

https://dspace.org/

How well do mothers and caregivers prepare oral rehydration solution

Llale, Mohubane Andrew

2017
http://hdl.handle.net/10539/23112

Downloaded from a DSpace repository. https://dspace.org/

How well do Mothers and Caregivers Prepare Oral Rehydration Solution

Student: Mohubane Andrew Llale

Student number: 338370

Degree: MMED Family Medicine

Supervisor: Dr Agetta Jimmy Akii

I Declaration

I, Mohubane Andrew Llale, hereby declare that this research report is my own work (except where indicated in the acknowledgement) and is being submitted for the award of the degree of Master of Medicine (MMed) in Family Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted for another degree at this or any other University.

Signed:……(Signature of Candidate)

Date:

II Dedication

This research report is in loving dedication to Sibongile Llale, Mahoro Llale; Motimedi Llale, Mphume Llale, Gentie Matshele, Motshidise Llale, Modibedi Matshele, Diphetogo Llale, Otlotleng Llale, Boingotlo Matshele, Nicholas Matshele, Thokozile Mbatha, Jabulani Mbatha, friends and extended family who have constantly been my greatest source of inspiration. Without their unconditional love and unflinching support, this project may not have materialized. Most importantly, I thank God, the Alpha and the Omega.

III Abstract

Background

Oral rehydration therapy (ORT) has been used for many decades, and its usefulness in the management of dehydration caused by diarrhoea is well established. On the other hand, childhood mortality from diarrhoea, is reportedly high in most developing countries. Improved case management of children with diarrhoea, adequate maternal and caregiver's knowledge on correct preparation, administration and use of oral rehydration solution, are seen as important interventions that could assist in addressing the problem.

Aim and Objectives

The aim of the study was to assess knowledge and skills of mothers and caregivers in the preparation and use of Salt Sugar Solution (SSS) at Mofolo Community Health Centre (CHC), Soweto. The study objectives were as follows:

1. To determine the proportion of caregivers that had ever-been-taught how to prepare SSS.
2. To assess knowledge of mothers and caregivers' on the correct use of SSS, including signs of dehydration and danger signs in the Integrated Management of Childhood Illness (IMCI).
3. To determine the proportion of caregivers who demonstrate correct preparation of SSS.

Method

The study was conducted in the well-baby and general clinic of Mofolo Community Health Centre in Soweto where 407 mothers and caregivers were conveniently sampled, interviewed and asked to practically demonstrate how they prepare SSS. The proportion of mothers and caregivers who were: a) ever-taught; b) knew how to correctly prepare SSS; had the new road to health card and knew signs of dehydration were determined. The chi-square test was used to determine the association between demographic characteristics and the main outcome measure, (correct preparation of SSS). Logistic regression analysis was used to determine the strengths of associations of different variables in relation to the outcome variable (correct preparation of SSS).

Results

Only 21% of mothers and caregivers could correctly prepare SSS. Less than half (45.7%) had the new road to health card containing correct preparation instructions. Only 7.6% of the 45.7% with the new road to health card, demonstrated how to correctly prepare SSS. A small proportion (2%) of participants said they were never taught how to prepare SSS, while, 55.6% had been taught by healthcare workers. In the category of household income, the largest group, 25.3% of participants had an income between South African Rands (R) 1000 and 2999. Male participants were only 4.9%. About 79% of participants knew at least one sign of dehydration. The chi-square test was used to determine the main outcome measure, which was correct preparation of SSS and demographic factors. Factors associated with correct preparation of SSS were; a) number of teaching sessions received, p-value = 0.0001; b) teaching done by healthcare worker, p-value = 0.0001; c) perceived knowledge of mothers or caregiver on how to correctly prepare SSS, p-value = 0.015; and d) number of children in the household, p-value = 0.011.

Conclusion

Overall, 79% of mothers and caregivers did not correctly prepare SSS, despite 97% of participants agreeing to having been taught how to prepare SSS. Over half (55.6%) of mothers and caregivers were taught by healthcare worker, however, incorrect SSS use in over half (57.8%) of mothers and caregivers as well as inability to recognize at least one sign of dehydration gave credence to general poor knowledge and use of SSS which is a threat to management of diarrhoeal diseases and overall child mortality and morbidity.

IV Acknowledgement

I am deeply indebted to my supervisors and mentors Dr Agetta Jimmy Akii, Dr Olufemi Omole, and Deidre Pretorius whose guidance, stimulating suggestions, knowledge, experience and encouragement helped me at all the times of study and statistical analysis of the project in the pre and post research period. I would like to express my sincere gratitude to all staff members in Department of Family Medicine for their academic guidance and commitment. I would also like to thank the staff members at the Mofolo Clinic without whom this research would have been almost impossible.

Table of contents

I Declaration....i
II Dedication ii
III Abstract iii
IV Acknowledgement....v
V List of Figures....ix
VI List of Tables....x
VII List of Acronyms and Abbreviations....xi

Chapter 1: Introduction....3
Chapter 2: Literature Review....3
2.1 Introduction 3
2.2 Historical overview....3
2.3 Composition of ORS/SSS....6
2.4 Extent of ORT use and knowledge....6
2.5 Factors determining correct use of ORT 9
2.6 Limitations of ORT 12
2.7 New Developments……...…...……...12
2.8 Homemade Salt Sugar Solution v/s Commercial ORS use 14
2.9 Impact evidence for ORT 15
2.9.1 Brazil 15
2.9.2 Egypt 16
2.9.3 Mexico....17
2.9.4 Philippines....17
2.10 South African context....18
2.10.1 Initiatives to improve mothers and caregivers' ORT use and knowledge...…….18
2.10.2 Extent of ORT use and knowledge…….……..19
2.11 Conclusion……20
Chapter 3: Methods....22
3.1 Study design and setting 22
3.2 Study population and sample size……...…….....……..22
3.3 Sampling procedure...…….22
3.4 Data collection....25
3.5 Exclusion criteria....26

3.6 Data analysis 27
3.7 Ethical consideration 27
Chapter 4: Results 28
4.1 Introduction 28
4.2 Profiles of participants 29
4.3 Profiles of children under participants' care 30
4.4 Participants' knowledge and practice of SSS 31
4.5 Results of participants demonstrating preparation of SSS 33
4.6 Association of correct ORS preparation with participants' characteristics 34
Chapter 5: Discussion 36
5.1 Introduction 36
5.2 Practical demonstration of SSS 36
5.3 Teaching on how to prepare SSS 37
5.4 Participants knowledge of SSS use 39
5.5 Participants' characteristics 40
5.5.1 Gender 40
5.5.2 Age 40
5.5.3 Socioeconomic status 41
5.5.4 Number of household children 41
5.6 Study limitations 41
Chapter 6: Conclusion and recommendations 43
6.1 Conclusion 43
6.2 Recommendations 43
Reference 44
Addendum 1: Interview Sheet 58
Addendum 2: Clearance Certificate 61
Addendum 3: Permission Letter 62
Addendum 4: Consent form 63
Addendum 5: Information Sheet 64

V List of Figures

Figure **Page**

Figure 3.1: Flow diagram.....24

Figure 4.1: Percentage of participants taught by healthcare worker and non-healthcare worker (friend, acquantaince of family member)…….....…….....32

VI List of Tables

Table **Page**

Table 4.1: Mothers and Caregivers' demographics 29
Table 4.2: Children's demographics sourced from road to health cards 30
Table 4.3: Response by mothers and caregivers 31
Table 4.4: Results of practical demonstration of SSS preparation 33
Table 4.5: Association between correct ORS preparation and various demographic characteristics 34
Table 4.6: Logistic regression analysis examining the relationship between demographic characteristics and correctly preparing SSS 35

VII List of Acronyms and Abbreviations

ANC	Antenatal Care
CHC	Community Health Centre
DHS	Demographic and Health Survey
DOH	Department Of Health
EPI	Expanded Program on Immunization
GLUT2	Glucose transporter type 2
HIV	Human Immunodeficiency Virus
IMCI	Integrated Management of Childhood Illnesses
IV	Intravenous
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
NCDDP	National Control of Diarrheal Diseases Project
ORS	Oral Rehydration Solution
ORT	Oral Rehydration Therapy
PHC	Primary Health Care
RHF	Recommended Home Fluids
RTHC	Road to health card
SADHS	South African Demographic and Health Survey
SDG	Sustainable Development Goals
SGLT1	Sodium glucose co-transporter 1
SSS	Salt Sugar Solution
T.B	Tuberculosis
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Chapter 1: Introduction

Oral rehydration therapy (ORT) has been used for many years and has shown to drastically reduce diarrhoea-associated mortality. It was promoted widely throughout the developing world since the late 1970's.[1] The efficacy of ORT in patients with dehydration following diarrhoea and vomiting requires no further scientific proof as it has yielded overwhelmingly positive results.[2] Oral rehydration therapy is currently the gold standard of management of mild to moderate dehydration associated with diarrhoea and is particularly useful when intravenous fluids are in short supply, health services are basic, and in settings where there is a shortage of skilled personnel as is usually the case in many developing countries.[3]

Although the overall child mortality has declined from 2.4 million in 2000 to 1.7 million in 2010[4] and the Millennium Development Goals (MDGs) commit nations to reduce under-5 child mortality by two thirds by 2015,[5] diarrhoeal disease remains one of the leading causes of under-5 child mortality in the world.[6] This is despite the availability of ORT in the form of salt-sugar solution or oral rehydration solution (ORS) sachets in most settings. Proper case management of diarrhoea and vomiting and subsequent prevention of dehydration is an opportunity to curb and significantly reduce under-5 child mortality.

Global efforts to promote effective diarrhoea management using ORS has shown less than satisfactory trends in a survey of 40 low and middle income countries from 1986 to 2003.[7] The survey used Demographic Health Surveys of respective countries and looked at three indicators, namely percentage of children given ORS, increased fluids and continued feeding. The results showed that only 35% of the countries had trend data for all three indicators. Only 7% of the countries showed positive trends for all indicators. From 37 countries that had data on trends for at least three indicators, 47% showed positive developments for three indicators or more.

In South Africa, it is estimated that 10 000 children under-5 years old die annually due to diarrhoea according to a burden of disease report.[8] In most instances these are deaths that could have been prevented with timeous usage of ORT that is correctly

prepared and administered. Some of the barriers to the greater uptake of ORT include, cultural practice,[9] lack of parental knowledge[10] and preference by doctors for IV hydration, even where evidence indicates improved results from oral rehydration.[11]

A previous assessment of SSS used by mothers, which was conducted in South Africa and Swaziland in a conveniently sampled study, showed that knowledge and wide use of SSS did not guarantee proper use and less than fifty percent of mothers knew how to make SSS correctly.[12] Some sterling work has been done by the Department of Health in an attempt to increase knowledge and uptake of ORT. However, indications are that effectiveness of these initiatives do not constitute a noteworthy improvement in constraining the problem.

The initiatives by the Department Of Health (DOH) regarding SSS, spoke to the poor knowledge, attitude and practice displayed in some of the local studies [4,12]. No study has evaluated the level of coverage by these initiatives, and only one study[4] was found to have allowed participants to practically demonstrate how to correctly prepare SSS instead of self-report. In light of this, the aim of this study was to determine how well mothers and caregivers know how to correctly prepare SSS and administer SSS.

Chapter 2: Literature Review

2.1 Introduction

This chapter presents a literature review on oral rehydration therapy (ORT): its history, extent of use, some cases of its success and failures, new developments, home and commercial use, its impact and use by a few countries internationally, hinderances encountered and its use in the South African context.

2.2 Historical overview

For centuries, cholera was mainly found on the Indian subcontinent, until an outbreak in 1817 on the routes of trade, which resulted in cholera spreading to China and Southern Russia, gradually making its way to other parts of the world.[13] Subsequent cholera pandemics left a disturbing trail of high mortality but also led to the improvement of sanitation following Dr John Snow's description of the relationship between cholera and drinking water during the second pandemic (1821 to 1851) – this is the work that launched the field of epidemiology[14] which subsequently directed research towards the development of oral rehydration therapy (ORT).

Oral rehydration therapy has been heralded as one of the most important medical advances of the 20th century.[15] ORT is an inclusive term used for both homemade oral rehydration solution and commercial oral rehydration solution. Prescriptions for rice water, coconut juice and carrot soup, written over 3000 years ago by the Indian physician, Sushruta, are evidence of elementary years in the evolution of ORT for the treatment of cholera-associated dehydration.[16] However, it was the high mortality associated with cholera, often above 70% that lends credence to the urgent need for an effective treatment modality.[17]

During the cholera epidemic in 1831, William Brooke O'Shaughnessy noted the loss of water and salt in the stool of cholera patients as the cause of death from dehydration.[18] Subsequent work by Latta[19] with intravenous (IV) saline fluids used in the management of diarrhoea showed miraculous results in patients who were severely sick, bedridden and dehydrated. He prescribed IV fluid therapy for these

patients, and obtained overwhelmingly good results. The use of intravenous solutions led to a reduction in cholera mortality rate from 70% to 40%.[20] The IV fluid replacement became the optimal standard of care for moderate to severe dehydration for a very long time, before ORT was found to be equally effective in certain instances.[21]

The difficulties in accessing IV fluids for treatment of dehydration associated with diarrhoea, in the era of cholera epidemics, further enhanced the quest for the development of an oral rehydration solution, which gained momentum in the 1940's.[22] A biochemist, Robert Crane discovered the sodium-glucose co-transport as one of the important mechanisms for intestinal glucose absorption in the early 1960's.[23] His work highlighted the passive process of water movement along the osmotic gradient generated by the transcellular transport of electrolytes and nutrients. There were three principal mechanisms of sodium absorption that had been described.[24] Firstly, sodium and glucose co-transport at the intestinal brush border through a protein called sodium glucose co-transporter 1 (SGLT1), protein that was necessary in enabling co-transportation across the luminal membrane in the gut, was one of the important processes essential to facilitate the efficacy of ORS.[25] Secondly, another protein that enabled transportation of glucose into the blood once inside the enterocytes was the glucose transporter type 2 (GLUT2).[26] The third mechanism was sodium-potassium ATPase, which provided the energy that drove the process, and this mechanism remains intact, even in patients with severe diarrhoea.[27]

It was also around the same time as the sodium-glucose co-transport discovery, that it was shown that the intestinal mucosa was not disrupted in cholera contrary to previous belief. This was proved by a study which was conducted during the 1959 cholera epidemic in Bangkok.[28] It was aimed at finding out whether there was any intestinal mucosa change with cholera infection. Nine participants with cholera were enrolled and serial biopsies were made during the course of the illness. In total 19 biopsies were obtained from the patients, specimens were taken from stomach, duodenum, jejunum, upper ileum and colon. Biopsies were taken of: two patients on the first day of the clinical illness, five on the second day, two patients on the third day and one on the fourth day. Specimens were also obtained in the convalescence

phase of the illness, on the 6th, 8th and 27th days. Twenty-nine control biopsies were taken from asymptomatic persons who were found to be infected with *V. cholerae*, and from patients with diarrhoea without bacteriological explanation. That study demonstrated that in biopsy specimens taken from their cholera patients, the intestinal epithelium was intact throughout the course of the acute disease.[28] This formed the rational basis for oral replacement of fluids. However, this deviated sharply from the traditional teaching regarding treatment of diarrhoea, which emphasized slow repletion of fluid losses, and the need to rest the bowel.[29] This practice still continues in some settings where mothers and caregivers withhold feeds when a child has diarrhoea. A Nigerian study described the belief and knowledge of mothers with respect to food restriction during acute diarrhoea. The cross-sectional survey involved 250 mothers with at least one child younger than a year, and reported that 71.2% of mothers withdrew feeds during an episode of diarrhoea.[30]

More experiments confirmed that a glucose-sodium oral therapy solution administered in quantities matching measured diarrhoea volumes was effective in considerably reducing the necessity for IV fluids by 80% in patients with cholera.[31] The results pointed out that the oral solution did not eliminate the need for initial IV therapy to treat shock in severe dehydration, but could eliminate the need for over three-quarters of the IV-fluid requirement in the therapy of acute cholera.[31] These results were the dawn of a new era in clinical medicine, which lead to the expanded use of ORT.

