HYGIENE PRACTICES AS A CONTRIBUTING FACTOR TO DIARRHOEA IN PRESCHOOL CHILDREN IN MPUMALANGA TOWNSHIP, KWAZULU-NATAL

By

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STUDENT DECLARATION

I, Samukelisiwe Nomonde Ntshangase, do declare that this dissertation is representative of my own work in both conception and execution. Where other people's work is used or quoted, acknowledgement by means of complete references is indicated.

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DEDICATION

This research work is dedicated to my daughter Snakhokonke, who makes me aspire to be the best version of myself every day. Secondly, I dedicate this work to my family. Thank you for always motivating me to never give up.

I also dedicate this work to my late grandfather, Mkipeni Samuel Ntshangase, who will forever remain my guardian angel.

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ABSTRACT

Background: Diarrhoeal disease is reported by the World Health Organisation (WHO) as the second leading cause of mortality in children under five years old, and worldwide is responsible for the deaths of almost 525 000 children annually. Diarrhoea is defined as the passage of three or more loose or liquid stools per day, or more frequent passage than is normal for the individual and can last for several days. Diarrhoea is typically a symptom of an infection in the intestinal tract, caused by a variety of bacteria, viral and parasitic organisms. The disease is spread through contaminated food or drinking water or from person-to-person as a result of poor hygiene practices.

Acute diarrhoea is a major cause of hospitalisation in South Africa, especially in children under two years of age. Diarrhoea is the main cause of morbidity and mortality in KwaZulu-Natal, even though case fatality decreased between 2014/15 and 2015/16. South Africa has improved the health and well-being of children through the introduction of the rotavirus vaccine into the National Immunisation Programme in 2009, the only known preventative measure against rotavirus diarrhoea.

Aim/Objectives: The study aimed to determine if hygiene practices of parents/guardians and ECD educators contributed to diarrhoea in children attending the centres.

Interdependent factors related to diarrhoea in children were also investigated. The objectives of the study included determining the prevalence of diarrhoea in children five years and under at ECD centres in Mpumalanga Township, KwaZulu-Natal; identifying risks factors that may contribute to diarrhoea in children; and assessing the knowledge, attitudes and practices of ECD educators and parents/guardians to diarrhoea and hygiene.

Methodology: A descriptive cross-sectional study design was conducted using self-administered questionnaires at the research tool. The study was done at ten Early Childhood Development (ECD) centres in Mpumalanga Township, KwaZulu-Natal, South Africa. The total number of centres registered with the

Department of Social Development in the area was 41 at the time of the study, with the total of educators approximating 177 and 3326 children attending the ECD centres. Simple random sampling was used in order to achieve a degree of accuracy and representativeness. The parents/guardians were selected from the same schools that were randomly selected for the educators. To achieve a 95% confidence level, respondents were invited to participate having signed informed consent. Statistical analysis was performed using SPSS version 26.0. Frequency distribution of categorical variables and means, standard deviation and ranges of continuous variables were calculated. Various graphs and tables were used to illustrate variables. The Pearson's Chi-squared test was used where applicable for bivariate associations between categorical variables. Multivariate regression modelling was done with the inclusion of relevant covariates. Odds ratios were calculated for binary outcome variables. Confidence intervals of 95% were calculated and p values < 0.05 were considered statistically significant.

Results: A total of 385 parents/guardians of 427 children attending ECD centres and a total of 121 ECD educators answered the questionnaires. The results indicated that 91.6% (n=350) of parents/guardians had flushing toilets and all the ECD centres had flushing toilets. Over 87.2% (n=333) parents/guardians reported that the toilets were indoors and 86.8% (n=105) ECD educators indicated that the centres had indoor toilets. The data revealed that over 60% (n=210) of parents/guardians said their child uses the toilet and 22.8% (n=76) had children who used nappies, thereby disposing the stools in the municipal collected waste. Only 0.9% (n=3) of parents said they buried the stools and 3.6% (n=12) said they left the child's stools in the open. Drinking water was easily accessible in this study population as households had indoor taps (n=311, 80.8%), outdoor tap on the premised (n=70, 18.2%) and ECD centres indoor taps (n=109, 90.1%). Approximately 85% (n=307) of parents/guardians washed their hands more frequently after defecating when there was an indoor tap. Furthermore, parents/guardians who had handwashing sinks closer to the toilet washed their hands more frequently compared to those with handwashing sinks furthest (p=0.000). The study found that

parents/guardians with a tertiary qualification were five times more likely to seek medical care than parents/guardians with a primary education education (OR=5.201, 95%CI=1.48-18.28, *p*=0.010). The administration of ORT was consistent across all levels of parental/guardian education (primary school, secondary school and tertiary). Homemade oral rehydration solution was mostly administered by parents/guardians with primary (n=5, 20.0%) and secondary education (n=21, 19.3%) compared those with tertiary education.

The mean number of children under five years who had diarrhoea in the 12 months preceding this study was 1.23 (SD=0.53). *Cryptosporidium* infection was the likely cause of the watery diarrhoea in this population since rotavirus immunisation was given to the children.

Conclusion: This study found that children were more likely to get diarrhoea from other children, compared to adults. How parents/guardians washed their hands was 1.239 times likely to contribute to children under the age of five getting infected with diarrhoea. The *p*-value of 0.010 was obtained in the association of type of toilet in the household and a child having diarrhoea. Knowledge around diarrhoea must be strengthened, more so in prevention, and when seeking medical care. Caregivers should be encouraged to have oral rehydration treatment readily available, to be used as needed.

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ABBREVIATIONS

WHO	World Health Organisation
SDG	Sustainable Development Goal
ECD	Early Childhood Development
VIP	Ventilated improved pit
ORS	Oral rehydration salts
ORT	Oral rehydration treatment
UNICEF	United Nations Children's Fund
DSD	Department of Social Development
NPO	Non-profit organisation
KPA	Knowledge, practices and attitude
EPI	Expanded Programme on Immunisation

CHAPTER 1

1.1 INTRODUCTION

Diarrhoeal disease is reported by the World Health Organisation (WHO) as the second leading cause of mortality in children under five years old, and worldwide is responsible for the deaths of almost 525 000 children annually (WHO 2017). Diarrhoea is defined as the passage of three or more loose or liquid stools per day, or more frequent passage than is normal for the individual and can last for several days (WHO 2017). Diarrhoea is typically a symptom of an infection in the intestinal tract, caused by a variety of bacteria, viral and parasitic organisms. The disease is spread through contaminated food or drinking water or from person-to-person as a result of poor hygiene practices (WHO 2017).

Various studies have been conducted globally regarding the management of diarrhoea and these have found to have diverse prevalence patterns across regions, countries or time periods (Oketcho *et al.* 2012: 83; Azage *et al.* 2017: 18; Fagbamigbe, Morakinyo and Abatta 2017: 122). Many authors reported that caregivers' concern for their child's health and action to treat the illness to the best of their knowledge and abilities is of importance (Freeman *et al.* 2014: 911; Carter *et al.* 2015: 819; Cunnama and Ayako Honda 2016: 677). Freeman *et al.* (2014) remarkably found marginal variability within regions in populations with similar income levels in a systematic review on global handwashing. The study firmly indicates that handwashing after possible contact with excreta is not universally practiced (Freeman *et al.* 2014: 906).

1.1.1 Global Context

There are nearly 1.7 billion cases of childhood diarrhoeal disease globally every year (WHO 2017). The Sustainable Development Goals (SDGs), launched in 2015, aimed to end child mortality by 2030 as well as to reduce preventable deaths of new-borns and children under five years of age (UNICEF 2019a). Attaining the SDG targets will prevent 11 million deaths of children under five years of age but if the current trends continue, approximately 52 million children

under five years of age will die between 2019 and 2030 (UNICEF 2019a). Efforts are needed in countries located in Sub-Saharan Africa and South Asia, which are falling behind in achieving the Sustainable Development Goals (UNICEF 2019a).

