervention.
Figure 19: Participation in community activities among the study sample N = 360

Those who were not involved in social health activities were (38.9%) and after the health program they reduced to (11.6%), those who were involved were spread in many activities.
Figure 20: Participation in women activities among the study sample $N = 360$

Those who were involved in women activities were (26.4%) and after the health program they increased to (37.4%).
Table 13: Animal home breeding among the participants N = 360

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>93</td>
<td>25.8</td>
</tr>
<tr>
<td>No</td>
<td>267</td>
<td>74.2</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

More than one quarter (25.8%) were breeding animals among the study sample. The relation between animal breeding and prevalence of diarrheal disease during last month among participant was not significant (P value = 0.248), as it was measured by using chi squire test.
Most of those who were breeding animals were breeding donkeys (11.6%), then came cows (7.4%).

Figure 21: Types of animal bread by the study sample N = 360
Those who were breeding inside their houses were (16.6%) before the intervention they were reduced to (5.5%) after the educational program.
CHAPTER SIX

6. DISCUSSION

This study was designed as an experimental pre-post study community based, to assess the effect of hygiene promotion program and improvement of the quality of water supply on the reduction of the incidence of diarrheal diseases among IDP in Ardamata Camp, Geniena Locality, West Darfur state during 2015. The total number of displaced people was about 19,440 and the household number was 3,244 the sample size is 360 households, with the following results, the highest age group was 21-30 with 122 participants (33.9%), and the lowest age group was above 60 with 18 participants (5%), with range of 16-72 years and mean age of 28.7 ± 5.6 years.

The gender distribution of the study sample, males were 130 (36.2%), while females were 230 (63.8%), there educational level showed that more than half of the participants were Khalawa educated (53.1%), while both university and post university were only (0.3%) for each category. the agricultural land ownership among the participants was (38.9%) of them were not owning the land, while (61.1%) were cultivating their own land. Only (10%) of the participants were working in their land by themselves, while the rest (90%) were not. Most of the study sample were using hand pumps as the main water source (46.6%) before intervention, they increased to (61.9%) after the educational program. Those who were using donkeys were (3.1%) after the intervention, they reduced to zero, these findings matches those found by (Y. M. Eltahir ET AL, 2013). More than one third of the participants (38.1%) spend between 10 to 20 minutes to collect their water, while nearly another third (36.1%) took more than one hour for water collection. One quarter of the participants (25.4%) were getting their water from a source near their home (less than 100 meters), while more than this number (27.5%) were getting their water from a source far from their home (more than 500 meter). The biggest portion of the participants were facing stealing their water (35.8%), while (7.2%) were not facing any type of problems when collecting water. Those who were using 20 Gerkan of water per day were only (5.6%) before the intervention, after the educational program they became (28.9%), while nearly half of the households (47.5%) were only using 5 Gerkan before the program, after intervention
they were reduced to (21.1%). Only (44%) of the study sample were storing drinking water in separate container before the educational program, they became (65%) after the program. (38.1%) of the participants were cleaning their drinking water container in the week of the pre questionnaire, in the week of post questionnaire they jumped to (73.3%). (79%) were having a latrine inside their house and (21%) were using open defecation before the educational program, those with latrines became (89%) and without became (11%) after the program. Those who were using concrete latrines before the educational program were only (5.6%), they became (21.7%) after the intervention. Most of the study sample (61.3%) were using straw as a shelter for their latrines roof before the educational program, and after they reduced to (42.5%), while those who were using the plastic were (22.8%) and the became (44.2%). (80.0%) of the participants were having their latrines 1-5 meters from house, after program they became (69.2%), while only (1.7%) their latrines were more than 11 meters far from the house before the program and it became (21.4%) after intervention. More than one third of the adult sample (36.7%) were defecate outside the houses when they were at house before intervention, they became (14.7%), while (56.9%) were using latrines before the educational program and they became (73.1%) after it. More than one third of the adult sample (32.5%) were defecate outdoors when they were outside the house before intervention, they became (51.9%), while (6.1%) were using neighbor latrines before the educational program and they became (11.7%) after it. More than one quarter of the children sample (27.8%) were defecate outside the houses when they were at house before intervention, they became (16.7%), while (62.5%) were using latrines before the educational program and they became (76.1%) after it. Nearly half of the children sample (44.2%) were defecate outside the houses when they were outside house before intervention, they became (37.2%), while (23.6%) were using public latrines before the educational program and they became (30.8%) after it. This is nearly the outcome of the (SHHS, 2010) More than three quarters of the participants (78.2%) were using water to clean their anus after defecation and they became (96.4%), while (5.6%) of them were using other materials and they reduced to (1.4%) after the intervention. About one quarter of the sample (25.6%) were washing their hands correctly before the educational program, they became (42.8%) after it. Nearly one-third (31.1%) of the participants were washing hands with only water they became (19.7%), (68.9%) were using water and soap they became (80.3%) after the educational program, those who were washing
their hands for prevention were (37.2%) before intervention they became (62.9%) after the program, while those who were washing just to clean their hands were (56.1%) after intervention they became (33.7%), these results were confirmed by (WASH, 2011). During last month, those who were having diarrhea were (38.9%) and they reduced to (26.9%) after the intervention, this result is lower than the results found by (Lorna Fewtrell et al, 2007). About knowledge about transmission of diarrhea among the participants, more than half of them (51.7%) stated that it is due to contaminated water, after intervention they reduced to only (1.1%) and those who said it is because of flies were (16.7%) they became (40.8%) after the program. (55.8%) of the participants stated that diarrhea was spread before intervention and they reduced to (31.9%), while those who stated that it was not spread were (44.2%) and increased to (69.1%) after the educational program. Those who said that hand wash is preventing diarrhea were (18.3%) before the educational program in they increased to (20.3%) after it, while those who thought healthy toilet were (38.1%) and reduced to (36.4%) after intervention, these almost matches the findings of (Global Handwashing, 2009). Less than one quarter were knowledgeable about ORS components before the educational program, they increased to (51.9%) after the intervention. Those who were not involved in social health activities were (38.9%) and after the health program they reduced to (11.6%), those who were involved were spread in many activities. Those who were involved in women activities were (26.4%) and after the health program they increased to (37.4%). More than one quarter (25.8%) were breeding animals among the study sample. Most of those who were breeding animals were breeding donkeys (11.6%), then came cows (7.4%). Those who were breeding inside their houses were (16.6%) before the intervention they were reduced to (5.5%) after the educational program.
CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATIONS

7.1. Conclusion

In conclusion, Diarrheal diseases are the second-biggest killer of children in developing countries. In Ardamata the overall hygiene and sanitation and water supply were very poor. An intervention to prevent acute diarrhea among household is essential, as poor water supply, sanitation and hygiene among household in Ardamata camps, and bad home-based management also remain poor. This intervention study, revealed that household health promotion, as community-based is very effective in reduction of prevalence and incidence of diarrhea among Ardamata IDP camps. However, promotion of hand washing and sanitation and hygiene habits showed great effect in reduction of diarrhea.
7.2. **Recommendations**

- Capacity building of community health workers in promoting educational programs, clean latrines, water supply and clean water points.
- Ensure community participation in management and prevention of acute diarrhea among household in Ardamata camp.
- Integration of community-based intervention programs with existing health services is important to improve the lifestyle of IDP in Ardamata camp.
- Strengthen knowledge about hygiene, proper latrines and water supply.
- Integrated volunteers management program with governmental and non-governmental programs, will help in improving the overall community attitudes and practices towards health problems.
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Annex 1: Questionnaire:

جامعة الجزيرة
معهد النيل الأزرق لحساسيات السارية

1- اثر تحسين مياه الإصلاح والممارسات الصحية من عدوى البراز المنقولة بواسطة الفم في مسارات النازحين ببادية الجينية ولاية غرب دارفور – السودان 2015

<table>
<thead>
<tr>
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<th>نمرة الاستبيان</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2- اسم المعسكر:--------------------------------------------- ( )
3- العمر:--------------------------------------------- ( )
4- المستوى التعليمي:--------------------------------------------- ( )
5- هل تعرف أساليب: اعتم------------------------------- ( )
6- هل لديك أرض للزراعة: اعتم------------------------------- ( )
7- هل تزرع أرضك: اعتم------------------------------- ( )

8- ما هو مصدر المياه الرئيسي في المنزل:----------------------------- ( )
   - مصخة----------------------------- ( )
   - نير فتح----------------------------- ( )
   - ماسورة----------------------------- ( )
   - كاروه----------------------------- ( )
   - أخرى----------------------------- ( )

9- كم الفترة انتظارك لأخذ المياه في المصدر:----------------------------- ( )
   - دقيقة----------------------------- ( )
   - دقائق----------------------------- ( )

10- هل تبعد مصدر المياه عن السكن:----------------------------- ( )
   - مترا----------------------------- ( )

11- كم عدد جرارات المياه تجمع في اليوم:----------------------------- ( )
   - جرارة----------------------------- ( )
   - جرارات----------------------------- ( )

12- هل لديك صهريج أو مخزن المياه منفصل: اعتم------------------------------- ( )
   - لا------------------------------- ( )
13 - منى آخر مرة غسيلك لصهريج المياه :-

- هذا أسبوع __________ ( )- الأسابيع الماضي __________( )- الأسابيع سابقة __________ ( )

* الإصحاح

14- هل تملك مرحاض ؟- نعم __________( )- لا __________( )

15- ماهو نوع مرحاض الذي تملكه :-

- حفرة عادية ( )- خرسانة إسمنتية __________( )- شبكة المياه __________( )- ٍلاادي __________( )

16- ما نوع سقف مرحاضك ؟- طوب بأسمنت __________( )- خشب __________( )- بلاستيك __________( )- قش __________( )

17- بمثابة مرحاض من منزلك :- __________( )- متر.