Evidence of the effectiveness of ORT was brought to the world to witness, after its great success in 1971 during the Bangladesh Liberation War, where the medical teams ran out of IV fluids, which were highly effective for treatment of cholera.[32] The limited availability of IV fluids informed the decision by Dr Dilip Mahalanabis to instruct his staff to distribute oral rehydration salts to people in refugee camps. This intervention had a resounding success with the mortality rate dropping to 3.9% from 30%, since the use of hypertonic IV solution.[32] Subsequently, success of this treatment in over 6 million of Bangladeshi refugees resulted in ORT guidelines being developed by WHO.[32]

2.3 Composition of ORS/SSS

The standard oral rehydration solution endorsed by WHO contained sodium 90 mmol/L, chloride 80 mmol/L, potassium 20 mmol/L, glucose 111 mmol/L and has an osmolarity of 311 mmol/L. A solution close to the desired concentration could easily be achieved with homemade salt, sugar solution (SSS) of 8 level teaspoons of sugar and ½ level teaspoon of salt in 1 litre of clean drinking water.[33] WHO had recommended the sodium concentration of ORS to be 90 mmol/L. This was most likely based on the research done in the area where cholera as the cause of diarrhoea had higher fecal sodium content than any other aetiological agents, with average sodium of 88.9 mmol/L being lost.[34] ORS with this sodium content was thought to be high in some developed countries, as indicated by the reported risk of hypernatremia in a randomised controlled study of 65 children aged 0 to 3 months with non-cholera diarrhoea in India.[35] The majority of diarrhoeal episodes in developed countries were of viral aetiology, thus having lower stool sodium content. This resulted in advocacy for lower sodium content of 50 – 60 mmol/L, which was shown to be safe and effective in rehydrating and maintaining hydration in diarrhoea of varied aetiology.[36]

WHO has since changed its stance regarding ORS formulation based on the latest available research. A new low osmolarity ORS has now replaced the traditional formulation. The benefits of which include, reduction in vomiting, stool volume and need for intravenous therapy. The new changes to the WHO recommended homemade oral rehydration solution, are still to be adopted by the South African Department of Health (DOH). The changes for preparation of homemade low osmolarity are 6 level teaspoon of sugar, ½ level teaspoon of salt and 1 litre of clean water. This is covered in section 2.8. The new road to health booklet still carries the old homemade oral rehydration solution recipe.

2.4 Extent of ORT use and knowledge

Seventy eight percent of the global estimate (1.87 million) of annual deaths from diarrhoea in children aged younger than 5 years was in developing countries.[37] The 2010 General Household Survey (GHS), a nationally representative inquiry into the

livelihood of South Africans, showed that there were over 60,000 cases of childhood diarrhoea per month and approximately 9,000 child diarrhoeal deaths in the same year.[38] Significant strides have been made towards achieving the Millennium Development Goal 4 (MDG4) target of reducing under-five mortality rate by two-thirds between 1990 and 2015. The global all-cause mortality has dropped by 47% since 1990 from 12.6 million to 6.6 million in 2012.[39] Diarrhoeal disease remained the second leading cause of death in children under 5 years globally.[40] The United Nations Children's Fund (UNICEF) and World Health Organization (WHO) developed a 7-point plan for diarrhoeal disease control. The plan involved an approach focusing on diarrhoeal disease treatment and prevention.[41] The treatment package on the one hand was aimed at, fluid replacement in the form of ORT to prevent dehydration and zinc treatment to decrease duration and severity. Zinc improves the absorption of water and electrolytes, improves regeneration of the intestinal epithelium, increases the levels of brush border enzymes, and enhances the immune response, allowing for a better clearance of the pathogens.[42] On the other hand prevention package was aimed at reducing diarrhoea in medium to long term, and included the introduction of rotavirus and measles vaccination, promotion of early, exclusive breastfeeding and vitamin A supplementation, promotion of hand washing with soap, improved water supply and community-wide sanitation promotion.[41]

In 2007, an analysis of the two most recent Demographic and Health Surveys of the time (SADHS 1998 and 2003), conducted in 34 developing countries in Africa, South America and Asia found a decline in ORT use for children younger than 3 years of age with diarrhoea, in 68% of those countries with Kenya and Nigeria showing the steepest decline.[43]

Prospects of controlling diarrhoea-associated mortality are hampered by poor knowledge of ORT, resulting in its decreased use by mothers and caregivers among other things. Campaigns to expand the knowledge base in preparing recommended homemade fluids (RHF) in the form of, for example, SSS and ORS have been run in a number of countries globally with unsatisfactory results in some countries. In India, a cross-sectional descriptive study was conducted among conveniently sampled 400

mothers with children aged six months to 11 years. It was aimed at finding out the knowledge and attitudes of mothers regarding the use of oral rehydration solution in the management of diarrhoea. The results showed knowledge on correct preparation of oral rehydration solution at 39%.[44]

A descriptive study was conducted in Nigeria with 203 conveniently sampled mothers, where knowledge of diarrhoea as a disease, causes and prevention, and treatment using the ORT were the main outcome measures.[45] About 27.6% of the mothers knew how to prepare the SSS correctly before giving it to their children at home; and 14.3% of the mothers could correctly prepare oral rehydration salts. That study also revealed that the knowledge of treatment of childhood diarrhea at home did not follow any social class pattern.

Another cross-sectional survey was conducted in Indonesia, where 100 conveniently sampled mothers of children younger than 5 years, were interviewed.[46] It was aimed at establishing how mothers prepared and administered oral rehydration salts (ORS), as well as the source of instruction for these practices. The results showed that only 23.7% of the mothers were found to have correctly prepared ORS, and none of the mothers fully knew the correct administration practices. In that study, the healthcare workers were found to be the major (62.9%) source of instruction.

Data analyzed from DHS surveys conducted from 1990 to 2005 in 55 countries of WHO regions in Africa, South-East Asia, Europe, Americas, Eastern Mediterranean and Western Pacific showed households in higher socioeconomic groups had a lower prevalence of morbidity caused by diarrhoea as well as greater use of ORT in almost all DHS surveys and countries analysed.[47] It was also found that the use of ORT was 47.7% in the lowest quintile i.e. poor households and 63.7% in the highest quintile, while the average use of ORT for all surveys was 53.5%.

Some active diarrhoea control programs in the 1980's encouraged increased access and availability of ORS in developing countries. The availability of ORS in developing countries increased substantially from 5% in 1982 to 61% in 1988, while the proportion of children who received ORS or recommended home fluids (RHF) during the diarrhea episode increased from approximately 0% in 1982 to 32% in

1988.[48] The global ORS use has persistently remained at around 30%.[49] A systematic review estimated that by using ORS, diarrhoea mortality can be reduced by up to 93% but was unable to estimate the effectiveness of RHFs against diarrhoea mortality because no studies were conducted outside hospital settings.[50] However, with greater uptake, timeous and adequate usage of RHFs (e.g. SSS), a reduction in diarrhoea mortality could be at comparable levels.

2.5 Factors determining correct use of ORT

A case control study involving 6674 children younger than 5 years, conducted in Ethiopia, showed that previous experience with ORT, knowledge of ORT, advice or treatment seeking behaviour and perceived cause of diarrhea were good predictors of ORT use.[51] In that study, caregivers were more likely to use ORT if they had previously used ORT, a finding that is consistent with knowing about ORT and having consulted for a current episode of diarrhoea. Teething as a perceived cause of diarrhea was negatively associated with ORT use. This was also seen in a Nigerian study, which was aimed at determining the caregivers' belief on teething.[52] In the study 87.3% of the participants attributed diarrhoea to teething. This has serious implications in terms of appropriate management of the condition. The perceived belief that when a child is teething consequently results in delayed administration of ORT, leading to severe mortality and morbidity associated with diarrhoea.

The socioeconomic status has been seen to be an important factor in increased and correct us of ORT. Education is considered an important component of socioeconomic status. In a Brazilian cohort study involving 6000 children, increased mortality was seen in children born to women with little or no schooling.[53] Some of the common causes of death among the children were from preventable conditions like diarrhoea. A Cameroonian study supported the notion of the importance of the education level of the caregiver, because a high education level was associated with an increased use of ORT.[54] A contrasting conclusion was reached in a local study, which showed that a higher education level was not associated with a greater ORT knowledge or practice.[4]

In 1979, WHO spearheaded the global effort to increase ORT use, using oral rehydration salts to reduce deaths of young children from diarrhoea, then estimated at 4.6 million annually.[55] The effects of this effort on indicators of program implementation, and on diarrhoea morbidity and mortality, were monitored throughout the 1980s and 1990s by periodic surveys, including the WHO Household Survey, the Demographic and Health Survey (DHS) supported by USAID, and UNICEF's Multiple Indicator Cluster Survey (MICS).[56]

In 1990, WHO estimated a 2.9-3.3 million per year global reduction in mortality in children aged 0-4 years from diarrhoeal disease.[57] This was followed by another significant reduction of up to 1.5 million per year by 1999,[58] indicating a reduction in mortality of 67% in two decades. This was achieved as a result of significant increase of ORT use rate in the 1980's.[59] The synergistic effect of ORT use and other public health interventions in the control of diarrhoea-associated mortality was highlighted in the Mexico study.[60] Public health interventions of which included, literacy campaigns, massive immunization against measles, and improvements in sanitation. Research has shown the protective benefits of immunization against rotavirus and administration of zinc in recent time as a complementary intervention to ORT use in the fight against diarrhoeal disease.[61]

Since 1995, overall use of oral rehydration solution in most countries has stagnated.[62] The integrated management of childhood illness approach has been prioritized instead, with training focusing on health-facility workers, and the community component has not put sufficient emphasis on diarrhoea treatment. This was complicated by the emergence of other diseases e.g. HIV that has pushed diarrhoeal diseases further down the priority list. The percentage of children younger than 5 years who received oral solution for treatment of diarrhoea from 2005 to 2008 was reported as 29% in sub-Saharan Africa, 32% in North Africa and the Middle East, 33% in South Asia, and 38% in East Asia and the Pacific.[63]

Even though ORS has shown to be useful in various medical applications, its use has not spread commendably due to various barriers. Some of the barriers to wider use of ORT include cultural practices.[64] In a qualitative study conducted in Thailand it was

shown that diarrhoea was not perceived as an illness in some instances, but a necessary part of child development. As such the mother's perception of the child's diarrhoeal episode determined the consequent management plan, and thus delays the recommended management plan.[65] Other cultural practices include therapeutic starving, so the bowel could have a 'rest' in the belief that resting the gut during diarrhoea instead of feeding could enhance the passage of frequent watery stools, thus increasing the severity and prolonging the duration of diarrhoea.[66] In societies where alternative medicine in the form of traditional healer services are sought, use of ORT/ORS use demands understanding of the local cultural beliefs and practices, some of which may be built upon to promote the home management of diarrhoea.[67]

In an Indian study, a review of the progress and barriers for control of diarrhoeal disease reported that, only 31% of doctors prescribed ORS for management of diarrhoea, whereas antibiotics or other unnecessary drugs were prescribed for 79% of patients.[62] Some of the drugs prescribed included anti-diarrhoeal drugs, which are reported to have bad side effects. This was further supported in a Nigerian study aimed at investigating the extent of use of antibacterial agents and other drugs by caregivers in home management of simple watery diarrhoea before presentation.[68] It was established that home treatment of diarrhoea was associated with unnecessary use of antibiotics and anti-diarrhoeal agents in about half of the respondents.

Other important obstacles identified included a lack of parental knowledge as seen in a survey of 2117 residents in Tennessee[69] assessing public knowledge and practices associated with diarrheal illness. Personal preference by attending medical personnel and poor knowledge of treatment guidelines which explicitly recommend ORS for mild to moderate dehydration, is another important reason for the poor uptake.[70] This is despite all known facts regarding the efficacy of ORS.