1.1.2 South African Context

The population of South Africa is approximately 55 653 654 (Statistics South Africa 2016), with the highest population aged from birth to four years old, amongst Black Africans. South Africa has improved the health and well-being of children through the introduction of the Rotavirus vaccine into the National Immunisation Programme in 2009 (Page *et al.* 2013: 108), which was also mentioned in a study by Mapaseka *et al.* (2010: 138), who reported that its deployment is the only known preventative measure against rotavirus diarrhoea.

Acute diarrhoea is a major cause of hospitalisation in South Africa, especially in children under two years of age (Groome and Madhi 2011: 178). In the year 2000 alone, diarrhoeal diseases contributed to 2.9% of the leading causes of morbidity in terms of disability-adjusted life in South Africa (Commission 2011: 299).

Preschools are the most populated environments for children under five years of age, as they provide early childhood stages of education. In 2014, approximately 50.8% of children up to the age of four years attended Early Childhood Development (ECD) centres (Statistics South Africa 2015: 17).

1.1.3 Provincial context: KwaZulu-Natal

The population of KwaZulu-Natal is approximately 11 065 240, with 1 343 532 in the age group birth to four years old (Statistics South Africa 2016: 18). Diarrhoea is the main cause of morbidity and mortality in KwaZulu-Natal, even though case fatality decreased between 2014/15 and 2015/16 (Department of Health Province of KwaZulu-Natal 2016: 47-48).

Early Childhood Development centres and parent/guardians should therefore recognise their roles in minimising factors that hinder the development of

children, by adopting practices such as the use of clean water, sanitation, and hygiene (WASH), which have been proven to avert more than 50% of diarrhoeal deaths (Chola *et al.* 2015: 8).

1.2 BACKGROUND TO THE PROBLEM

This study was based in the Mpumalanga Township, which is located approximately 40km west of Durban, falling under the Outer West sub-district. Twelve percent (12%) of the EThekwini district live in this sub-district which includes semi-rural, deep rural and tribal areas. The area is under serviced compared to other sub-districts with a similar population as it only has one Community Health Centre, 6 Provincial clinics and 4 Local authority clinics (Department of Health Province of KwaZulu-Natal 2015: 12). The research sites were 10 Early Childhood Development centres registered with the Department of Social Development (DSD) in this area. The South African National Integrated Early Childhood Development Policy describes Early Childhood Development centres as partial care facilities that provide early childhood programmes with a learning and development focus for children from birth until the year they enter formal school (Department of Social Development 2015: 11).

Programmes provided by these centres include community-based play groups operating for specific hours; outreach and support programmes provided at household level for young children, their families, or caregivers; parenting support, enrichment programmes; and support for psychosocial needs of young children and their families (Department of Social Development 2015: 12). It is therefore imperative, that the ECD centres are competent in ensuring the risks for diarrhoea are prevented or minimised as much as possible through education and training that will extend to parents and guardians of children attending the centres.

Figure 1.1 Map of Mpumalanga Township (Google Maps, 2018)

1.3 RATIONALE OF THE STUDY

This study was based on 10 ECD centres in Mpumalanga Township, KwaZulu-Natal which falls under the eThekwini Outer West sub-district with a population of 338 362 accounting for 12% of the district population (Department of Health Province of KwaZulu-Natal 2015: 12). The eThekwini 2015/2016 District Health Plan reports that the sub-district is the worst affected by diarrhoea (Department of Health Province of KwaZulu-Natal 2015: 17). The study population included all the parents/guardians of children who are five years and under attending ECD centres in the area and all the ECD centre educators. Evaluation and analysis of the knowledge, attitudes, and practices of the educators and the parents/guardians regarding diarrhoea and hygiene provided more information on the risk factors that contribute to diarrhoea in children.

1.4 SIGNIFICANCE OF THE STUDY

The study provided information on whether hygiene practices of the study population contribute to diarrhoea in children in Mpumalanga Township area. This will be beneficial in the prevention of infection and reduction of childhood mortality. The causes, risk factors, and control measures of childhood diarrhoea

will be effectively communicated through a controlled setting of the ECD centres.

In focusing on ECD centres, the risk factors for diarrhoea in children under five years were determined through a wider spectrum of population dynamics. The findings of the study can be used by the Department of Social Development in implementing policies to assist in establishing proper hygiene practices at ECD centres as well as aid in the training programme for ECD centre educators and other staff.

Recommendations to prevent and/or minimise the severity of diarrhoea in children can be extracted from the study in order to improve management of childhood diarrhoea in Mpumalanga Township. Ultimately, this will reduce under-five child mortality, keeping in line with the Sustainable Development Goal 3 (UNDP 2015).

1.5 RESEARCH PROBLEM

The lack of knowledge regarding good hygiene practices in ECD centre educators and parents/guardians may lead to diarrhoea in children.

In addressing the problem statement, the following research questions were asked:

- What are the contributing factors for diarrhoea in children five years and under?
- How do the ECD centre educators and parents/guardians perceive good hygiene practices?
- What role can ECD centres and parents/guardians play to prevent or minimise diarrhoea in children?

1.6 AIM OF THE STUDY

The study aimed to determine whether hygiene practices of parents/guardians and ECD educators contributed to diarrhoea in children attending the centres.

Interdependent factors related to diarrhoea in children were also investigated.

1.7 RESEARCH OBJECTIVES

The objectives of the study were to determine the following:

- to assess the prevalence of diarrhoea in children five years and under at ECD centres in Mpumalanga Township, KwaZulu-Natal;
- to identify risks factors that may contribute to diarrhoea in children;
- to assess the knowledge, attitudes and practices of ECD educators and parents/guardians to diarrhoea and hygiene.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

An estimated 5.3 million children under the age of five years died in 2018, translating to 15,000 under-five deaths occurring every day, despite the global progress in reducing child mortality (UNICEF 2019b). Almost half of those deaths occurred in Sub-Saharan Africa, accounting for 78 deaths per 1,000 live births (UNICEF 2019b) and furthermore, 1 in 13 children died before reaching their fifth birthday. The Sustainable Development Goals (SDGs) target for child mortality aims to end preventable deaths of new-borns and children under the age of five by 2030 (UNICEF 2019a).

Diarrhoeal disease is one of the major causes of death in children (UNICEF 2017c), accountable for approximately 20% of deaths in children under the age of five years (Statistics South Africa 2015:17). Diarrhoea is defined as the passage of three or more loose or liquid stools per day (WHO 2013). It is clinically characterised as three types: acute watery diarrhoea, which lasts for several hours or days; dysentery, which contains bloody stools; and persistent diarrhoea, which lasts 14 days or longer (WHO 2013).

Diarrhoea is a symptom of infection caused by viral, bacterial, or parasitic infections (WHO 2013; Van Wyk 2015: 23) and is transmitted through contaminated food, drinking-water, or from person-to-person as a result of poor hygiene practices. The symptoms of diarrhoea include fever and vomiting (Panda *et al.* 2014: 1851), and this concurs with a study by Kattula *et al.* (2015: 3042), who observed an association of diarrhoeal events with either fever or vomiting, or both symptoms. Further symptoms of diarrhoea include dehydration due to loss of fluids that may result in shock, and eventual death from diarrhoea (Onwukwe, Van Deventer and Omole 2016: 45).