18- اين يقضي كبار حاجتهم عند ما يكونون في منزل :-

- عراء __________( )- مرحاض منزلي __________( )- ج - مرحاض عام __________( )- ه - مرحاض حاجتهم __________( )

19- اين يقضي كبار حاجتهم عندما يكونون خارج المنزل :-

- عراء __________( )- مرحاض منزلي __________( )- ج - مرحاض عام __________( )- ه - مرحاض حاجتهم __________( )- و - أخرى __________( )

20- اين يقضي صغار حاجتهم عندما يكونون في المنزل :-

- عراء __________( )- مرحاض منزلي __________( )- ج - مرحاض عام __________( )- ه - مرحاض حاجتهم __________( )

21- لماذا تنطف شركك بعد تبرز :-

- بالماء __________( )- ب - بورة نباتية __________( )- ج - بورة عادية __________( )- د - أخرى __________( )

* غسل الأيدي

22- متي الأوقات مهمة لغسل الأيدي :-

- بعد استحمام الأطفال __________( )- د - قبل تجهيز الطعام __________( )- ج بعد ملامسة حيوانات __________( )

23- لماذا تغسل اليد :-

- بماء فقط __________( )- ب - ماء وصابون __________( )- ج - رمال ومياه __________( )- د - رمال ومياه __________( )

24- ما أهمية غسل الأيدي :-

- الوفاية __________( )- ب - نظافة __________( )- ج - أخرى __________( )- د - لإيادي __________( )

* إسهام

25- كيف تنتشر إسهال :-
28- ما الرسالة أنت متناول: 

29- نشاط الصحة أنت مشاركة أي المجتمع: 

30- ملك أي أسرة المشاركة في أنشطة مجموعات تسويه:

31- هل تربوا الحيوانات:

32- ما نوع الحيوانات الذي تقوموا بتربيته:

33- أين توجد الزرائيب الحيوانات:

أ- أيدي متسخ------- ( ) ب- ميا ح متسخ-------- ( ) ج- الديابة---------------- ( ) د- طعام فاسد ------- ( 

١٥٦- إذا إصابة احدي أفراد أسرتك بإسهال أين تذهب تدوه لعلاج: 

١٥٧- مستوصف-------- ( ) ب- طبيب تقليدي------( ) ج- تدوه في منزل-------- ( ) د- أخر-------- ( 

١٥٨- إذا إصابة أكثر من إسهال حالي إسهال هذا سنة مقايرة مع نهاية هذه السنة يكون: 

١٥٩- أكثر------------- ( ) ب- كما هو-------------- ( ) د- أقل --------------------------------- ( 

* المشاركة المجتمع 

٢٤٤- استخدام مراحض-------- ( ) ب- سلامة مياه------ ( ) ج- غسل الأيدي------ ( ) د- وقاية إسهال--- 

٢٤٥- نظافة نفايات------ ( ) و- سلامة غذاء-------- ( ) ي- أخر-------- ( 

٢٤٦- حملات نظافة-------- ( ) ب- نظافة حركات-------- ( ) ج- اجتماع المجتمع-------- ( ) د- نظافة محطات المياه----------- ( ) ه دفن الجثث الحيوانات الميتة 

٢٤٧- منع---------------- ( ) ب لا------------------ ( ) 

٢٤٨- تعم---------------- ( ) ب لا------------------ ( )
### Annex 2: Time Frame

<table>
<thead>
<tr>
<th>Phase</th>
<th>Planned activity</th>
<th>TIME RAME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Phase One</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proposal writing and consultation with supervisor</td>
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<tr>
<td></td>
<td>Contacting with local authorities to get approval</td>
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<tr>
<td></td>
<td>Identification of the Data Collection team,</td>
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<tr>
<td></td>
<td>Meeting with assessment team to discuss assessment and share responsibilities.</td>
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<tr>
<td></td>
<td>Preparation &amp; distribution of data collection tools</td>
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<tr>
<td></td>
<td>Training of the Data Collection Team</td>
<td></td>
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<tr>
<td></td>
<td>Data collection.</td>
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<tr>
<td></td>
<td>Data entry and analysis.</td>
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<tr>
<td></td>
<td>Baseline finding report draft</td>
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<tr>
<td></td>
<td><strong>Phase Two</strong></td>
<td></td>
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<tr>
<td></td>
<td>Implementation of intervention</td>
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<tr>
<td></td>
<td>Home visit and group session</td>
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<tr>
<td></td>
<td>Health promotion &amp; Awareness raising</td>
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<tr>
<td></td>
<td>Conduction of mini survey for follow up</td>
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<tr>
<td></td>
<td><strong>Phase Three</strong></td>
<td></td>
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<tr>
<td></td>
<td>Contacting the assessment team</td>
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<tr>
<td></td>
<td>Collection of evaluation data</td>
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<tr>
<td></td>
<td>Data Entry and analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drafting the evaluation report</td>
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<tr>
<td></td>
<td>Finalizing the study report</td>
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</tr>
<tr>
<td></td>
<td>Circulation of report</td>
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</tbody>
</table>