The 1970s and 1980s saw global attention and funding directed towards childhood diarrhoea, which resulted in a major reduction in deaths from diarrhoea as a result of scaling up of ORS, coupled with programs to educate caregivers.[71] These efforts have not been given deserving attention in recent times. Activities in diarrhoea-control programs varied widely, and included changes to medical school curricula, training of

partly skilled health workers, participation of religious leaders, educational campaigns in schools, and modifications of the use of oral rehydration formulations to fit local traditions and beliefs.[56]

2.6 Limitations of ORT

Stool output in excess of 10mL/kg body weight per hour has been associated with a lower rate of success of oral rehydration; however, it should not delay prompt and early initiation of ORT.[72] Often there is associated vomiting which resolves once the acidosis and dehydration is corrected, thus passing a nasogastric tube might help the initial rehydration and speed up tolerance to re-feeding, leading to improved patient disposition and quicker discharge.[73] Despite its use in diarrhoea of varying cause, its use is contraindicated in children in shock, because airway protective reflexes might be impaired.

2.7 New Developments

Osmolarity measures the number of osmoles of solute particles per unit volume of solution, solute particles represented by sodium and glucose in ORS.[74] Current literature supports adoption of low osmolarity ORS. In a systematic review synthesized from 15 randomized controlled trials, consisting of 2397 participants, it was found that a reduced osmolarity ORS was associated with less vomiting, less stool output, and a reduced need for unscheduled IV infusions when compared with standard ORS among infants and children with diarrhea.[75] Fourteen of the 15 trials were conducted in developing countries, with children aged from 1 month to 5 years included in the trials.

Randomized controlled trials have established the superiority of reduced osmolarity ORS over standard ORS in the management of diarrheal diseases in children, which has informed WHO's revised recommended formulation to consist of 75 mmol/L glucose, 75 mmol/L sodium and a total osmolarity of 245 mmol/L.[76] The previously advocated homemade mixture of 8 level teaspoons of sugar and half a teaspoon of salt in 1L water which meant 111 mmol/L glucose, 90 mmol/L sodium and osmolarity

larger than 310 mmol/L, was replaced by WHO with 6 level teaspoons of sugar and half teaspoon of salt in 1L of boiled and cooled water meaning a solution with 75 mmol/L sodium chloride, 75 mmol/L glucose and total osmolarity of about 245 mmol/L.[77]

In the quest for an improved ORS, that would be even more efficient in water and sodium absorption, reduced stool output and duration of diarrhoeal episode, studies have expanded to polymer-based ORT. Glucose polymers include whole rice, wheat, sorghum, and maize. In these polymer-based solutions, the glucose is slowly released after digestion and is absorbed in the small bowel, enhancing the reabsorption of water and electrolyte secreted into the bowel lumen during diarrhoea.[78] A meta-analysis was conducted including 34 trials involving 4214 participants with diarrhoea of varying cause (cholera and non-cholera) in both children and adults.[79] It was aimed at comparing polymer-based oral rehydration solution and glucose based oral rehydration solution, the WHO-ORS and low osmolarity ORS. These studies concluded that polymer-based oral rehydration solution had some advantages compared to glucose-based ORS for treating diarrhoea of any cause as shown by reduced need for unscheduled IV infusion. However, the limited evidence favoured the polymer-based ORS over low osmolarity ORS and thus further research was recommended in the area.

Further attempts at improving the oral rehydration solution saw the addition of amino acids like glutamine to the solution. Glutamine, in particular, has been investigated because of specific few reasons. Firstly, it stimulates sodium absorption as seen in a study describing transport response to mucosal glutamine following intestinal injury caused by rotavirus in pigs.[80] Secondly, it is an important source of energy for the intestinal epithelial cells.[81] A meta-analysis from seven randomized trials compared the clinical effects of the standard solution of WHO-ORS, and experimental ORS solutions, containing glycine, on 643 children with acute non-cholera diarrhoea. Results showed that the addition of glycine failed to reduce either stool output or diarrhoea duration in the children.[82] A similar conclusion was reached when L-glutamine-containing glucose free ORS was compared to standard glucose-based

formulation recommended by the WHO in a randomized doubled blind controlled trial conducted in children aged 1 to 60 months in Mexico.[83]

2.8 Homemade Salt Sugar Solution (SSS) vs. commercial ORS use

There is a big debate around which solution is better between the homemade oral rehydration solution and the commercial oral rehydration solution.[84] Commercial oral rehydration solution is made of precisely measured and controlled contents and thus considered very safe. Proponents of ORS packets include WHO, UNICEF, USAID and many ministries of health. Proponents of the homemade solution on the other hand argue that ingredients for homemade solution are usually available at hand in homes, but are concerned with mixing the commercial packet with inadequate amount of water, which is dangerous.[82]

In South Africa erratic availability of ORS packets at local clinics is sometimes a huge problem. This has also been seen in other countries. A study in Pakistan, for instance, revealed that while the country's central warehouse was overstocked with packets, irregular deliveries led to widespread shortages at the community level.[85] This is a common reason for unavailability of the ORS packets in our local clinics.

Efforts have also been made at developing new flavours and varying packet sizes for ORS.[86] A randomised controlled trial conducted in Manila, involving 437 children younger than five years of age, found that flavoured ORS did not have any clear advantage over standard glucose based ORS in terms of consumption.[87] Increased consumption of ORS during a diarrhoeal episode improves and maintains a good hydration status. On the other hand, flavouring the solution can also render the solution ineffective, by changing the electrolyte composition.[88]

A study conducted in Bangladesh, aimed at identifying factors that determine the use of ORT in the management of diarrhoea in children aged younger than five years. Some of the reasons mothers reported for not using ORT were difficulty in preparing homemade SSS and inability to afford commercial ORS packets.[47] For many poverty stricken families in most developing countries, including South Africa, commercial

ORS packets remain a luxury. In another Bangladeshi study, the cost of a commercially produced ORS packet was seven times greater than that of a litre of a homemade SSS made from unrefined cane sugar and table salt.[89]

2.9 Impact evidence for ORT

2.9.1 Brazil[90]

This is a summary of the important findings of a Brazilian study that was considering the impact of ORT on the declining diarrhoea mortality, between 1980 and 1990 in the northeast region of the country. Many other factors could account for the significant reduction in mortality such as other socioeconomic activities happening at the time. The study was aimed at describing these trends, correlating ORT use with diarrhoea mortality and exploring alternative explanations for the declining diarrhoea rates.

The introduction of ORT coincided with deteriorating socioeconomic conditions that were also accompanied by an increase in the water supply, vaccination coverage, increased breastfeeding duration and improved nutritional status. In the midst of these significant changes, there was a notable decline in infant mortality and infant death attributed to diarrhoea. The decline extended to the 1- 4 years age group. There was also a decline in hospital admissions for diarrhoea, which no other cause of death or admission showed.

Taking all other interventions into account, a simulation model estimated that changes in factors other than ORT (i.e. increase in water supply, vaccination coverage, increased breastfeeding duration and improved nutritional status) would lead to a 21% reduction in infant diarrhoea mortality. This accounts for about one third of the actual decline, which stood at 57% thus highlighting the support of the hypothesis that case management, most likely ORT, maybe responsible for the substantial proportion of the remarkable fall in diarrhoea mortality. Ecological analysis further showed that ORT use rates were inversely correlated to infant diarrhoea.

2.9.2 Egypt[91]

This section reviews the strategy employed in Egypt between 1981 and 1991, aimed at reducing mortality from diarrheal disease in children less than five years of age by at least 25% within five years. A nation-wide campaign project named National Control of Diarrheal Diseases Project (NCDDP) was setup in 1981, following funding from United State Agency for International Development (USAID). The grant agreement specified three principal outcomes expected by 1986, a) 90% of mothers would become aware of ORT and 75% understand its use; b) more than half of serious cases seen by the health system would get ORT and c) diarrhoea mortality in children under 5 years of age would decline by at least 25%.

Strategies employed by the NCDDP to meet the targets included a) in-country production and distribution of ORS; b) the innovative use of mass media to promote and teach the use of ORT; c) training of health workers and families on a large scale and d) establishment of rehydration rooms in clinics and hospitals.

According to the civil register, between 1983 and 1988 infant and childhood mortality rate was reported to have declined by one-third. In the same period, registered diarrhoeal mortality fell by 58% for infants and 53% for children ages 1 to 4 years. Seventy-nine percent of the drop in infant mortality and 62% of the drop in childhood mortality were attributed to diarrhoeal disease.

The declines in diarrhoeal mortality coincided with the peak of NCDDP activities and improved results in case-management. Analysis of the findings of the study revealed that the following materialized: a) there was an actual decline in diarrhoeal mortality; b) that case-management improved with plausible sufficiency to account for most of the diarrheal mortality reduction; and c) other changes including host resistance did not account for the magnitude of the reductions that were seen. These benefits occurred despite economic deterioration occurring at the time, which one expected would have offset these benefits. Improved case-management, which included ORT, was the logical explanation for these benefits.

2.9.3 Mexico[58]

This section describes the Mexico study on mortality trends from diarrhoeal diseases among under-5 year olds in the country between 1978 and 1993. The study was aimed at assessing the impact of various public health interventions on reduction of diarrhoeal disease mortality and also at estimating the relative impact of the national ORT programme on the reduction of mortality of these children.

Three periods were covered in the analysis, 1978 to 1983 (stage 1) when ORT had not been introduced as a public measure in the country, 1984 to 1989 (stage 2) when ORT programme was launched and 1990 to 1993 (stage 3) when additional public health interventions (e.g. sanitation, immunization) were introduced. Over the period and the different stages, there was a reduction in the number of deaths from diarrhoeal diseases, increase in mothers using ORT and ORS, decrease in number of diarrhoeal episode per child per year while there were improvements in sanitation, greater immunization coverage and improved female literacy. The greatest impact was seen in the 3rd stage where various health interventions were evaluated together with ORT.

Pearson's correlation was used to evaluate the strength of association between mortality and selected variables. The highest correlations in reducing diarrhoeal disease mortality were for interventions concerned with improving environmental and home sanitation, as well as with increased immunization coverage. The study highlighted that the diarrhoeal disease control programme, which relied mainly on the promotion of oral rehydration would most likely be less effective than a more holistic programme, which takes into account improvements in sanitation and the general wellbeing of the population.

2.9.4 Philippines[92]

A study was conducted in the Philippines to evaluate the impact of the National Control of Diarrhoeal Disease Programme (NCDDP) in the country over the period 1980 to 1993 on diarrhoea morbidity and mortality among under-5 years old. Some of the objectives of NCDDP included, a) determining ORT use; b) describing levels and trends in diarrhoeal morbidity and mortality among under-5-year olds; and c) to relate

the levels and trends of programme activities (including ORT use) to diarrhoeal morbidity and mortality.

The launch of the NCDDP coincided with changes in other factors, including improvements in water and sanitation, and the trend towards higher wage levels in addition to widespread training activities. There was a resultant increase in ORT use rate, diarrhoea mortality and hospital admission rates subsequently fell faster than those related to respiratory illnesses among children aged 1–4 years (although not so markedly for infants), and the diarrhoea mortality also dropped much faster than deaths due to perinatal causes, indicating that the programme had an impact. Ecological analysis showed that there was no association between level of knowledge of ORS and the proportion of deaths due to diarrhoea among infants and young children. There was also no association between ORT use and proportion of deaths due to diarrhoea among infants and young children.

Although the plausibility of the impact of the NCDDP could not be established beyond doubt because of lack of reliable data especially measuring the impact of other factors e.g. improvement in water and sanitation, there was a significant associated improvement in diarrhoea mortality, which could be better explained from the intervention.

2.10 South African Context

2.10.1 Initiatives to improve mothers' and caregivers' ORS knowledge

The South African Department of Health (DOH) has made efforts to curb childhood diarrhoeal morbidity and mortality. Pregnant mothers are currently taught how to prepare SSS as part of antenatal care (ANC). Mothers and caregivers in the well-baby clinic and every encounter with them at the clinics is viewed as a useful opportunity for health promotion, and thus mothers and caregivers are again taught how to prepare the solution. Education as the main interventional tool has not worked as expected in South Africa and many other countries. However, it is an intervention that still has a significant role to play as seen in work done outside the S.A borders. An interventional study was conducted in Bangalore, aimed to measure the knowledge of

mothers regarding management of diarrhoeal diseases and to find out the impact of educational intervention on the knowledge of the mothers.[93] Two hundred and twenty-five mothers participated in the study conducted in 3 stages. The first stage was an assessment of mother's knowledge, attitude and practice. The second stage was an educational intervention and the third stage included post intervention knowledge, attitude and practice. After the educational intervention, there was significant improvement on knowledge of mothers regarding definition of diarrhoea, signs of dehydration, awareness of ORS solution, correct preparation of ORS solution, shelf life of ORS solution, seeking health care and rational drug therapy during diarrhoea. Although overall knowledge scores improved significantly at two months and at two years, knowledge dropped after two years. This however, could be attributed in part to the fact that some of the participants were lost to follow up as a result of relocation and death. Only 147 of the original 200 participants were assessed after the two years. No other such study was ever done locally.

In South Africa in addition to the teaching done at the clinics, the new children's road to health card has the instructions on how to prepare the salt sugar solution. However, the current initiatives by healthcare workers in trying to teach mothers and caregivers how to prepare homemade oral rehydration solution and the recipe contained in RTHC appeared not to be yielding the desired outcome namely, equip mothers and caregivers to be able to correctly prepare homemade oral rehydration solution, to recognize signs of dehydration and to practice timeous and proper administration of oral rehydration solution in children with diarrhoea.

2.10.2 Extent of ORT use and knowledge

The South African Demographic and Health Survey 1998 (SADHS) revealed that 49% of mothers and caregivers who participated in the survey knew how to treat diarrhoea.[94] There was also an overall 81% use rate of ORT (ORS and HF) and 68.6% use of homemade solution. However, in a study at the Red Cross War Memorial Children's Hospital, also in Cape Town, more than 10 years ago showed that despite 70% of caregivers having knowledge of ORT, only 9% administered it.[95] In 2003, a SADHS follow up study showed a decline in mothers and caregivers knowledge of treatment of diarrhoea and a decline in ORT use. A third (33.1%) of mothers and

caregivers who participated in the survey knew how to treat diarrhoea. The overall use of ORT (ORS and HF) was 63% and homemade fluids was 37.6% respectively.[96]
In 2000, the under-5 child mortality rate from diarrhoeal disease accounted for 10.2% in South Africa.[97] However, in 2007 the single leading cause of death in under-5 years was reportedly diarrhoeal diseases, constituting 21.4%.[98] This notable increase may possibly be linked to HIV/AIDS epidemic. The millennium development goal for child mortality commits nations to reduce child deaths by two thirds by 2015.[99] The management of diarrhoea is seen to be one of the measures that can be used to reduce the alarming rate of morbidity and mortality and thus meet the MDG4. Heightened impetus regarding ORT use, sound knowledge on the correct preparation method by mothers and caregivers, and adherence to the WHO's 7-point plan of diarrhoeal control has the potential to decrease mortality in children under-5 years of age as seen with ORT use and other public health measures in the Mexican[58] study.