The highest contributors to diarrhoeal episodes were found amongst children under five years and moreover in the youngest child of the family (Kattula *et al.*

2015: 3041). These children were predisposed to poor hygiene practices, poor environmental factors, disadvantaged households and low social-economic factors (Fagbamigbe, Morakinyo and Abatta 2017: 126). The highest prevalence of diarrhoea was found in children aged 12 to 23 months and it decreased as the child's age increased and was not different between the sexes (Agustina *et al.* 2013: 985). This corresponded with a study by Oketcho *et al.* (2012: 84) at Morogoro regional hospital in Tanzania, where children appeared to be particularly vulnerable to diarrhoea before the age of two, peaking around ages of seven to 12 months.

2.2 PATHOPHYSIOLOGY OF DIARRHOEA

Diarrhoea is mainly caused by microbial infections ranging from viruses, bacteria and protozoa (WHO 2005: 29). These microbial infections generally invade either the small or large intestines causing mucosal damage resulting in fluid secretion and malabsorption, which are the main cause of dehydration and malnutrition respectively in patients with diarrhoea (WHO 2005: 30).

Diarrhoeal disease is differentiated by four clinical types, which are: acute watery diarrhoea, dysentery, persistent diarrhoea and diarrhoea with severe malnutrition (WHO 2005: 4). Acute watery diarrhoea, mainly caused by Rotavirus and *Cryptosporidium* infections, normally lasts for several hours or days and is the main cause of dehydration as well as weight loss if feeding is not continued (WHO 2005: 4). Dysentery, or acute bloody diarrhoea, is a symptom of *Shigella* infection that damages the intestinal mucosa, causing sepsis, malnutrition and dehydration (WHO 2005: 4). Persistent diarrhoea last for 14 days or longer, and is the main cause of malnutrition and serious non-intestinal infections, such as pneumonia (WHO 2005: 4). Diarrhoea with severe malnutrition results in severe systemic infection, dehydration, heart failure, and mineral deficiency (WHO 2005: 4).

Diarrhoea causes an increased loss of water and electrolytes in liquid stools that, if not replaced, results in dehydration and shock (Department of Health 2016: 142). During diarrhoea, there is a decreased food intake, decreased

nutrient absorption, and increased nutrient requirements, resulting in weight loss and stunting (WHO 2005: 5). Malnourished children therefore are more prone to diarrhoea that is severe, prolonged and more frequent (WHO 2005: 5).

2.3 FACTORS CONTRIBUTING TO DIARRHOEA

2.3.1 Pathogenic infection and exposure

The rotavirus and *Escherichia coli* are the two most common etiological agents of moderate-to-severe diarrhoea in low-income countries, although other pathogens such as *cryptosporidium* and *Shigella* may also be important (WHO 2017). The prevalence of rotavirus is worldwide and is spread by faecal-oral transmission or possibly by airborne droplets (WHO 2005: 29). A study in Burkina Faso reported rotavirus as the most commonly detected virus in children under five years of age consulting for gastroenteritis treatment in three hospitals in Ouagadougou (Ouédraogo *et al.* 2016: 11). This was followed by infections with Adenovirus and Norovirus (Ouédraogo *et al.* 2016: 5).

The highest incidences of Rotavirus diarrhoea were observed by Panda *et al.* (2014: 1856) in children between the ages of six to 18 months. In Peru, Cornejo-Tapia *et al.* (2017: 831) found that the most prevalent causes of acute diarrhoea were rotavirus, adenovirus, norovirus, and the bacteria *Shigella*. Rotavirus was observed as the most frequently isolated pathogen in diarrhoeal faecal samples followed by *Shigella* (Cornejo-Tapia *et al.* 2017: 829). These finding were similar to a finding by Ashie *et al.* (2017: 267), who observed rotavirus and adenovirus as the most common acute diarrhoea causing pathogens in children in Ghana. The study also reported *salmonella* and *Sshigella* to be causes of diarrhoea.

Rotavirus, in particular, was responsible for severe gastroenteritis in children under five years of age in Tanzania (McHaile *et al.* 2017: 5). Another study found that an increase in severe gastroenteritis was common during the first year of life, and decreased thereafter (Mapaseka *et al.* 2010: 136-137). However, Ashie *et al.* (2017: 266-267), in a study in Kumasi, Ghana identified

most adenovirus infections during the first year of life, whereas rotavirus occurred mainly in children between 13 and 24 months. The presence of both rotavirus and *Sshigella* were found to be significantly associated with an age of more than 17 months (Cornejo-Tapia *et al.* 2017: 829). This observation corresponded with a study by Groome and Madhi (2011: 175), who found that the majority of acute gastroenteritis episodes occurred in children less than two years of age. Furthermore, the study reported that the burden of disease resulting from severe acute gastroenteritis decreased with an increase in age (Groome and Madhi 2011: 176). Another study in Tanzania observed children less than 24 months of age as the most affected by rotavirus infections (McHaile *et al.* 2017: 545). Rotavirus diarrhoea therefore contributes greatly to the disease burden in young children, which emphasises the need for vaccinations at an early age (Mapaseka *et al.* 2010: 136).

Viral and bacterial co-infections were observed by Cornejo-Tapia *et al.* (2017: 829) as the most frequent causes of diarrhoea and co-infections mainly comprised of Rotavirus with *Shigella* and Adenovirus with *Shigella.* Virus-virus co-infection were mainly rotavirus, with norovirus and bacteria-bacteria co-infections were *Sshigella,* with *salmonella* and *Shigella* with *Campylobacter*. The symptoms of vomiting were predominant in children with viral infections than bacterial infections (Cornejo-Tapia *et al.* 2017: 828). These findings correlate with a study by Page *et al.* (2017: 1950) in four major hospitals located within three provinces in South Africa. The latter study also reported vomiting as a significant symptom associated with Norovirus infection in children hospitalised for diarrhoea.

Amongst norovirus infected children, HIV infection was associated with prolonged hospitalisation and increased mortality (Page *et al.* 2017: 1948). A similar finding was observed by Groome and Madhi (2011: 176), who found the burden of acute gastroenteritis in hospitalised children in South Africa to be five times higher in HIV-infected as compared to HIV-uninfected children. Furthermore, rotavirus incidences were two times higher in HIV-infected children, compared to those who were HIV-uninfected (Groome and Madhi

2011: 176). Persons with advanced immunodeficiency are more likely to contract opportunistic diseases such as diarrhoea from infections like norovirus and non-infectious causes arising from adverse effects of medication. In Tanzania, undernutrition in the form of anaemia, protein energy malnutrition and under-weight children between six to 60 months were highly associated with the likelihood of diarrhoea occurrence (Oketcho *et al.* 2012: 83).

2.4 RISK FACTORS FOR DIARRHOEA

2.4.1 Overcrowding

Diarrhoeal diseases were found to be associated with housing conditions in a study in North-east Ethiopia, where children who lived in homes with only one room were more likely to have diarrhoea compared to children living in houses with two rooms (Bitew, Woldu and Gizaw 2017: 5). A study in India reported that the presence of siblings, overcrowding and open field defecation in rural areas without latrines were associated with an increased risk of diarrhoea (Kattula *et al.* 2015: 3045). Households with siblings aged under five years were identified as a significant risk factor in both the rural and urban areas, resulting in a higher incidence as well as a longer duration of diarrhoea (Kattula *et al.* 2015: 3044). Furthermore, Kattula *et al.* (2015: 3045) observed a longer duration and a higher incidence of diarrhoea to be associated with overcrowding in rural and urban households, due to a high incidence of person-to-person contact.

These findings correspond with a study by Godana and Mengistie (2013: 2332), where the occurrence of acute childhood diarrhoea was associated with the number of under-five children in the household. A study in Ethiopia also reported similar findings, with significant association of household size of six or more persons with acute diarrhoea (Adane *et al.* 2018: 403). These findings may be related to the fact that crowded living creates a greater opportunity for close contact amongst children, thereby making conditions for transmission of disease-causing pathogens more favourable.

A study in Iceland focusing on day care centres observed that larger day care centres had a reduced risk of diarrhoea whereas increased risk to diarrhoea

was associated with a high number of staff (Gudnason *et al.* 2012: 155). However, the same study did not observe any association of diarrhoea with the number of children at the day care centres.

2.4.2 Sanitation and drinking water

The prevalence of diarrhoea was more common in households with inadequate or unimproved sanitation (Fagbamigbe, Morakinyo and Abatta 2017: 127), as well as drinking water sources (Bitew, Woldu and Gizaw 2017: 4). Children whose families collected water from unprotected water sources were more likely to develop diarrhoeal disease (Bitew, Woldu and Gizaw 2017: 4). Other risk factors of diarrhoea observed in Nigeria included use of non-improved sources of drinking water, unimproved toilet facilities, sharing toilets, and no hand washing with soap or ash (Fagbamigbe, Morakinyo and Abatta 2017: 129). Improved sources of drinking water are described as piped water into either a dwelling or yard, public tap, borehole, spring water, rainwater, and bottled water. Any other source of drinking water are regarded as non-improved sources of drinking water (Fagbamigbe, Morakinyo and Abatta 2017: 122). Improved toilet facilities are regarded as household flush to piped sewer system, flush to septic tank, flush to pit latrines, ventilated improved pit (VIP), and pit latrine with composting toilet (Fagbamigbe, Morakinyo and Abatta 2017: 122).

The key measures to prevent diarrhoea include: access to safe drinking water; use of improved sanitation; hand washing with soap; exclusive breastfeeding for the first six months of life; good personal and food hygiene; health education about spread of infection; and Rotavirus vaccination (WHO 2017). A study in Kenya reported that point-of-use water disinfection using sodium hypochlorite solution, safe water storage, and behavioural change techniques was associated with significantly lower risk of diarrhoea in children under five years (Garrett *et al.* 2008: 1468). The study recommended that caregivers ensure that children are not given untreated water but only treated water to drink, and demonstrate good hygiene behaviour (Graf *et al.* 2008: 352).

2.4.3 Socio-economic factors

The strongest determinants of the duration of diarrhoea were reported by Santos *et al.* (2012: 694) as socio-economic factors, mother's education, and marital status. A study in Northern Nigeria revealed that married mothers required permission from their husbands to attend the health clinic when their child had diarrhoea (Charyeva *et al.* 2015: 38), which results in longer duration of diarrhoea if permission is not given immediately. Other people influencing the decision of mothers included the mothers-in-law; fathers-in-law, and mothers of the caregivers (Charyeva *et al.* 2015: 38). This corresponds with a study in Pakistan, where Aftab *et al.* (2018: 51) found that most caregivers utilise knowledge accumulated through family and personal experiences as the main source of diarrhoea care, which included home remedies often accompanied with self-prescription of medicines such as metronidazole syrup. Caregivers reported that they only utilise home remedies such as cardamom, glucose, and rice, as a routine first response to manage mild diarrhoea, because it is inexpensive and readily available (Aftab *et al.* 2018: 51).

A systematic review in the Indian subcontinent reported sociodemographic factors such as household income, maternal age, education and family size as risk factors for *Cryptosporidiosis*; an enteric parasite found in humans, domestic and wild animals that is associated with diarrhoea (Murugesan, Ganesan and Ajjampur 2017: 24). Living in poverty resulted in overcrowding and inadequate sanitation facilities, which increases the risk to cryptosporidium infections (Murugesan, Ganesan and Ajjampur 2017: 24).

2.4.4 Literacy of caregivers

Children whose mothers were illiterate were more likely to have diarrhoea when compared with children whose mothers were literate (Gebru, Taha and Kassahun 2014: 399). A similar finding was reported by Desta, Assimamaw and Ashenafi (2017: 7), who noted that caregivers who had any form of education were more likely to have better knowledge regarding management of diarrhoea than illiterate caregivers. In fact, the same study observed that with an increase in educational level of caregivers, the level of awareness and knowledge

regarding diarrhoea also increases (Desta, Assimamaw and Ashenafi 2017: 7). Education provided knowledge on the guidelines of hygiene, feeding and weaning practices, where illiterate mothers may have had difficulty in understanding these guidelines (Gebru, Taha and Kassahun 2014: 399).

2.4.5 Infrastructure

The determinants of acute diarrhoea were observed in a study in Ethiopia to include household water, availability of home-based water treatment, latrine ownership, and the consumption of left-over food stored at room temperature (Godana and Mengistie 2013: 2335). The availability of home-based drinking water was an independent predictor of diarrhoeal diseases (Godana and Mengistie 2013: 2335). Children whose families used a home-based drinking water treatment such as boiling, chemical treatment, or water filters were found to have lower odds of having diarrhoea compared to families who did not treat their drinking water (Godana and Mengistie 2013: 2335).

Inadequate sanitary infrastructure resulted in inadequate disposal of sewage thereby increasing the risk of exposure to excreta (Santos *et al.* 2012: 692). Poor floor quality is a determinant of the duration of diarrhoea might be because some floor surfaces are not easy to clean, and are therefore inadequately cleaned, thereby increasing the risk of cross-contamination, especially in young children who constantly play on the floor, particularly in rural areas (Santos *et al.* 2012: 690). However, a similar study by Panda *et al.* (2014: 1853) found no association of the construction of the houses (mud wall, brick, or cement) and the occurrence of diarrhoea in children.

The management of human excreta was found to be associated with childhood diarrhoeal disease (Bitew, Woldu and Gizaw 2017: 4). Children from families without any type of latrine were more likely to be affected by diarrheal disease than children with families with some type of latrine (Bitew, Woldu and Gizaw 2017: 4). A study by Kattula *et al.* (2015: 3045) found that the usage of a latrine for defecation offered 41% protection against diarrhoea. Furthermore, children who defecated in the open field had a 50% higher chance of diarrhoea infection

than children who defecated in a latrine (Kattula *et al.* 2015: 3045). Similar findings were observed by Godana and Mengistie (2013: 7), where children from households without toilet facilities were more likely to develop diarrhoea compared to children from households with latrine facilities. This is similar to a study in India by Bawankule *et al.* (2017: 3) where the authors reported that the lack to access to improved toilet facilities was associated with the unsafe disposal of stool, which increases exposure to diarrhoeal causing microorganisms.

The presence of toilets promoted the safe disposal of faeces, thereby decreasing the possibility of contact between causative organism of diarrhoea and host (Godana and Mengistie 2013: 2335). Children under five years of age living in households with communal latrines were more likely to experience moderate-to-severe diarrhoea than household with private latrines (Baker *et al.* 2016: 12). However, Gebru, Taha and Kassahun (2014: 399) did not find any association of sanitary facilities with the occurrence of diarrhoea, suggesting that households with better sanitation habits were more likely to safely dispose of child faeces (Islam *et al.* 2018: 8).

A study in a rural setting in Zimbabwe reported community members extracting water from unprotected and potentially contaminated sources, despite their knowledge on the risks associated with the practice (Demberere *et al.* 2016: 121). Children whose mothers used untreated water more commonly suffered from diarrhoea than children whose mothers use treated water (Acharya *et al.* 2017: 71). The frequency of diarrhoea in children was also observed in the same study in families where mothers used uncovered water, thereby highlighting the importance of promoting the safe handling of water.