Previous assessments of mothers' use of SSS, which were conducted in South Africa and Swaziland in a conveniently sampled study, showed that knowledge and wide use of SSS did not guarantee proper use, and less than fifty percent of mothers knew how to correctly make oral rehydration solution.[12] Furthermore, only a questionnaire was administered in the study and no practical demonstration was performed. In the only local study[4] that also looked into practical demonstration of SSS only 33% of participants could correctly prepare SSS. In one of the more recent studies, a prospective descriptive study, conducted in Cape Town, found that 78.9% of caregivers gave ORT at home before seeking help from a healthcare practitioner and 67.9% administered SSS while 12.5% made an inaccurate mixture.[100]

2.11 Conclusion

The literature is clear on how the ORS has evolved over the years and reports that the ORS usage rate is not as high as it was in the earlier years despite its efficacy. Some of the obstacles hindering uptake include: poor knowledge of preparation, cultural practices and personal preferences by the doctor. Countries like South Africa, have put in place interventions to address the poor knowledge and poor practice deficit. Assessments on knowledge and practice has mostly been based on questionnaires and

shows the need for studies that assess practical preparation of ORS. The aim of the current study was therefore to practically assess mothers' and caregivers' knowledge on how to correctly prepare and administer SSS.

Chapter 3: Methods

3.1 Study design and setting

The study was a cross sectional survey conducted between October 2011 and February 2012. This is the appropriate study design for researchers who want to describe[101] the participants' knowledge considering interventions already put in place by DOH towards improving knowledge.

Mofolo CHC is situated in Mofolo Township, Soweto, in Johannesburg Metro District, which caters for mainly black people living in the township. This centre offers a wide range of primary health care (PHC) services, which include: Immunization, obstetric care, counselling, HIV management, Psychiatry, Tuberculosis (TB) management, physiotherapy, occupational therapy, speech therapy and emergency services. The CHC operated from Monday to Friday 08:00 to 16:00, Saturday 08:00 to 12:00 and a 24/7 maternity and obstetric unit. An average of 2200 under 5yrs were serviced per month, by 4 medical officers, 2 registrars attached to University of Witwatersrand, 2 interns, 2 physiotherapists, 2 occupational therapists, 1 speech therapist and 4 PHC nurses.

3.2 Study population and sample size

The sample population was adult mothers and caregivers, aged 18 years and older, who had brought children between the ages of one day to five years to the clinic at Mofolo CHC. The children were brought to either the well-baby clinic for immunization or the general clinic because they were sick. Using Stata 11, a sample size of 407 was calculated, assuming a power of 90%, a target population of 2200 and a significance level (alpha) 0.05.

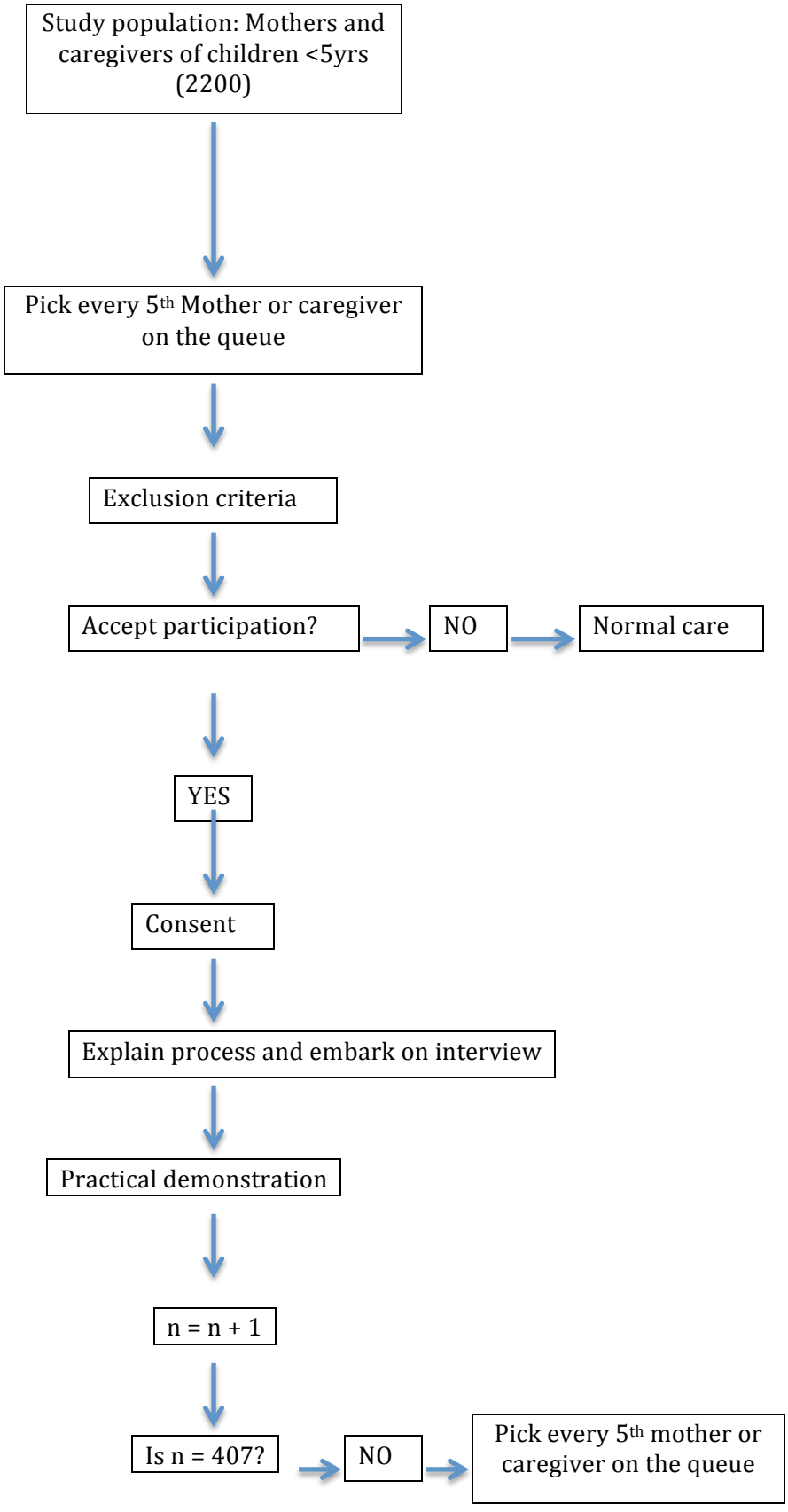
3.3 Sampling procedure

Figure 3.1 shows the sampling methods. A convenient sampling method was used. The mothers and caregivers were approached and talked to about the research, as they consecutively presented to the clinic. Those that agreed to participate in the study

were attended to by clinicians and thereafter ushered into a prepared room, for interviews and demonstration on how to prepare ORS. This was to ensure confidentiality and ensure that they did not miss their place in the queue.

Given that the average number of children under the age of 5 years seen in Mofolo CHC per month was 2200, and the calculated sample size was 407, the total number of participants enrolled were 407, the calculated K-interval was approximately 5. This was obtained by dividing 2200 by 407. Therefore, using the random number table, one number, between 1 and 5 was picked randomly at the beginning of the day. This meant the first potential participant to be chosen from the queue was participant of the number picked on the day, then thereafter every 5^{th} potential participant was chosen using the positions, e.g. $a + Ki = 2 + 5i$, $i = 0, 1, 2, \ldots 407$. This process was repeated on data collection days continuing from the count of the previous data collection day during the weekdays until the required sample was obtained. The selected participants were the mothers and caregivers of under-5's who were arriving at the Mofolo CHC according to positions 2, 7, 12, . . . 2035.

Figure 3.1: Flow diagram



3.4 Data collection

An interview and data collection sheet was used to collect information from study participants (Addendum A). It captured the following information: 1) participants' demographic data; 2) child information on the road to health card; 3) assessment on SSS teaching; 4) mothers' and care-givers knowledge of signs of dehydration; 5) knowledge of the appropriate way of administering ORS; 6) knowledge on appropriate time to go to clinic. Data collection session was completed with a practical demonstration checklist.

Participants' demographic data included the age of the mother or caregiver, monthly household income, household number of children and the gender of the caregiver. Child information on the road to health card determined was whether the card was new or old, age of the child, rotavirus vaccination status, number of vaccination doses and recorded diarrhoeal episodes.

Assessment on SSS teaching; a) determined whether the mothers and caregivers were taught how to prepare SSS; b) determined the person who conducted the teaching; c) number of teaching sessions received by mother or caregiver; d) determined whether mothers and caregivers were satisfied with the teaching and if not, suggested alternative teaching method and; e) determined whether participants thought they knew how to prepare ORS.

Mothers' and care-givers' knowledge of signs of dehydration was assessed and any one sign of dehydration mentioned was checked and mothers or caregivers were considered knowledgeable on signs of dehydration and similarly, knowledge of the appropriate way of administering ORS was assessed and any correct method mentioned was checked and mother or caregiver considered knowledgeable.

The practical demonstration followed immediately after the interview, conducted by the researcher, with an assessment on hygienic practice, amount of water, amount of salt and amount of sugar to be used. Participants were expected to wash their hands and utensils, use 1 litre of boiled water, 8 level teaspoons of sugar and a half level teaspoon of salt. This was done to measure knowledge objectively to minimize bias, because some participants would say they knew how to prepare salt sugar solution,

while actually they did not know. Participants were marked correctly if they had used ½ level teaspoon of salt, 8 level teaspoon of sugar and 1L of clean, boiled & cooled water as is the recommended method in the road to health card. However, those with correct measurements of salt, sugar and water, even though water was not boiled, were also marked correctly because water was from a reliable water source (water tap).

The interview sheet was piloted at Mofolo CHC and modified to meet the aim and objectives of the study. Changes included, addition of a cup as an option in the container options available for preparing SSS and also added all danger signs according to the integrated management of childhood illnesses (IMCI) irrespective of whether they are related to dehydration as reason to take child to clinic.

3.5 Exclusion criteria

The following potential participants were excluded:

- Deaf and blind mothers and caregivers,
- Mothers and caregivers with children requiring emergency treatment
- Mothers and caregivers declining interview, and
- Those without road to health booklets.

Reasons for the exclusion of firstly deaf and blind mothers and caregivers were that because other complex interview (as well as data analysis) methods would have had to be developed and validated, such as the use of brail and sign language to be able to interview the participants. Secondly, it would have been impossible when it came to the demonstration part of the study for this group of participants, as this was the main focus of this study. Questions would then arise such as, “how does a blind person demonstrate practically how to prepare ORS?” Those potential participants without the road to health cards were excluded because it was a data source. Data had to be extracted from the cards, such as, diarrhoeal episodes, rotavirus vaccination, child age and also used to prevent result bias from re-interviewing mothers and caregivers who had been interviewed already.

3.6 Data analysis

The data was collected and entered on Stata version 11 and analyzed. The proportion of mothers who could correctly prepare SSS during general clinic and well-baby clinic was determined. Mothers and caregivers who mixed 1 litre of water, 8 level teaspoon of sugar and ½ level teaspoon of salt were deemed to know how to correctly prepare SSS. Chi-square test was used to compare non-numeric data (nominal data) e.g. age groups, the individual variables and main outcome measure (correct preparation of SSS). The chi-square test only indicated whether there was an association between variables and correct preparation of SSS or not, without giving the strengths of the association. The logistic regression analysis (univariate) was therefore used to identify the individual variables that were significantly associated with the main outcome measure (correct preparation of SSS), and strengths of the association. Statistical significance was set at 0.05.

3.7 Ethical consideration

Written consent (Addendum 4) was obtained from willing participants after explaining the details of the research project to them. Numbers were used on the interview sheet, in Addendum 1, instead of participants' names to ensure anonymity and confidentiality. Eligible participants were informed that they had the right not to participate in the study and could withdraw at any stage of the study without any consequence. The protocol was approved by the Human Research & Ethics Committee of the University of the Witwatersrand. The clearance certificate number is M101016 (Addendum 2). A letter of permission was also obtained from the facility manager of the Mofolo CHC (Addendum 3).

Chapter 4: Results

4.1 Introduction

This chapter presents the findings made in relation to the study purpose.

Mothers and caregivers' demographic characteristics, which include age, household income, age and number of household children, were categorized and tabulated. Similarly, index children's demographic characteristics sourced from the road to health card, which included age, rotavirus vaccination status, number of rotavirus vaccine doses received, number of diarrhoeal episodes, were also categorized and tabulated.

Knowledge and practice on SSS by study participants and the practical demonstration on how to correctly prepare SSS was categorized and tabulated. The different individuals who taught study participants how to preapare SSS were presented in a pie chart.

The associations of various study participants' demographic characteristics and the main outcome measure (correct preparation of SSS) was determined using a chi-square test and was presented in a table. Also, the strength of association of demographic characteristics and main outcome measure was determined using logistic regression analysis and presented in a table.

4.2 Profiles of participants

A total of 407 mothers or caregivers took part in the study.

Table 4.1: Mothers and Caregivers' demographics

Variables	Categories	Number (n)	Total (n)	Percentage (%)	Total (%)
Mothers' or caregivers' ages	< 20	26	407	6.4	100
	20 - 29	197		48.4	
	30 - 39	138		33.9	
	> 40	46		11.3	
Monthly household income	< R1000	61	407	15.0	100
	R1000 - R2999	103		25.3	
	R3000 - R4999	86		21.1	
	R5000 - R9999	85		20.9	
	> R10000	72		17.7	
Gender	Male	20	407	4.9	100
	Female	387		95.1	
Number of children	1-3	378	407	92.9	100
	>3	29		7.1	

Table 4.1 shows demographic information of mothers or caregivers. Males were only 4.9% of the total participants included in the study. The largest age group of mothers and caregivers was between 20-29 years accounting for 48.4% of participants. The majority of participants, 93%, had three or fewer children and more than half (61.4%) had a household income less than R5000.