Increasing water and sanitation infrastructure reduced the risk of diarrhoeal diseases in children (Fuller *et al.* 2015: 288). In Ethiopia, Adane *et al.* (2017: 12) found that intermittent supply of piped water, point-of-use contamination of household stored water by *E.coli*, the use of containers without handles, and interchangeable use of containers, both with and without handles, for retrieving water from household water storage containers, were independently associated

with acute diarrhoea. These findings concurred with those of Herbst, Fayzieva and Kistemann (2008: 316), who reported that the quality of drinking water's microbiological content deteriorated during storage as a result of unhygienic water retrieval. Acute diarrhoea was associated with unhygienic water retrieval from water storage containers, which was worsened by the use of wide-mouth containers that allowed the hands to enter along with the retrieving container (Adane *et al.* 2017: 14).

Unimproved water sources were among the potential sources of transmission of diarrhoeal diseases and households using unprotected water sources were three times more likely to have a child with diarrhoea (Godana and Mengistie 2013: 9). Although household improvement in sanitation may be achieved, those without access still carry the risk of contracting diarrhoeal disease. Therefore, community-based access to sanitation will ensure a much greater outcome of reducing diarrhoeal disease (Larsen *et al.* 2017: 11). Garrett *et al.* (2008: 1468) reported that village households who used a 10% sodium hypochlorite solution to treat water, and who had latrines with a lower risk of diarrhoea in children aged five and under. Drinking water from shallow wells had a subsequently higher risk of diarrhoea in children when compared to consuming water from surface water sources (Garrett *et al.* 2008: 1468).

2.4.6 Environmental factors

2.4.6.1 Rainfall

Climate variables in north-western Ethiopia were associated with the occurrence of childhood diarrhoea, whereby heavy rainfall was found to be associated with an increased rate of childhood diarrhoea (Azage *et al.* 2017: 14). A similar study by Mertens *et al.* (2019: 9) observed that heavy rainfall was associated with the prevalence of diarrhoea in children under five years of age. This might be due to human and animal faeces accumulating in the environment during dry seasons, with the subsequent flushing of such faeces by heavy rainfall into a drinking water source (Mertens *et al.* 2019: 9). Communities who source drinking water from rivers, wells and springs have increased exposure to waterborne disease

during rainfall, due to surface run-off that transports pathogens into these water sources (Azage *et al.* 2017: 13). Interventions such as boiling of water and point-of-use chlorination by families who source their drinking water from rivers and wells reported an increased reduction of diarrhoeal disease (Herbst, Fayzieva and Kistemann 2008: 316).

2.4.6.2 Seasonal temperature

In South Africa, Mapaseka *et al.* (2010: 137) observed rotavirus diarrhoea throughout the year, with distinctive peaks in winter (50%), and a <5% during summer in the Gauteng Province. In Peru, the distribution of diarrhoeal cases were reported by (Cornejo-Tapia *et al.* 2017: 827), to indicate a seasonal component as they peaked during dry, winter seasons. Rotavirus is transmitted faecal-orally or by airborne droplet, which will result in increased exposure in households with inadequate water supply and overcrowding (WHO 2005: 29). However, other diarrhoeal incidences not associated with rotavirus peaked during the summer months (Mapaseka *et al.* 2010: 133). Moreover, Groome and Madhi (2011: 176) observed a peak in hospitalisation due to acute gastroenteritis from March to May, which is an autumn-winter season in South Africa. Another study in Uzbekistan also reported that the duration of a single diarrhoea incident lasted longer in winter than in summer in children under five years of age (Herbst, Fayzieva and Kistemann 2008: 308).

Norovirus infections were detected throughout the year and tended to increase during the warmer seasons (Page *et al.* 2017: 1948). The reason for the increased risk of childhood diarrhoea during higher temperatures might be due to the rapid multiplication and survival of causative agents for longer periods in warmer seasons (Azage *et al.* 2017: 13).

2.4.7 Domesticated animals

Households in rural areas with domesticated animals in close proximity to homes were observed by Kattula *et al.* (2015: 3045) to have an increased risk of diarrhoea, because zoonotic transmission occurred by being in close proximity with livestock or household pets. Furthermore, the soil and water might be

contaminated with animal faeces. A study by Murugesan, Ganesan and Ajjampur (2017: 24) also reported the presence of animals as a risk factor for diarrhoea. Diarrhoeal disease was highly prevalent when water sources were shared with livestock (Bitew, Woldu and Gizaw 2017: 94). However, Panda *et al.* (2014: 1853) found no significant association of the presence of pets in the family with the occurrence of diarrhoea in children.

2.4.8 Hygiene practices

Diarrhoea was found to be more common among infants whose mothers sometimes or never wash their hands with soap after cleaning the infants' perineum (Dairo, Ibrahim and Salawu 2017: 112). Adults who prioritise hygienic sanitation practices for themselves behave similarly with their children (Islam *et al.* 2018: 9). The presence of observed soap in the household was associated with fewer days of diarrhoea per 100 child-days when compared to children in households with no observed soap (Kamm *et al.* 2014: 402). The presence of soap in the homes may be an indication that caregivers of young children are washing their hands during key events that disrupt transmission of diarrhoea causing pathogens to the children such as after faecal contact and before feeding the child (Kamm *et al.* 2014: 403).

Four critical hand washing stages for mothers of children under the age of five years were identified by Demberere *et al.* (2016: 123) as: prior to eating; after defecation; prior to preparing food; and after handling the child's stool. Similar findings were reported in a study by Adane *et al.* (2018: 403) indicating that before food preparation and after defecation are the most important recommended times for hand washing with soap, for the prevention of acute diarrhoea. Gebru, Taha and Kassahun (2014: 399) also observed that children whose mothers did not practice hand washing at critical times with soap were more likely to develop diarrhoea, when compared to children whose mothers practiced hand washing at critical times with soap.

Handwashing with soap was practiced in households having a closer or more convenient water source, which highlights the importance of water availability in

facilitating safer hygiene practices (Biran *et al.* 2009: 1311). Likewise, households with lower monthly incomes had an increased risk of acute diarrhoea due to caregivers not being able to afford soap, which may hinder hand washing with soap at any recommended time (Adane *et al.* 2018: 404).

Although the presence of soap does not necessarily result in handwashing with soap, the absence of soap does minimise opportunity for the behaviour (Kamm *et al.* 2014: 403). The presence of soap was determined by the socio-economic status of the household, with the poorest households not having soap in their homes (Kamm *et al.* 2014: 403).

Food-hygiene practices of mothers might have an important impact on diarrhoea among children (Takanashi *et al.* 2009: 606). The risk of having diarrhoea is increased in children aged two years and under, whose mothers had poor food-hygiene practices (Agustina *et al.* 2013: 26). The probability of having diarrhoea, however, significantly decreases as the age of the children increases (Oyekale 2017: 191).

Practices in the homes on managing drinking water, such as dipping a pot to draw water from a storage vessel, was found by Panda *et al.* (2014: 1853) to have a significant association with diarrhoea in children. Poor domestic water handling practices may offset gains achieved by having deep tube wells or safe pipe-water (Panda *et al.* 2014: 1853). A study in Kenya evaluating the health impact of safe water systems reported that point-of-use water disinfection using sodium hypochlorite solution was the most effective prevention of recontamination of stored water compared to using safe storage involving narrow-mouthed, covered containers (Garrett *et al.* 2008: 1468). The safe storage was more effective when the source of water quality was good and the containers prevented contamination (Garrett *et al.* 2008: 1469). Caregivers should therefore ensure that children are not given untreated water but only treated water to drink, ensuring and demonstrating good hygiene behaviour (Graf *et al.* 2008: 352).

Strategies to target high-risk groups and improvement in personal and domestic hygiene are essential in reducing the burden of gastrointestinal illnesses (Kattula *et al.* 2015: 3046).

2.4.8.1 Food preparation

In Matlab, Bangladesh, widespread contamination of food used to wean babies was a likely contributor to food-related diarrhoea in children (Islam *et al.* 2013: 256). Children under two years of age whose mothers had poor food-hygiene practices are at increased risk of having diarrhoea (Agustina *et al.* 2013: 991). Food prepared under unhygienic conditions is a risk factor for diarrhoea, as they are often contaminated with pathogens (Agustina *et al.* 2013: 991). Weaning food prepared under proper hygienic conditions can reduce its contamination and ultimately diarrhoea in children (Islam *et al.* 2013: 256).

The risk of diarrhoea was also found to be higher amongst children whose mothers did not separate utensils for raw and cooked food compared to mothers who did separate the utensils (Takanashi *et al.* 2009: 606). For this reason, the implementation of hygiene interventions, such as reheating food correctly and separating utensils for raw and cooked food, reduced contamination of food, lowering the risk of diarrhoea in children (Takanashi *et al.* 2009: 609);(Islam *et al.* 2013: 257).

2.4.9 Breastfeeding

Early initiation of breastfeeding and exclusive and predominant breastfeeding are protective against diarrhoea in contrast to bottle-feeding and introduction to complimentary food, which are risk factors for diarrhoeal morbidity in children (Ogbo *et al.* 2016: 353). Exclusively breastfed babies are less likely to get diarrhoea or die from it than babies who are not breastfed or are partially breastfed (WHO 2005: 26). Breast milk has immunological properties that protect the infant from infection, especially diarrhoea. These factors are not present in animal milk or formula (WHO 2005: 27). Breast milk is clean, and does not require the use of bottles or water, which are easily contaminated with bacteria that can cause diarrhoea (WHO 2005: 27).

In Beijing, adenovirus infection was relatively low amongst children below the age of six months, due to the transfer of maternal antibodies, from mother to child, during pregnancy and breastfeeding. These antibodies were effective in protecting against common adenoviral types that cause gastroenteritis (Liu *et al.* 2016: 5013). It is thus recommended that breastfeeding continue in children until the age of two (NDoH *et al.* 2017: 29). The incidence of diarrhoea was higher in infants who were introduced to solid, semi-solid, and soft foods than those who continued being breastfed up to one year of age (Ogbo *et al.* 2017: 10).

Significantly lower mortality rates were observed in exclusively breastfed infants compared to those who were partially breastfed or not breastfed at all (Motsa, Ibisomi and Odimegwu 2016: 2134; Ogbo *et al.* 2017: 8; Ogbo *et al.* 2018: 4). Likewise, infants aged 6-8 months, who were introduced to complementary foods had a higher prevalence of diarrhoea compared to those who did not receive any complementary foods.

Breastfeeding of any form, whether partial or exclusive, greatly reduces the risk of infant mortality (Motsa, Ibisomi and Odimegwu 2016: 2134). Knowledge, influence of culture custodians, patterns, burden of work, and other responsibilities at home are the main barriers affecting the use of proper infant and young child-feeding practices (Nankumbi and Muliira 2015: 111). Mothers' lack of knowledge regarding the importance of initiation of breastfeeding immediately after delivery, frequency of breastfeeding, and when to stop breastfeeding, resulted in poor infant feeding practices (Nankumbi and Muliira 2015: 109). Culturally, mothers were influenced by the advice of elders in the family and respected community members regarding infant feeding, thereby hindering appropriate feeding practices (Nankumbi and Muliira 2015: 110). Mothers reported that they had heard that a child can be exclusively breastfed for six months, however, household chores, taking care of other children and working prevented them from exclusively breastfeeding for six months (Nankumbi and Muliira 2015: 110).

A systematic review by Carter *et al.* (2015: 807) on harmful practices in the management of childhood diarrhoea in low and middle-income countries identified a practice of breastfeeding reduction or cessation during diarrhoea episodes. Various reasons for reduction or ceasing breastfeeding was reported by mothers. These included beliefs that breastfeeding will not reduce the duration of diarrhoea or could cause or worsen the diarrhoea (Carter *et al.* 2015: 807).

2.4.10 Antibiotics and antidiarrheal treatment

The most reported measures for treatment of diarrhoea were the use of antibiotics and the use of antidiarrheal agents (Carter *et al.* 2015: 817). Antibiotics are recommended for treatment of dysentery diarrhoea and cholera with severe dehydration, but should not be used routinely, as it is not possible to distinguish clinical episodes that might respond and those caused by agents unresponsive to antibiotics such as Rotavirus and *Cryptosporidium* (WHO 2005: 5). Antibiotic use also increases the risk of adverse reactions and enhances the development of resistant bacteria (WHO 2005: 5). Anti-diarrhoeal treatment has no useful benefits in children with acute or persistent diarrhoea, as they do not prevent dehydration or improve nutritional status, and some have dangerous or even fatal side effects and therefore should not be given to children below five years (WHO 2005: 5).

2.5 MANAGEMENT OF DIARRHOEA IN CHILDREN

Beliefs about the causative agents of diarrhoea are fundamental to the decision process of mothers of children with diarrhoea (Cunnama and Ayako Honda 2016: 675). Most caregivers' initial responses to their child having diarrhoea were to manage it at home by changing their diet, using various home remedies, and/or self-prescribing medicines (Aftab *et al.* 2018: 49). The management of diarrhoea, however, was observed to improve with frequent attendance at a health services relating to an improved use of oral rehydration salts (ORS), extra fluid, and continued feeding during diarrhoea treatment (Ghimire *et al.* 2018: 8).

High diarrhoeal mortality rates in children under five years were mostly due to inappropriate management of diarrhoea episodes, and included fluid and breastfeeding restrictions, food restrictions, and inappropriate medication usage (Carter *et al.* 2015: 31), thereby prolonging the duration of diarrhoea.

Mothers above the ages of twenty-five were more likely to have good diarrhoea management practices than younger mothers (Desta, Assimamaw and Ashenafi 2017: 7). This might be due to the fact that mothers above twenty-five have had experience in managing diarrhoea as they might have more than one child (Desta, Assimamaw and Ashenafi 2017: 7).

Planned health teachings were effective in increasing the knowledge and practices of mothers regarding the prevention and management of diarrhoea in children (Sethi 2016: 31). However, in Singapore, good knowledge and attitude did not translate into good behaviour and practice of hygiene in everyday lives (Pang, Chua and Hsu 2015: 583). Busy lifestyles, low prevalence of severe and fatal diarrhoea in the developed country, as well as high standard of medical, water and sanitation facilities may have resulted in complacency (Pang, Chua and Hsu 2015: 583).

Harmful practices and inappropriate management of diarrhoea episodes in children can result in higher mortality risks resulting from fluid and breastfeeding curtailment, food restrictions, and inappropriate medication use (Carter *et al.* 2015: 31).

2.5.1 Oral rehydration treatment

The World Health Organisation (WHO) describes oral rehydration treatment (ORT) as a balanced glucose-electrolyte mixture used for the treatment of clinical dehydration throughout the world (WHO 2006:2). Diarrhoea causes an increased loss of water and electrolytes (sodium, chloride, potassium and bicarbonate) during the passing of watery stools (WHO 2005: 4). The glucose component in the ORT promotes the absorption of sodium and water in the small intestine, irrespective of the cause of diarrhoea (WHO 2005: 33). When

these are absorbed in the small intestine, they replace the water and electrolytes lost in faeces (WHO 2005: 3). Oral rehydration treatment adopted by United Nations Children's Fund (UNICEF) and WHO in the late 1970s have been successful to aid the management of diarrhoea among children (UNICEF 2004: 2). Dehydration should be avoided by administering ORT which contains low concentrations of glucose and salt (UNICEF 2004: 2).