4.3 Profiles of children under participants' care

Table 4.2: Children's demographics sourced from road to health cards

Variables	Categories	Number (n)	Percentage (%)
Children's age groups	< 1yr	211	51.8
	1yr	68	16.7
	2yr	47	11.6
	3yr	35	8.6
	4yr	46	11.3
Road to health card	New	186	45.7
	Old	221	54.3
Rotavirus vaccination	Vaccinated	283	69.5
	Not vaccinated	124	30.5
Number of rotavirus vaccine doses received	0	124	30.5
	1	84	20.6
	2	199	48.9
Diarrhoeal episodes	Had diarrhoea	214	52.6
	No diarrhoea	193	47.4
Number of diarrhoeal episodes recorded on RTCH	0	193	47.4
	1	94	23.1
	2	43	10.6
	3	37	9.1
	≥4	40	9.8

Table 4.2 shows demographic information of children. Most children (51.8%) brought to the clinic by mothers or caregivers were less than one year old and 45.7% had the new road to health card. Sixty nine point five percent of the children had received rotavirus vaccination. Episodes of diarrhoea were recorded in 52.6% of the children's road to health cards. Most of the recorded diarrhoeal episodes on the road to health cards were only one diarrhoeal episode and accounted for a combined (vaccinated and not vaccinated) total of 23.1%.

4.4 Participants' knowledge and practice of SSS

Table 4.3: Response by mothers and caregivers

Variable	Categories	(n)	Total n	(%)	Total %
Teaching	Taught	396		97.3	
	Not taught	11	407	2.7	100
Taught by	Healthcare worker	220		55.6	
	Other	176	396	44.4	100
Perceived knowledge	Know	375		94.7	
	Don't know	21	407	5.3	100
Number of teachings	0	11		2.7	
	1 – 3	344		84.5	
	> 3	52	407	12.8	100
Teaching method	Lecture	245		61.9	
	Lecture/Practical	92		23.2	
	Pamphlets	28		7.1	
	Pamphlets/Lecture	30		7.6	
	Pamphlets/Lecture/Practical	1	407	0.2	100
Satisfied with teaching	Yes	346		87.4	
	No	50	407	12.6	100
Preferred teaching method	Lecture	199		50.3	
	Lecture/Practical	137		34.6	
	Pamphlets	31		7.8	
	Pamphlets/Lecture	24		6.1	
	Pamphlets/Lecture/Practical	5	407	1.3	100
Signs of dehydration identified	Doesn't know	83		21.0	
	Dry mouth and thirst	12		3.0	
	No tears when crying	2		0.5	
	Sunken eyes	69		17.5	
	Sunken fontanelle	5		1.3	
	Loss of skin turgor	20		5.1	
	Weight loss	26		6.6	
	Lethargic/weakness	178	407	45.1	100
Frequency of administration	Doesn't know	229		57.8	
	After each loose stool	45		11.4	
	After vomiting	1		0.3	
	When child feels thirsty	25		6.3	
	Throughout the diarrhoea	96	407	24.2	100
When do you take a child to clinic?	Doesn't know	236		59.6	
	Any IMCI danger sign	1		0.3	
	Prolonged diarrhoea	137		34.6	
	Bloodstained stools	2		0.5	
	Fever	3		0.8	
	Signs of severe dehydration	17	407	4.3	100
Does ORS stop V&D	Yes	275		67.6	
	No	132	407	32.4	100

Table 4.3 shows the response of mothers or caregivers to the various questions asked relating to the teaching received about ORS and the knowledge they believed to have gained. The majority of mothers or caregivers (97.3%) were taught how to prepare SSS and over half (55%) of the teachers were health care workers. The number of teachings in most instances (84.5%) was between one and three. The popular teaching method was lectures (61.9%) and was the most preferred teaching method (50.3%). Most mothers or caregivers (87.4%) were satisfied with the teaching method used to teach them and thought they knew how to prepare SSS in 94.7%.

Signs of dehydration were unknown to 21% of mothers or caregivers and the most commonly recognized sign (45.1%) was lethargy/weakness. About 58% of mothers or caregivers did not know the frequency of administering SSS and more than half (59.6%) did not know when to take the child to clinic. SSS was believed to stop vomiting and diarrhoea in 67.5% of participants.

Figure 4.1: Percentage of participants taught by Healthcare workers and non-healthcare worker

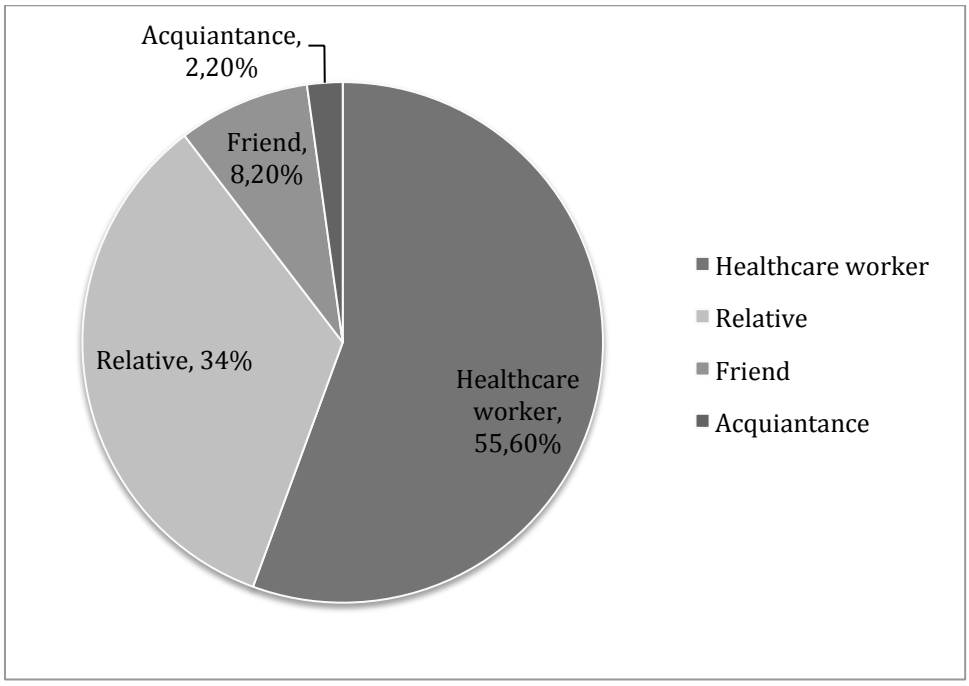


Figure 4.1 shows the proportion of teaching that was either done by a health care worker or a non-healthcare worker for example a relative, friend, colleague, or an acquaintance. The majority (55.6%) were taught by healthcare workers.

4.5 Results of participants demonstrating the preparation of SSS

Table 4.4: Results of practical demonstration of SSS preparation

Variable	Categories	Numbers (n)	Percentage (%)
Washing hands	Washed hands	3	0.8
	Did not wash hands	393	99.2
Boiling water	Used boiled water	321	81.1
	Did not use boiled water	75	18.9
Washing utensils	Washed utensils	6	1.5
	Did not wash utensils	390	98.5
Washing bottle	Washed bottle	6	1.5
	Didn't wash bottle	390	98.5
Choice of bottle	Cup	59	14.9
	500ml bottle	26	6.3
	1L bottle	253	64.1
	2L bottle	58	14.7
Choice of spoon	Tablespoon	36	9.1
	Teaspoon	360	90.9
Number of teaspoons of salt	½	187	47.2
	1	130	32.8
	2	50	12.6
	3	6	1.5
	4	5	1.3
	5	0	0
	6	6	1.5
	7	2	0.5
	8	6	1.5
	9	1	0.3
	≥10	0	0
Number of teaspoons of sugar	½	31	7.9
	1	68	17.2
	2	38	9.6
	3	17	4.3
	4	16	4.0
	5	14	3.5
	6	20	5.1
	7	19	4.8
	8	166	41.9
	9	6	1.5
	≥10	1	0.2
SSS preparation	Correctly prepared*	83	20.9
	Incorrectly prepared	313	79.1

*Correctly Prepared = ½ level teaspoon salt, 8 level teaspoon sugar and 1L water

Table 4.4 demonstrates the four hygienic practices (hand washing, boiling of water, washing of utensils and bottle washing), utensils utilized and various measurements made during the SSS practical preparation assessment. A huge number 79% of

participants prepared the SSS incorrectly, despite having had over 94% in Table 4.3 perceiving themselves as knowing how to prepare SSS. The majority of mothers or caregivers (81%) used boiled water for preparation of SSS. The washing of hands, utensils and bottle were frequently not done as only 0.8% washed their hands, only 1.5% washed utensils and only 1.5% washed the bottles. There was correct choice of bottle and spoon in 64.1% and 90.4% respectively.

4.6 Association of correct SSS preparation with participants' characteristics

Table 4.5: Association between correct SSS preparation and various demographic characteristics

Variable	Chi^2 value	p-value
Mother/caregiver's age group	8.451	0.075
Number of children in the family	8.471	0.011
Average household income	5.347	0.511
Number of teachings received by mother/caregiver	3.071	0.0001
Teaching method	4.413	0.220
Mother/caregiver's perceived knowledge	5.880	0.015
Teacher (Healthcare work or other)	16.861	0.0001
Road to health card (new/old)	1.483	0.191
Gender	3.070	0.080

In table 4.5, the first row demonstrated that correct ORS preparation is independent of age of the respondent. At the 5% significance level (or $\alpha = 0.05$), this hypothesis cannot be rejected (p-value > 0.05). Thus, correct preparation of SSS is not dependent on age of the mother or caregiver. Furthermore, from rows 3, 5, 8 and 9, at the 5% level of significance, correct SSS preparation was also independent of the following variables: any household income, teaching method, road to health card and gender. However, rows in 2, 4, 6 and 7: number of household children under care, number of teaching received, mothers perceived knowledge and the kind of teacher giving the training, were associated with correct SSS.

Table 4.6: Logistic regression analysis examining the relationship between demographic characteristics and correctly preparing SSS

Variable	Categories	Odds ratio	p-value	95% CI*
Respondent's age group	<20	-	-	-
	20 – 29	5.88	0.087	0.77 – 44.86
	30 – 39	7.69	0.050	1.00 – 59.02
	>40	11.29	0.023	1.39 – 91.84
Average household income	<R1000	-	-	-
	R1000 – R2999	1.22	0.617	0.56 – 2.67
	R3000 – R4999	1.21	0.651	0.54 – 2.70
	R5000 – R9999	0.55	0.203	0.22 – 1.38
	>R10000	1.26	0.593	0.544 – 2.90
Gender	Male	-	-	-
	Female	4.13	0.173	0.54 – 31.71

*CI = confidence interval

Table 4.6 shows that mothers and care-givers age older than 40 years was the only socio-demographic characteristic that predicted correct preparation of ORS.

Chapter 5: Discussion

5.1 Introduction

This chapter attempts to provide interpretations of the findings in this study, comparing and contrasting these findings to literature. It further highlights the clinical policy and research implication of these findings.

5.2 Practical demonstration

In this study, the main aim was to assess the knowledge and skills of mothers and caregivers in preparation and use of SSS at Mofolo CHC. The main finding was that only 21% of mothers and caregivers at the CHC knew the correct preparation method of SSS as corroborated by their practical demonstration. This was consistent with the findings in other studies, in Nigeria[45] (27.6%), India[44] (39%) and in a CHC in Sedibeng[4] (33%). This confirms that the increased ORT use world wide seen in the 80's[59] has indeed stagnated.[62] In the South African context, the 1998 SADHS survey found knowledge on how to treat diarrhoea adequate in 49% of mothers and caregivers and overall ORT use rate at over 80%. [94] This had dropped to 33.1% and 63% respectively; following a 2003 SADHS survey.[96] The implication here is that it undermines efforts to improve childhood diarhoea-associated mortality and morbidity, because there's poor case management at household level as a result of poor knowledge on preparation of SSS. Initial steps in management of childhood diarrhoea involving early initiation of SSS at home, are not followed by mothers and caregivers. This further supports the need to reprioritize household management of diarrhoea as was the case in the 80's. There are very few interventional studies aimed at resolving the ongoing poor knowledge. There need to be more studies aimed at intervention at primary health care level. In addition, opportunities provided by clinic visits at PHC level should be used to educate mothers and care-givers of children on the correct use and preparation of SSS, as this is a life-saving, home-made intervention that reduces morbidity and mortality from diarrhoea.

The practical demonstration of SSS, also indirectly highlighted unhygienic preparation methods by mothers and caregivers. Hygienic practices in the household for example, washing hands, usage of clean utensils, safe clean water are important interventions in diarrhoeal disease control, with risk of diarrhoea being reduced by 42–45% by washing hands with soap.[102] A report has indicated that improved sanitation and hygiene could have a significant reduction in the prevalence of diarrhoea in children of less than five years.[103] The washing of hands, utensils and bottles were infrequently done, as only 0.8% washed their hands, 1.5% washed the utensils and 1.5% washed the bottles. The finding could be because participants assumed the utensils were clean, and maybe it was not an important part of the teaching process. While watching the demonstration, they may have felt stressed and believe they did not have to go through all the steps, or have forgotten. Also, aspects of hygiene in the preparation method do not appear in the new road to health cards as part of the preparation method. Since this is key to diarrhoeal disease control, emphasis needs to be put on it during health education programs for children under 5 years of age.

5.3 Teaching on how to prepare SSS

The majority (94.7%) of the mothers and caregivers were initially convinced that they knew how to correctly prepare SSS. Some confidently proclaiming knowledge probably because of previous ORT use or because of teaching received. A study conducted in Nigeria showed that there was no difference in method of preparation and administration of ORT between mothers and caregivers who have used ORT and those using it for the first time.[104] Also, high knowledge of existence of SSS and wide use of SSS in management of diarrhoea did not necessarily translate to correct use in one study,[12] hence, the need for continued teaching on an on-going basis on SSS preparation to the mothers and caregivers, especially during antenatal and well-baby clinic visits. On-going teaching is crucial for reinforcement of knowledge, noting that, in this study, mothers' and caregivers' perceived knowledge of SSS preparation was associated with correct preparation (p-value, 0.015).