The United Nations Children's Fund (UNICEF) and WHO have recommended cost-effective and affordable treatment for childhood diarrhoea by replacing lost fluids through ORT and zinc supplements, along with continued feeding (UNICEF 2004). Administering ORT at the onset of diarrhoea stops or prevents dehydration (Onwukwe, Van Deventer and Omole 2016: 45). Home preparation of the ORT includes having one litre of cooled, boiled water, mixing it with eight level teaspoons of sugar and half a teaspoon of salt.

The United Nation Children's Fund (UNICEF) reported that worldwide just over 40% of children under the age of five with diarrhoea receive the recommended oral rehydration therapy and continued feeding. The lowest coverage of the treatment package being in Sub-Saharan Africa and South Asia, which are also the regions with the most deaths from diarrhoea (UNICEF 2017c).

2.5.2 Caregivers and the use of oral rehydration treatment

A study in Sedibeng District, South Africa, found a large number of caregivers who did not know the exact function of oral rehydration therapy/solution and why it should be given at the onset of diarrhoea (Onwukwe, Van Deventer and Omole 2016: 45). This is despite the high reporting and awareness regarding the importance of ORT. The majority of caregivers reported that they heard of ORT mainly from clinics but did not know its exact function. They only knew that it stops diarrhoea (Onwukwe, Van Deventer and Omole 2016: 44). Only a few caregivers knew that ORT prevents the kind of dehydration that results in shock and eventual death from diarrhoea (Onwukwe, Van Deventer and Omole 2016: 45). A study by Desta, Assimamaw and Ashenafi (2017: 4) found that a majority of caregivers in their study stated that diarrhoea was not treatable, at home and half of that study population indicated that they did not know any type of fluids used for management of diarrhoea at home. Of those caregivers who used rehydration fluid, only half were able to prepare a correct ORT mixture (Onwukwe, Van Deventer and Omole 2016: 44), even though the correct way of preparing ORT is demonstrated in the *Road to Health* book (Figure 2.1) issued by South Africa's Department of Health to all mothers. The book serves as a formal record of a child's medical history, growth chart and immunisations.

Figure 2.1 Method of ORT preparation. From: Road to Health book (Department of Health, South Africa. 2018)

The level of education of caregivers had a significant association with attitude, ORT knowledge, and practice (Onwukwe, Van Deventer and Omole 2016: 44). A study in Ethiopia reported a low level of awareness in caregivers regarding the use of the sugar and salt solution, as home management of diarrhoea, and in those who were aware of it, where only a few were able to correctly prepare and use the ORT (Desta, Assimamaw and Ashenafi 2017: 6).

Caregivers who sought treatment or advice from health care providers were more likely to use ORT, extra fluid, and continued feeding for childhood diarrhoea, compared to mothers who did not seek treatment or advice from the healthcare providers (Ghimire *et al.* 2018: 7). The same finding was observed in Northern Nigeria, where an intervention of having an ORT corner; a referral area within a healthcare facility where caregivers with children who had

diarrhoea; indicated that ORT corner users were more knowledgeable of the amount of liquids to give a sick child, as well as of correct ORT preparation (Charyeva *et al.* 2015: 40).

A study assessing knowledge, attitude, and practices of mothers regarding ORT similarly observed that mothers learnt about ORT from a doctor (Hayat *et al.* 2017: 794). Healthcare providers should counsel mothers to begin administering suitable fluids immediately upon onset of diarrhoea in a child, treat dehydration with ORT solution, or with intravenous electrolyte solution in severe dehydration (UNICEF 2004: 4). Healthcare providers should encourage continued or increased breastfeeding, prescribe antibiotics when appropriate and refrain from administering anti-diarrhoeal medication (UNICEF 2004: 4).

The successful management of diarrhoea depends greatly on well-informed caregivers rather that the health system; therefore, supporting and informing caregivers about oral rehydration treatment (ORT) will ensure that they are more persuaded to use them (Onwukwe, Van Deventer and Omole 2016: 45).

2.5.3 Immunization

The introduction of the rotavirus vaccine, proven to be safe in both HIV-infected and uninfected children, has resulted in a decreased burden of diarrhoea in children in South Africa (Groome and Madhi 2011: 178). General immunisation of children against common vaccine-preventable diseases is important in reducing infant and child mortality (NDoH *et al.* 2017: 22), providing progress in attaining the SDG targets. Rotavirus immunisation consists of two vaccinations, given at age six weeks and 14 weeks. The vaccine does not only protect those who are vaccinated, but it possibly indirectly protects unvaccinated people, thereby resulting in a decrease in the prevalence of rotavirus disease (Groome and Madhi 2011: 178).

2.5.4 Vitamin A supplementation

Diarrhoea reduces the absorption of Vitamin A, thereby causing a deficiency of this vitamin in the body (WHO 2005: 25). Young children with acute or

persistent diarrhoea can rapidly develop eye lesions due to Vitamin A deficiency, and even become blind, especially during or shortly after measles infection. This will particularly affect malnourished children (WHO 2005: 25). Forming part of the South African vaccination programme is the Vitamin A supplementation that is given to children between the ages of six month to five years at two high-doses each year, as it helps maintain a strong immune system as well as reducing all-cause mortality by 24%, along with cases of diarrhoea by 15% (UNICEF 2017c).

2.5.5 Zinc supplements

Zinc deficiency is widespread among children in developing countries. It occurs in most parts of Latin America, Africa, the Middle East, and South Asia (WHO 2005: 5). Zinc supplementation significantly reduces the severity and duration of diarrhoea in children less than five years of age (WHO 2005: 5). Oral zinc administration changes the natural course of acute diarrhoeal disease, causes early normalisation of stool consistency, early recovery, and decreases total duration of hospital stay (Rao, Malik and Raza 2017: 120). Zinc administration also has a preventative effect, as it reduces the incidence of diarrhoea for two to three months after taking zinc supplements for 10 to 15 days (UNICEF 2004: 7).

Zinc supplementation has been found to effectively reduce both frequency of diarrhoea and stool output in a study by Rao, Malik and Raza (2017: 120), where the zinc supplemented group showed faster recovery of diarrhoea by the third day compared to non-zinc supplemented group. In addition, low intake of zinc was association with longer episodes of diarrhoea (Santos *et al.* 2012: 695). These findings were consistent with those of Ahmadipour *et al.* (2019: 167), who observed significantly shorter duration of diarrhoea in children administered with zinc supplements compared with probiotics.

Despite the global recommendation to include zinc supplementation for diarrhoea, worldwide coverage of the intervention is extremely low, with 4% of children receiving it (UNICEF 2017c). The South African Department of Health's treatment guidelines on the management of acute diarrhoea, persistent

diarrhoea and dysentery in children aged one week to five years are rehydration therapy, continued feeding, prevention of malnutrition and zinc supplementation (Department of Health 2016: 142).

A study conducted in India by Walker *et al.* (2016: 6) assessing the practice of private providers from formal and informal settings in the management of childhood diarrhoea, observed consistently higher rates of antibiotic prescribing compared to zinc. Furthermore, they observed that those prescribing zinc did so in addition to antibiotics and ORT. Further evaluation of this practice was seen to have resulted from the pharmaceutical training not addressing the unnecessary overuse of antibiotics and pharmaceutical representatives might also be promoting other treatments for diarrhoea in addition to zinc and ORT (Walker *et al.* 2016: 6).