The majority (97.3%) of mothers and caregivers who were taught how to prepare SSS, compares with the self-perception of knowledge (94.7%). Healthcare workers

did the teaching in 55.6% of the time. Other studies revealed that healthcare workers were also the majority in disseminating preparation method, where in a Nigerian[105] study it was 80.1% and in a Cameroonian study it was 54.3%. [106] The teaching method used to teach participants in this study was mostly from lectures. The other studies do not mention the type of teaching method used by healthcare providers in teaching participants.[5,105,106] It is ideal to have teaching done by healthcare workers, as they are expected to be more knowledgeable about SSS and this would minimize misinformation. In this study it was shown that teaching by healthcare provider was associated with correct preparation on SSS. However, a study conducted in Zimbabwe showed that 27% of village healthcare workers, 30.8% of the Medical and Health Assistants and 10.5% of the community sisters did not give the standard SSS formulation.[107] This means that lower caders of healthcare workers are also prone to misinforming clients and future quality improvement projects need to focus on this as a possible area of interest, especially given that these cadre of workers are primarily engaged with health education.

The VARK[108] theory as a learning style has been considered conducive to patient education. With this model patients are categorized into visual, auditory, reading and kinesthetic/tactile learners. It would be very useful for healthcare workers to be aware of it to improve health promotion literacy outcomes. This could be achieved by considering patients who prefer to learn from reading and cater for them using information in the new road to health card. More auditory learners would be catered for with oral health education sessions while practical demonstration would cater for tactile and visual learners. In this study the majority of participants were taught mostly by lectures and with low level of dissatisfaction. One of the challenges at Mofolo CHC was the unavailability of a dedicated health promoter who would teach mothers and caregivers and make sure they understand issues relating to SSS. Nurses were short staffed with a huge number of patients who needed to be treated daily and the former are currently the ones facilitating the teaching in most instances. Every morning nurses at Mofolo CHC needed to prioritize the daily duties, more often informed by the patient load, leading to erratic teachings on ORS preparation at times. With a high patient load, it goes without saying that hearing and understanding of what is being taught could be a serious challenge. Despite the challenges, mothers and caregivers continue to be taught under such conditions that is a clear hindrance to

knowledge transfer. It is not surprising that the vast majority could not correctly prepare SSS.

Every visit to a health facility by mothers and caregivers should be viewed as an opportunity for health promotion. Important health issues e.g. ORS preparation method, should be discussed consistently as recall promoting behaviours like repetition have been shown to enhance understanding.[109] This was shown in an interventional study done in Karnataka, India, where participants' knowledge of the signs of dehydration, awareness of ORS solution, correct preparation, shelf-life of ORS solution and seeking healthcare were significantly improved following appropriate educational intervention, although that knowledge dwindled over time.[110]

5.4 Participants knowledge of SSS use

The lack of knowledge on correct preparation of SSS extended to lack of knowledge on the use of SSS. An estimated 67.6% thought SSS stopped diarrhoea and vomiting, a rate lower than what another study[4] found (81%) found. Around 57.8% did not know the frequency of administration of SSS during an acute episode of vomiting and diarrhoea. The ability to identify signs of dehydration is the cornerstone of early institution of SSS and timeous seeking of medical help. In this study 21% of study participants did not know a single sign of dehydration, and in Nigeria[111] and India[112] it was 10.4% and 27.2% respectively. Also, with 59.6% of mothers and caregivers not knowing when to take the child to clinic during a diarrhoeal episode, makes achieving Goal 3 of the Sustainable Development Goals (SDG), a pie in the sky, as it is aimed to reduce under-5 mortality to at least as low as 25 per 1,000 live births by 2030.[113] This can only be achieved with adequate case management of preventable conditions like diarrhoea. Poor knowledge of the signs of dehydration by mothers and caregivers hinders greater use of SSS. The cascade of events leading to death in children with diarrhoea, begins when they become dehydrated. It is expected that on the basis of recognizing the signs of dehydration that a mother or caregiver would decide to initiate ORS therapy or to take the child to a health facility. Therefore, health promotion talks in this PHC facility need to focus on the need to institute SSS timely, including early recognition of danger signs.

5.5 Participants' characteristics

5.5.1 Gender

The study consisted mostly of female participants (95.1%), a finding consistent and comparable with similar studies conducted in other parts of the world. In a study conducted in a CHC in Sedibeng district, 88.3 % of participants were mothers.[5] In two cross sectional surveys done in Cameroon[106] and Ethiopia[114] where the use of oral rehydration in treatment of childhood diarrhoea was studied, 95.7% and 95.4 % respectively of participants were women. Females are usually the primary caregivers. This is most likely in part due to gender based traditional roles that expects mothers to stay at home and raise children while fathers were away at work. Females are also; for the most part employed as child minders and are expected to take children in their care to the clinic for health care. So, interventions aimed at addressing the prevalent poor knowledge and skills of ORT preparation and use should target mothers for education and training.

5.5.2 Age

The largest age group of participants was between ages 20-29 (48.4%). This finding was similar to a cross sectional survey done in Nigeria where the largest group was also between ages 20-29 accounting for 47.1 % of the participants.[105] Other studies employed different age groups, where the majority of participants were between the age group 25-35.[4,114] Maternal age was shown to be a predictor of diarrhoeal disease in a Colombian study[115], where the proportion of mothers with at least one child between 0 and 4 years with diarrhoea decreased with each five-year increment in maternal age. This is probably as a result of maternal practices, such as preventive measures like cleanliness and also experience. According to this study women aged 40 years or older were more significantly likely to know how to correctly prepare SSS. This means attention needs to be focused on younger mothers and caregivers in order to improve use of ORT. However, a Nigerian study[53] showed that age had no association with ORT knowledge and ORT use.

5.5.3 Socioeconomic status

In this study household income was used as the only indicator of socioeconomic status. Most household income was between R1000 – R2999. A study found that households in the poorest socioeconomic group consistently showed higher morbidity attributable to diarrhoea and less frequent use of ORT when compared with households in the richest socioeconomic group.[52] A finding consistent with what a Cameroonian study revealed, where higher education was associated with increased ORT use.[106] A contrasting conclusion was reached in a local study that showed that higher educational level was not associated with a greater ORT knowledge or practice.[4] Education is considered an important component of socioeconomic status and there is a strong correlation between maternal education and child health outcomes.[116] One of the limitations of this study was not recording the level of education of the participants, which could have affected the results. In this study, the majority of participants were of low socioeconomic status, considering the household income, which could account for the poor knowledge on SSS. However, socioeconomic status did not predict correct preparation and use of ORT.

5.5.4 Number of household children

Increased parity seem to affect diarrhoea management positively.[105,106] This study has shown an association between the number of household children and correct preparation of SSS, p-value = 0.011. Risk of diarrhoea increases with increased number of household children.[117] This is probably because the more household children there are, the more teaching opportunities and the more likely the mother or caregiver would have had experience of preparing SSS and therefore know how to correctly prepare SSS and manage diarrhoeal disease. Nonetheless, result of regression analysis did not support this.

5.6 Study limitations

This was a descriptive study that employed convenient sampling. That could have led to over-representation or under-representation and in light of this renders the study not representative. It could have been one catchment area with one common problem.

Again, teaching at Mofolo CHC and interaction with mothers and caregivers could be different from other catchment areas. Another limitation of this study is that the term 'healthcare worker' was used as all-encompassing term to describe e.g nurse, doctor, pharmacist, etc all with differing levels of practice, skill and knowledge in SSS preparation. The use of a used and validated questionnaire would have been ideal, with some modification done if deemed necessary. Some very important information was omitted from the data sheet. Some of these omissions include, identifying which of the caregivers are mothers, and which are not. Those who are mothers have prior personal experience, unlike those who are not mothers and thus probably have a better knowledge and practice. Aspects of socioeconomic status like educational level, were not on the questionnaire even though literature clearly indicated correlation with child health outcomes. Although the literature gave contradicting finding regarding ORT use in association with education, i.e both positive[106] and negative[4], information could have greatly enhanced the data. An alternative to monetary measure of socioeconomic position i.e household income used in this study could have been replaced by the now used asset index measure.[118] No study on the topic has used this before and maybe this could have led to different outcomes.

Chapter 6: Conclusion and Recommendation

6.1 Conclusion

This study found that despite most caregivers reporting to have had prior training by healthcare worker the majority had poor knowledge of SSS use and could not correctly prepare SSS. More mothers and caregivers need to be taught by healthcare workers. The terribly unhygienic practices during practical demonstration of SSS preparation, highlighted that hygiene seem to be inadequately addressed during the health education. It is also not emphasized on the RTHC.

6.2 Recommendations

The main finding of the study is the poor knowledge on preparation and administration of SSS. The use of Ward based Primary health Care Outreach Teams, to educate mothers and caregivers on how to prepare and administer SSS, is a promising proposition. High self-perception of knowledge is a result of poor teaching methods, therefore Ward based Primary health Care Outreach Teams should also be constantly assessed to ensure optimum standards are achieved. The unhygienic practice employed by mothers and caregivers, requires special emphasis when conducting the health talks, and should also come out clear in the RTHC. In this study women aged 40 years or older were more likely to know how to correctly prepare ORT. This means attention needs to be focused on younger mothers and caregivers in order to improve use of ORT.

Reference:

1. Sastry N, Burgard S. Changes in Diarrheal Disease and Treatment Among Brazilian Children from 1986 to 1996. Population research and policy review. 2011 Feb; 30(1): 81–100.

2. Desjeux JF, Briend A, Butzner JD. Oral rehydration solution in the year 2000: pathophysiology, efficacy and effectiveness. Baillieres Clinical Gastroenterology. 1997 Sep;11(3): 509-27.

3. Almroth S, Latham MC. Rational home management of diarrhoea. Lancet 1995; 345:709–11.

4. Onwukwe S, Van Deventer C, Omole O. Evaluation of the use of oral rehydration therapy in the management of diarrhoea among children under 5: knowledge attitudes and practices of mothers/caregivers. <http://dx.doi.org/10.1080/20786190.2015.1120933> [accessed 15/02/2016]

5. United Nations Millennium Development Goals . "Goal 4: Reduce child mortality" <http://www.un.org/millenniumgoals/childhealth.shtml> [accessed 17 May 2010]

6. WHO. Fact sheets on Diarrheal disease. 2013; Retrieved from <www.who.int/mediacenter/factshees/fs330/en/> [accessed 17 May 2014].

7. Forsberg BC, Petzold MG, Tomson G, Allebeck P. Diarrhoea case management in low- and middle-income countries--an unfinished agenda. Bull World Health Organ. 2007 Jan;85(1):42-8

8. Medical Research Council of South Africa. Burden of disease report 2003 [cited 2015 Mar 31]. Available from: <http://www.mrc.ac.za/policybriefs/childmortality.pdf.> [accessed 12/04/2014]

9. Mull JD, Mull DS. Mothers' concepts of childhood diarrhea in rural Pakistan: what ORT program planners should know. Soc Sci Med 1988;27:53—67

10. Anidi I, Bazargan M, James FW. Knowledge and management of diarrhea among underserved minority parents/caregivers. Ambul Pediatr 2002;2:201—6

11. Ozuah PO, Avner JR, Stein RE. Oral rehydration, emergency physicians, and practice parameters: a national survey. Pediatrics 2002;109:259—61

12. Dippenaar H, Joubert G, Nel R, Bantobetse ML, Opawole AA, Roshen KS. Homemade sugar-salt solution for oral rehydration: Knowledge of mothers and caregivers. South African Family Practice. 2005;47(2): 51-53

13. Guerrant RL, Carneiro-Filho BA, Dillingham RA. Cholera, diarrhea, and oral rehydration therapy: triumph and indictment. Clin Infect Dis. 2003 Aug 1;37(3):398-405.

14. Okun DA. From cholera to cancer to cryptosporidiosis. Journal of Environmental Engineering. 1996 Jun; Vol. 122, No. 6, pp. 453-458

15. Chow CM, Leung AK, Hon KL. Acute gastroenteritis: from guidelines to real life. Clinical and Experimental Gastroenterology. 2010;3:97-112

16. Cunha Ferreira RM, Cash RA. History of the development of oral rehydration therapy. Clinical Therapeutics 1990; 12(Suppl A):2–11.

17. Carpenter CCJ. The erratic evolution of cholera therapy: from folklore to science. Clinical Therapeutics 1990;12:22-8.

18. O'Shaughnessy WB. Proposal of a new method of treating the blue epidemic cholera. Lancet. 1832;1:366-71.

19. Latta T. Malignant cholera: documents communicated to the Central Board of Health, London, relative to the treatment of cholera by the copious injection of aqueous and saline fluids into the veins. Lancet. 1832;2:274-7.

20. Mangala S, Gopinath D, Narasimhamurthy NS, Shivaram C. Impact of educational intervention on knowledge of mothers regarding home management of diarrhoea. Indian Journal of Pediatrics. 2001 May;68(5):393-7.

21. Ruxin, JN. Magic bullet: the history of oral rehydration therapy. Medical History.1994 Oct;38(4):363-97

22. Harrison HE. Contribution of American pediatricians to treatment of diarrheal dehydration. Pediatric Research. 1990;27:S62—4

23. Robert K. Crane, D. Miller and I. Bihler. The restrictions on possible mechanisms of intestinal transport of sugars". In: Membrane Transport and Metabolism. Proceedings of a Symposium held in Prague, August 22-27, 1960. Edited by A. Kleinzeller and A. Kotyk. Czech Academy of Sciences, Prague, 1961, pp. 439-449.

24. Acra SA, Ghishan GK. Electrolyte fluxes in the gut and oral rehydration solutions. Pediatric clinics of North America. 1996;43:433--49.

25. Curran PF. Na, Cl, and water transport by rat ileum in vitro. The Journal of general physiology. 1960;43:1137--48.

26. Loo DD, Zeuthen T, Chandy G, Wright EM. Cotransport of water by the Na+/glucose cotransporter. Proceedings of the National Academy of Sciences of the United States of America. 1996 Nov 12;93(23):13367-70

27. Field M. Intestinal ion transport and the pathophysiology of diarrhea. The Journal of Clinical Investigation. 2003 Apr;111(7):931-43

28. Gangarosa EF, Beisel WR, Behyajati C, Sprinz H, Piyaratn P. The nature of the gastrointestinal lesion in Asiatic cholera and its relation to pathogenesis:a biopsy study. The American journal of tropical medicine and hygiene. 1960;9:125–35

29. Hirschhorn N. The treatment of acute diarrhea in children. An historical and physiological perspective. American Journal of Clinical Nutrition. 1980 Mar;33(3):637-63

30. Ogunbiyi BO, Akinyele IO. Knowledge and belief of nursing mothers on nutritional management of acute diarrhoea in infants, Ibadan, Nigeria. African Journal of Food, Agriculture, Nutrition and Development. 2010; Vol 10, No 3

31. Nalin DR, Cash RA, Islam R, Molla M, Phillips RA. Oral maintenance therapy for cholera in adults. Lancet. 1968;2:370--3.

32. Mahalanabis D, Choudhuri AB, Bagchi NG,Bhattacharya AK, Simpson TW. Oral fluid therapy of cholera among Bangladesh refugees. Johns Hopkins Medical Journal.1973; 132:197–205

33. Buccimazza SS, Hill ID, Kibel MA, Bowie MD. The composition of home-made sugar/electrolyte solutions for treating gastro-enteritis. South African Medical Journal. 1986 Dec 6;70(12):728-30.

34. Molla AM, Rahman M, Sarker SA, Sack DA, Molla A. Stool electrolyte content and purging rates in diarrhea caused by rotavirus, enterotoxigenic E. coli, and V. cholerae in children. Journal of Pediatrics. 1981 May;98(5):835-8.

35. Bhargava SK, Sachdev HP, Das Gupta B, Daral TS, Singh HP, Mohan M. Oral rehydration of neonates and young infants with dehydrating diarrhea: comparison of low and standard sodium content in oral rehydration solutions. Journal of Pediatric Gastroenterology and Nutrition. 1984 Sep;3(4):500-5.

36. Elliott EJ, Cunha-Ferreira R, Walker-Smith JA, Farthing MJ. Sodium content of

oral rehydration solutions: a reappraisal. Gut. 1989 Nov;30(11):1610-21.

37. Boschi-Pinto C, Lana Velebit L, Shibuya K. Estimating child mortality due to diarrhoea in developing countries. Bulletin of the World Health Organization. 2008 Sept; 86 (9)

38. Statistics South Africa: Levels and trends of morbidity and mortality among children aged under-five years in South Africa, 2006–2010. Pretoria, South Africa: Statistics South Africa; 2012.

39. World Health Organization. "Global health observatory." WHO 2013 <http://www.who.int/maternal_child_adolescent/epidemiology/child/en/> [Accessed 7 Jun 2013].

40. World Health Organization. "Diarrhoeal disease." WHO 2013 <http://www.who.int/mediacentre/factsheets/fs330/en/> [Accessed 7 June 2013]

41. United Nations Children's Fund and World Health Organization, WHO/UNICEF Joint Statement: Clinical management of acute diarrhoea, UNICEF, New York, 2004 <http://www.7pointplan.org/diarrhoea-control.html> [Accessed July 22, 2013].

42. Bajait C, Thawani V. Role of zinc in pediatric diarrhea. Indian Journal of Pharmacology. 2011 May-Jun; 43(3): 232–235.

43. Ram PK , Choi M , Blum LS , Wamae AW , Mintz ED , Bartlett AV . Declines in case management of diarrhea among children less than five years old. Bulletin World Health Organisation. 2008.86(3):E–F

44. Mahor GR. Knowledge and attitudes of mothers regarding use of oral rehydration solution in management of diarrhoea. Asian journal of biomedical and pharmaceutical services. 2013, 3(22): 6-8.

45. Adimora GN, Ikefuna AN, Ilechukwu G. Home management of childhood diarrhoea: Need to intensify campaign. Nigerian Journal of Clinical Practice.

46. MacDonald SE, Moralejo DG, Matthews MK. Correct preparation and administration of oral rehydration solution: essential for safe and effective home treatment of diarrhea in Indonesia. International quarterly of community health education. 2005-2006;24(3):205-14.

47. Forsberg BC, Gwatkin D, Tomson G, Allebeck P, Petzold MG. Socioeconomic Inequalities in the Prevalence and Management of Childhood Diarrhoea: Potential Health Gains to be Achieved. The Open Infectious Diseases Journal. 2009; 3, 44-49

48. Claeson M, H MM: Global Progress in the Control of Diarrheal Diseases. Pediatric Infectious Disease Journal. 1990; 9:345-55.

49. Sabot O, Schroder K, Yamey G, Montagu D: Scaling up oral rehydration salts and zinc for the treatment of diarrhoea. British Medical Journal. 2012; 344:e940

50. Munos MK, Walker CLF, Black RE: The effect of oral rehydration solution and recommended home fluids on diarrhoea mortality. International journal of epidemiology. 2010; 39(Suppl 1):i75-87.

51. Mengistie B, Berhane Y, Worku A. Predictors of Oral Rehydration Therapy use among under-five children with diarrhea in Eastern Ethiopia: a community based case control study BMC Public Health. 2012; 12: 1029.

52. Uti OG, Savage KO, Ekanem EE: Maternal Beliefs About Infant Teething. Health Care: Journal of Community Medicine and Primary; 2005:17(1).

53. Victora CG, Huttly SR, Barros FC, Lombardi C, Vaughan JP. Maternal education in relation to early and late child health outcomes: findings from a Brazilian cohort study. Social Science and Medicine. 1992 Apr;34(8):899-905.

54. Essomba NE, Kedy Koum DC, Adiogo D , Ngwe MI , Coppieters Y. Use of oral rehydration therapy in the treatment of childhood diarrhoea in Douala, Cameroon. Malawi Medical Journal; 27(2): 60-64 June 2015

55. Snyder JD, Merson MH. The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. Bulletin World Health Organisation 1982;60:605-13

56. Pierce NF. How Much Has ORT Reduced Child Mortality? Journal of Health, Population and Nutrition 2001 Mar;19(1):1-3

57. Bern C, Martines J, de Zoysa I, Glass RI. The magnitude of the global problem of diarrhoeal disease:a ten-year update. Bulletin World Health Organisation 1992;70:705-14

58. Victora CG, Bryce J, Fontaine O, Monasch R. Reducing deaths from diarrhoea through oral rehydration therapy. Bulletin World Health Organisation 2000;78:1246-55

59. Forsberg BC, Petzold MG, Tomson G, Allebeck P. Diarrhoea case management in low- and middle-income countries-an unfinished agenda. Bulletin World Health Organisation 2007; 85: 42-8

60. Gutierrez G, Tapia-Conyer R, Guiscafré H, Reyes H, Martínez H, Kumate J. Impact of oral rehydration and selected public health interventions on reduction of mortality from childhood diarrhoeal diseases in Mexico. Bulletin of the World Health Organization, 1996, 74: 189–197

61. Shad D, Gupta P, Gera T, Mohan P, Panda R, Menon S. Promoting appropriate management of diarrhea: a systematic review of literature for advocacy and action: UNICEF-PHFI series on newborn and child health, India. Indian Pediatrics. 2012 Aug;49(8):627-49

62. Santosham M, Chandran A, Fitzwater S, Fischer-Walker C, Baqui AH, Black R. Progress and barriers for the control of diarrhoeal disease. Lancet. 2010 Jul 3;376(9734):63-7.

63. WHO/UNICEF. Diarrhoea: why children are still dying and what can be done. Geneva/New York: World Health Organization/United Nations Children's Fund, 2009.

64. Mull JD, Mull DS. Mothers' concepts of childhood diarrhea in rural Pakistan: what ORT program planners should know. Social Science and Medicine 1988;27:53-67.

65. Pylypa J. Elder authority and the situational diagnosis of diarrheal disease as normal infant development in northeast Thailand. Qualitative Health Research. 2009 Jul;19(7):965-75.

66. Hoekstra JH; European Socirty of Paediatric Gastroenterology, Hepatology and Nutrition Working Group on Acute Diarrhoea. Acute gastroenteritis in industrialized countries: compliance with guidelines for treatment. Journal of Pediatric Gastroenterology and Nutrition. 2001 Oct;33 Suppl 2:S31-5.

67. De Zoysa I. Treating diarrhoea early. Diarrhoea Dialog 1985;20:3.

68. Uchendu U, Ikefuna A, Emodi I. Medication use and abuse in childhood diarrhoeal diseases by caregivers reporting to a Nigerian tertiary health institution South African Journal of Child Health. 2009;3:83–9

69. Jones TF, Grimm K. Public knowledge and beliefs about diarrheal disease. Foodborne Pathogens and disease Dis. 2011 Jan;8(1):165-7.

70. Ozuah PO, Avner JR, Stein RE. Oral rehydration, emergency physicians, and practice parameters: a national survey. Pediatrics 2002;109:259--61

71. Boschi Pinto C, Lanata CF, Black RE. The global burden of childhood diarrhea. In: Ehiri JE, Meremikwu M, eds. International maternal and child health. Washington, DC: Springer Publishing (in press).

72. Sack DA, Islam S, Brown KH, Kabir AK, Chowdhury AM, Ali MA. et al. Oral therapy in children with cholera: a comparison of sucrose and glucose electrolyte solutions. Journal of Pediatrics 1980;96:20--5.

73. Gremse DA. Effectiveness of nasogastric rehydration in hospitalized children with acute diarrhea. Journal of Pediatric Gastroenterology and Nutrition 1995; 21:145--8.

74. Widmaier, Eric P.; Hershel Raff, Kevin T. Strang (2008). Vander's Human Physiology, 11th Ed. McGraw-Hill. pp. 108–12.

75. Hahn S, Kim Y, Garner P. Reduced osmolarity oral rehydration solution for treating dehydration due to diarrhoea in children: systematic review. British Medical Journal. 2001;323:81--5.

76. Duggan C, Fontaine O, Pierce NF, Alam NH, Bhan MK, Santosham M, et.al. Scientific rationale for a change in the composition of oral rehydration solution. JAMA. 2004 Jun 2;291(21):2628-31.

77. World Health Organization . WHO Position Paper on Oral Rehydration Salts to Reduce Mortality from Cholera .
<http://www.who.int/cholera/technical/en/> [Accessed 15 January 2011]

78. Pizarro D, Posada G, Sandi L, Moran J. Rice-based oral electrolyte solutions for the management of infantile diarrhea. New England Journal of Medicine 1991;7(6):882–8

79. Gregorio GV, Gonzales ML, Dans LF, Martinez EG. Polymer-based oral rehydration solution for treating acute watery diarrhoea. Cochrane Database Systematic Review. 2009 Apr 15;(2)

80. Rhoads JM, Keku EO, Quinn J, Woosely J, Lecce JG. L-glutamine stimulates jejunal sodium and chloride absorption in pig rotavirus enteritis. Gastroenterology. 1991 Mar;100(3):683-91.

81. Spolarics Z, Lang CH, Bagby GJ, Spitzer JJ. Glutamine and fatty acid oxidation are the main sources of energy for Kupffer and endothelial cells. American Journal of Physiology. 1991 Aug;261(2 Pt 1):G185-90.

82. International Study Group on Improved ORS. Impact of glycine-containing ORS solutions on stool output and duration of diarrhoea: a meta-analysis of seven clinical trials. Bulletin World Health Organisation. 1991;69:541–548.

83. Gutiérrez C, Villa S, Mota FR, Calva JJ. Does an L-glutamine-containing, glucose-free, oral rehydration solution reduce stool output and time to rehydrate in children with acute diarrhoea? A double-blind randomized clinical trial. Journal of Health, Population and Nutrition. 2007 Sep;25(3):278-84

84. Werner D. Questioning the solution: The politics of primary health care and child survival. Chapter 7 pg 42 - 53 <https://healthwrights.org/content/books/QTS/qts_ch07.pdf> [Accessed 10/12/2013]

85. K. Siener, Wheat based ORS for Afghans(1989), International Rescue Committee, Peshawar, Pakistan. Cited in Dialogue on Diarrhoea,No. 41 (June 1990), p. 5.

86. Wardlaw T, Salama P, Brocklehurst C, Chopra M, Mason E. Diarrhoea: why children are still dying and what can be done. The Lancet March 2010; 375 (9718): 870 – 872.

87. Saniel MC, Zimicki S, Carlos CC, Maria AC, Balis AC, Malacad CC. Acceptability of rice-based and flavoured glucose-based oral rehydration solutions: a randomized controlled trial. Journal of Diarrhoeal Disease Research. 1997 Jun;15(2):47-52.

88. te Loo DM, van der Graaf F, Ten WT. The effect of flavoring oral rehydration solution on its composition and palatability. Journal of Pediatric Gastroenterology and Nutrition 2004;39:545–8.

89. Islam MR, Greenough WB, Rahaman MM, Choudhury AK, Sack DA., "Lobon gur (Common Salt and Brown Sugar) Oral Rehydration Solution in the Treatment of Diarrhoea in Adults," Journal of Tropical Medicine and Hygiene, No. 83 (1980), p. 44

90. Victora CG, Olinto MT, Barros FC, Nobre LC. The recent fall in diarrhoea mortality in Northeastern Brazil: did ORT play a role? Health Policy and Planning, 1996, 11: 132–141.

91. Miller P, Hirschhorn N. The effect of a National Control of Diarrheal Diseases Program on Mortality: the case of Egypt. Social Science and Medicine, 1995, 40: S1–S30.

92. Baltazar JC, Nadera DP, Victora CG.Evaluation of the national control of diarrhoeal disease programme in the Philippines, 1980-93.Bulletin World Health Organisation. 2002;80(8):637-43.

93. Mangala S, Gopinath D, Narasimhamurthy NS, Shivaram C.Impact of educational intervention on knowledge of mothers regarding home management of diarrhoea. Indian Journal of Pediatrics. 2001 May;68(5):393-7.

94. South African Demographic and Health Survey 1998. <http://www.hst.org.za/sites/default/files/SADHS_1998_Full.pdf> [accessed 27/07/2014]

95. Huskisson JM, Feulbach S. A profile of the socio-demographic background of children admitted with acute diarrhea to the Red Cross Children's Hospital, Cape Town. Curationis 1995;18(1):34-36.

96. South African Demographic Health Survey 2003 <http://www.mrc.ac.za/bod/sadhs2003part2.pdf >[Accessed 11/11/2013]

97. Kibel M, Saloojee H, Westwood T. Child health for all. 4th Edition. Southern Africa, Oxford. 2007

98. Nannan N, Dorrington R, Laubscher R, Zinyakatira N, Prinsloo M Bradshaw D, et.al Under-5 mortality statistics in South Africa: Shedding some light on the trend and causes 1997–2007. South African Medical Reasearch council. http://www.mrc.ac.za/bod/MortalityStatisticsSA.pdf [Accessed 03/12/2013]

99. United Nations Millennium Development Goals . "Goal 4: Reduce child mortality" <http://www.un.org/millenniumgoals/childhealth.shtml> [accessed 17 May 2010]

100. Cooke ML, Nel ED, Cotton MF. Pre-hospital management and risk factors in children with acute diarrhoea admitted to a short-stay ward in an urban South African hospital with a high HIV burden. South African Journal of Child Health. 2013, Vol 7, No 3 pg 84 – 87

101. Introduction to study designes: cross sectional studies. <http://www.healthknowledge.org.uk/e-learning/epidemiology/practitioners/introduction-study-design-css> [Accessed 02 November 2016]

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

103. Kariuki JG, Magambo KJ, Njeruh MF, Muchiri EM, Nzioka SM, Kariuki S Changing Mother's Hygiene and Sanitation Practices in Resource Constrained Communities: Case Study of Turkana District, Kenya. Journal of Community Health. 2012 Dec;37(6):1185-91.

104. Uchendu UO, Emodi IJ, Ikefuna AN. Pre-hospital management of diarrhoea among caregivers presenting at a tertiary health institution : Implications for practice and health education. <http://www.ajol.info/index.php/ahs/article/view/64991/52708>[Accessed 03 November 2016]

105. Agbolade M.O, Dipeolu I.O and Ajuwon A.J. Oral Rehydration Therapy among Mothers of under-five children in a Military Barrack in Ibadan, Nigeria. African Journal of Biomedical Research.Vol.18 (January, 2015); 7- 15

106. Essomba NE, Kedy Koum DC, Adiogo D , Ngwe MI , Coppieters Y. Use of oral rehydration therapy in the treatment of childhood diarrhoea in Douala, Cameroon. Malawi Medical Journal; 27(2): 60-64 June 2015

107. Mtero SS, Dube N, Gwebu ET. Rural community management of diarrhoea in Zimbabwe: the impact of health education message on oral rehydration therapy. Central African Journal of Medicine. 1988;34(10):240-3.

108. Inott T, Kennedy BB. Assessing learning styles: practical tips for patient education. Nursing Clinics of North America. 2011 Sep;46(3):313-20,

109. Silberman J, Tentler A, Ramgopal R, Epstein RM. Recall-promoting physician behaviors in primary care. Journal of General Internal Medicine. 2008 Sep;23(9):1487-90.

110. Mangala S, Gopinath D, Narasimhamurthy NS, Shivaram C. Impact of educational intervention on knowledge of mothers regarding home management of diarrhoea. Indian J Pediatr. 2001 May;68(5):393-7

111. Osonwa KO, Eko JE, Ema S. Utilization of Oral Rehydration Therapy in the Management of Diarrhea in Children among Nursing Mothers in Odukpani Local Government Area of Cross River State, Nigeria.< http://pubs.sciepub.com/ajphr/4/1/5/> [Accessed 06 November 2016]

112. Hemant J, Subhash B. Knowledge and attitude towards oral rehydration therapy among mothers of under-five children of South Rajasthan, India. http://www.scopemed.org/fulltextpdf.php?mno=211640 [Accessed 08 November 2016]

113. United Nations. Sustainable Development Goals. 16 Goals to transform our world. <http://www.un.org/sustainabledevelopment/health/> [Accessed 07 November 2016]

114. Eshete A. Assessment of knowledge, practice and utilization of oral rehydration therapy for acute watery diarrhoeal disease case management among mothers (caregivers') of under-five children in Assela Town, Ethiopia. <http://etd.aau.edu.et/bitstream/123456789/6797/1/Adanech%20new.pdf > [Accessed 07 November 2016]

115. Bertrand WE, Walmus BF.Maternal knowledge, attitudes and practice as predictors of diarrhoeal disease in young children. International Journal of Epidemiology. 1983 Jun;12(2):205-10.

116. Victora CG, Huttly SR, Barros FC, Lombardi C, Vaughan JP. Maternal education in relation to early and late child health outcomes: findings from a Brazilian cohort study. Social Science and Medicine. 1992 Apr;34(8):899-905.

117. Woldemicael G. Diarrhoeal morbidity among young children in Eritrea: environmental and socioeconomic determinants. Journal of Health, Population and Nutrition. 2001 Jun;19(2):83-90.

118. Howe LD, Hargreaves JR, Huttly SR. Issues in the construction of wealth indices for the measurement of socio-economic position in low-income countries. Emerg Themes Epidemiol. 2008 Jan 30;5:3.

Addendum 1: Interview sheet

ID no.:

1. Demographic data

Age of mother/care-giver:

Household income:

No. Of Children:

2. Immunization card

Card: New Old

Age of child:

Rotavirus Vaccine Yes No

Doses 1 2

Diarrhoeal episodes Yes No

No. of diarrhoeal episodes:

3. Antenatal or well-baby or general clinic teaching

Were you taught to prepare homemade ORS? Yes No

If Yes, Do u think you know how to prepare ORS correctly? Yes No

Taught by: Healthcare worker or Other

No. of times taught:

How were you taught?

a) Pamphlets only

b) Lecture only

c) Pamphlets and lecture

d) Lecture and practical demonstration

e) Lecture and practical demonstration/pamphlets

Are you happy with the way you were taught? Yes No

How would you have liked to be taught?

4. Knowledge

Does ORS stop vomiting and diarrhea? Yes No

What are the signs of dehydration? Knows doesn't know

(Any of the following)

Dry mouth and thirst

No tears when crying

Sunken eyes

Sunken fontanelle

Loss of skin turgor

Weight loss

Lethargic/weakness

How often do you give ORS to a child with diarrhea and vomiting?

Knows doesn't know

(Any of the following)

After each loose stool

After vomiting

When the child feels thirsty

Throughout the diarrhoeal episode

When do you take the child to the clinic? Knows doesn't know

(Any of the following)

- IMCI danger signs: The child is unable to drink or breastfeed
  The child vomits everything
  The child has had convulsions with this illness
  The child is lethargic or unconscious
- Prolonged diarrhea
- Bloodstained stools
- Fever
- Signs of severe dehydration (No tears when crying, Sunken eyes, Sunken fontanelle, loss of skin turgor, Weight loss)

4. Practical Demonstration

Hygiene

Washing Hands	Yes	No
Boiling water	Yes	No
Washing utensils	Yes	No
Washing bottle	Yes	No

Utensils

Correct choice bottle		cup ☐		500ml ☐			1litre ☐			2litre ☐
Correct choice spoon		Spoon ☐				teaspoon ☐				

Measurements

Salt measurement	½	1	2	3	4	5	6	7	8	9
Sugar measurement	½	1	2	3	4	5	6	7	8	9

Addendum 2: Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Mohubane Andrew Llale

CLEARANCE CERTIFICATE	**M101016**
PROJECT	How well do Mother and care-givers prepare home-made oral re-hydration solution?
INVESTIGATORS	Dr Mohubane Andrew Llale.
DEPARTMENT	Department of Family Medicine
DATE CONSIDERED	29/10/2010
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

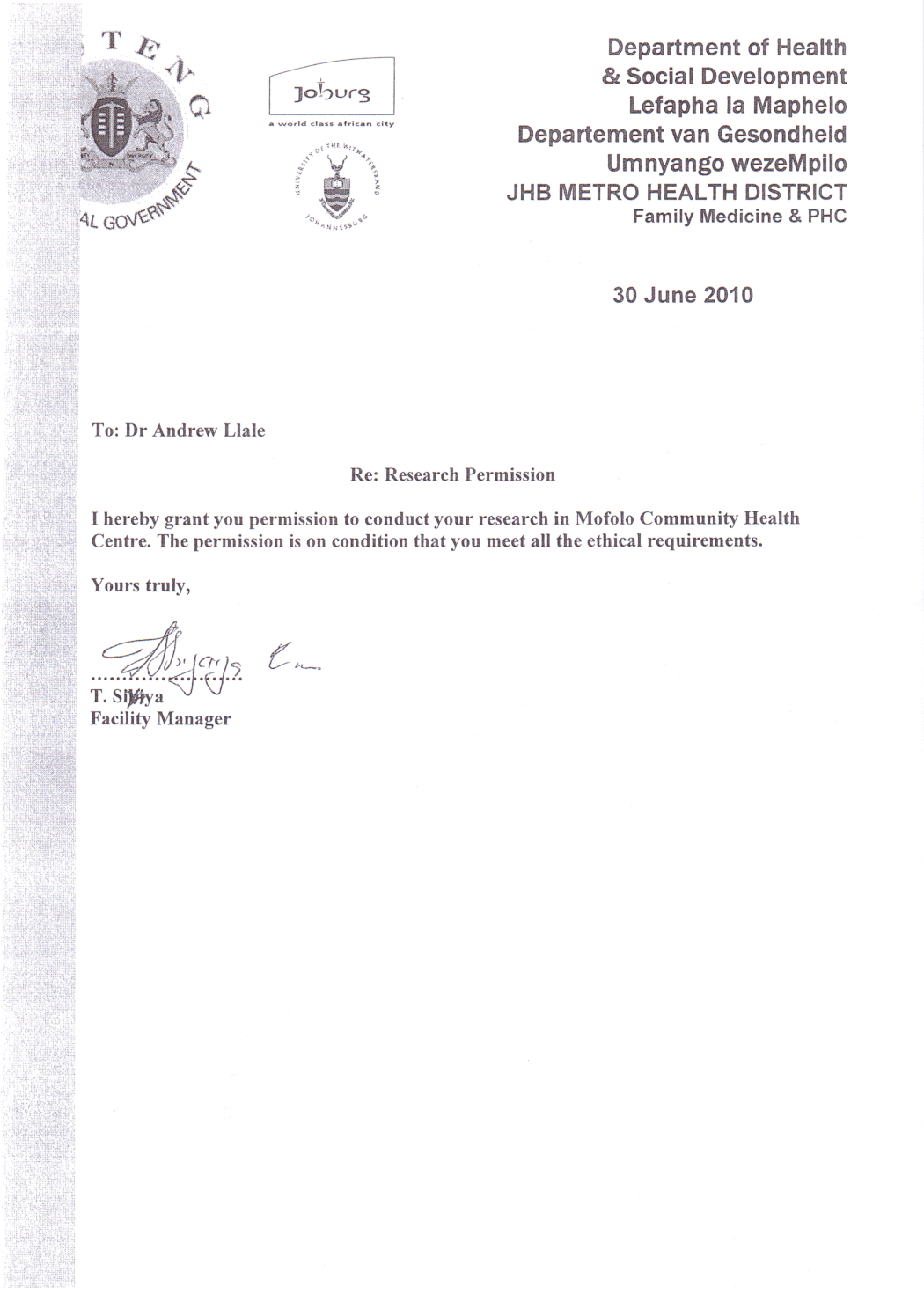
DATE 30/11/2010 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr AJ Akii

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Addendum 3: Permission Letter



Department of Health
& Social Development
Lefapha la Maphelo
Departement van Gesondheid
Umnyango wezeMpilo
JHB METRO HEALTH DISTRICT
Family Medicine & PHC

30 June 2010

To: Dr Andrew Llale

Re: Research Permission

I hereby grant you permission to conduct your research in Mofolo Community Health Centre. The permission is on condition that you meet all the ethical requirements.

Yours truly,

.....
T. Sibiya
Facility Manager

Addendum 4: Consent form





Department of Health
& Social Development
Lefapha la Maphelo
Departement van Gesondheid
Umnyango wezeMpilo
JHB METRO HEALTH DISTRICT
Family Medicine & PHC

Addendum 4: Consent form

HOW WELL DO MOTHERS AND CAREGIVERS PREPARE HOMEMADE ORAL REHYDRATION SOLUTION?

I, …… the undersigned agree to take part in the study "HOW WELL DO MOTHERS AND CARE-GIVERS PREPARE HOMEMADE ORAL REHYDRATION SOLUTION?" I have been briefed by the researcher what the study is about and fully understand the information contained in the information sheet. There are no risks to me or my child. Participation is at no cost to me and I can freely terminate participation at anytime with no consequences. If it is found that I cannot prepare homemade oral re-hydration solution correctly, I will be taught how to prepare it correctly.

Mother/ Care-giver's signature…… Witness……..

Date……

If under 18yrs of age Guardian must sign consent for participation of the minor below

Guardian/Parent's name…….... Signature……
(In case of minor <18yrs)

Date……

Addendum 5: Information Sheet

Study Title: **HOW WELL DO MOTHERS AND CAREGIVERS PREPARE HOMEMADE ORAL REHYDRATION SOLUTION?**

Hello

I am Dr Andrew Llale currently studying for MMED degree in the Department of family medicine, University of the Witwatersrand medical school. In order to complete the degree, I'm expected to do research. My planned research is aimed at finding out how well do mothers and caregivers prepare homemade oral rehydration solution. This study is not part of the normal medical care provided at the clinic and will require a few minutes of your time.

I hereby invite you to take part in the study. Mothers and caregivers of children 0-5yrs are requested to participate. A minimum number of 407 mothers and caregivers are required. If you have been identified as suitable, you will be taken to another consulting room after your consultation where you will be asked a few questions. This will be followed by a practical demonstration of how to prepare homemade oral rehydration solution. This will hopefully not take much time, with expected 20min of your time.

There are no risks involved in the study. Participants that are found not to know how to correctly prepare homemade oral rehydration solution will be taught how to prepare it. Participation is voluntary, with no consequence for not taking part. If you do take part you are free to withdraw at any time. Please be informed that efforts will be made to keep personal information confidential. Information collected does not contain personal information that can be used to identify participants.

If you have any queries or questions please contact the researcher Dr Andrew Llale at 0827777437

Thank you