2.6 CONCLUSION

Proper management of diarrhoea in children is depended on accurate evaluation, recommendation of ORT alone and correct instructions on fluid and food consumption (Ogbo, Aina and Aderemi-Williams 2014: 379). Increasing awareness to caregivers regarding good hygiene practices, feeding practices as well as the management of diarrhoea at home will ensure that childhood diarrhoea is lowered, which will ultimately reduce deaths in children.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 STUDY AREA AND POPULATION

This study was conducted in Mpumalanga Township within the parameters of the eThekwini Outer West sub-district, KwaZulu-Natal, South Africa. This area has a population of approximately 62 406 people (Statistics South Africa 2011). eThekwini district statistics for 2010-2013 revealed that the sub-district was one of the worst affected sub-districts with diarrhoeal cases (Department of Health Province of KwaZulu-Natal 2015: 17). Early Childhood Development Centres also known as crèches, are facilities that provide learning and support appropriate to the child's developmental age and stage. The study population included all educators at the ECD centres and parents/guardians of children who are five years and under attending the ECD centres in the Mpumalanga Township. The total number of centres registered with the Department of Social Development in the area was 41 at the time of the study, with the total of educators approximating 177 and 3326 children attending the ECD centres. The study site provides direct access to parents/guardians of the age group focused in this study.

3.2 STUDY DESIGN

A descriptive cross-sectional study design was conducted to assess the prevalence of diarrhoea in children under five years attending ECD centres; to identify risk factors that may contribute to diarrhoea in children; and to assess the knowledge, attitudes, and practices of educators and parents/guardians to hygiene.

The study consisted of two phases of data collection which formed part of the basis of the study. These phases are outlined below:

- Phase One consisted of collecting data from parents/guardians of children attending the ECD centres through self-administered questionnaires in either English or IsiZulu (Appendix A).

- Phase Two consisted of collecting data from ECD centre educators via self-administered structured questionnaires in English and isiZulu (Appendix B). The educators were directly involved in the day-to-day teaching and monitoring of children in the ECD centres as well as in the preparation and provisioning of meals to the children.

Permission to conduct the study was sought (Appendix C) and granted (Appendix D) from the Department of Social Development in the Province of KwaZulu-Natal, who are the gatekeepers. Data collection commenced on the 7th September 2018, and was completed on the 29th November 2019. A total number of questionnaires collected for parents/guardians were 385 and 121 for educators. A total number of 506 participants were involved in our study.

3.3 RESEARCH INSTRUMENT AND DATA COLLECTION PROCEDURE

The self-administered structured questionnaires were designed to obtain data from parents/guardians and educators at ECD centres. The questionnaires for the different participants were in isiZulu and English, and the participants did not have a specific preference to either language as they were comfortable in both.

Questionnaire for parents/guardians of children attending early childhood development centre (Appendix A) consisted of 29 questions adapted from UNICEF Multiple Indicator Cluster Surveys questionnaires which was sourced from the internet. The section aimed at collecting data on the socio-economic status of the household was adapted from MICS6 Questionnaire for Children Under Five (UNICEF 2017b), the MICS6 Questionnaire for Individual Women (UNICEF 2013) and MICS6 Household Questionnaire (UNICEF 2017a).

Questionnaire for ECD centre educators Appendix B consisted of 25 questionnaires adapted UNICEF Multiple Indicator Cluster Surveys

questionnaires and the Perception Survey for Health-Care Workers survey (WHO 2009). The section aimed at collecting data on the socio-economic status of the ECD centre was adapted from MICS6 Questionnaire for Children Under Five (UNICEF 2017b) and MICS6 Household Questionnaire (UNICEF 2017a). The section aimed at evaluating knowledge, practices and attitudes of ECD educators was derived from the Perception Survey for Health-Care Workers survey (WHO 2009).

3.4 VALIDITY

The level of validity indicates the extent to which an instrument measures what it is designed to measure (Connaway, Radford and Connaway 2017: 77). Face validity of the data collection tool was assessed by a focus group discussion involving six experts, comprising the researcher, both supervisors and three academics, who had been involved in similar research. This group reviewed the research instrument in a round table setting, where all questions were thoroughly interrogated. Both the questionnaire for parents/guardians (Appendix A) and questionnaire for ECD educators (Appendix B) were assessed for validity. The only recommendation the group made was to code each question on the questionnaire. All relevant corrections and recommendations were made.

3.5 RELIABILITY

Reliability refers to the ability of the measuring instrument to be able to produce findings that are repeatable or replicable and generalisable (Connaway, Radford and Connaway 2017: 78). The reliability of the self-administered questionnaires was tested through piloting of the questionnaires in an ECD centre in iMbali Township, located in Pietermaritzburg, uMgungundlovu District, KwaZulu-Natal. The pilot area site chosen displayed similar demographics as Mpumalanga Township. Piloting the study was done to ensure trustworthiness of the collection tool, and removing any ambiguous questions on the questionnaires.

3.5.1 Parents/guardians questionnaire

Eight parents/guardians were issued with the self-administered questionnaire when they were dropping off their child at the centre. Written consent was obtained from the participants to partake in the study. Participants were asked prior to being issued with the questionnaire if they had a language preference, which was either isiZulu or English. The participants did not have a specific preference of language as they were comfortable with either language. Two parents/guardians answered the questionnaires in isiZulu and six answered questionnaires in English. When asked whether they had difficulty in answering the questionnaire, all participants said they did not experience any difficulties.

3.5.2 ECD centre educators questionnaire

Seven ECD centre educators were issued with the self-administered questionnaires. Written consent was obtained from the participants to partake in the study. Participants were asked prior to being issued with the self-administered questionnaire if they had a language preference, which was either isiZulu or English. The participants did not have a specific preference of language as they were comfortable with either language. Therefore, the researcher distributed both isiZulu and English questionnaires. Five educators answered questionnaires in isiZulu and two educators answered questionnaires in English. The participants found the questionnaires easy to understand and they did not request for any changes to be made.

The post focus group questionnaires were therefore used as the final questionnaires for both categories.

3.6 CREDIBILITY

Credibility refers to the accuracy with which the researcher interpreted the data that was provided by the participants (Bezuidenhout, Davis and Du Plooy-Cilliers 2014: 258). Credibility is increased when the researcher spends extended periods of time with the participants in order to understand them better and gain insight into their lives (Bezuidenhout, Davis and Du Plooy-Cilliers

2014: 258). Using more than one research method also increases credibility of the results (Bezuidenhout, Davis and Du Plooy-Cilliers 2014: 258). The researcher adopted well-established methods which were self-administered structured questionnaires combines with focus groups.

3.7 DEPENDABILITY

Dependability refers to the quality of the process of integration that takes place between that data collection method, data analysis, and the theory generated from the data (Bezuidenhout, Davis and Du Plooy-Cilliers 2014: 259). Dependability is demonstrated through the research design and its implementation (Maree 2016: 124).

Dependability was ensured in the following ways:

- All data collection was conducted in the same manner, with the use of the same data collection tools; and
- Data was analysed after collection from participants.

3.8 POPULATION AND SAMPLING

A sample provides reasonably accurate representation of the circumstances in the total group (Connaway, Radford and Connaway 2017: 94). The sample size was determined using the statistical software Raosoft Sample Size Calculator. There are approximately 41 ECD centres with a total of 177 educators and using a total population of educators with a 95% confidence interval, and a 5% margin of error. A minimum sample of 120 educators was calculated. Simple random sampling was used in order to achieve a degree of accuracy and representativeness (Connaway, Radford and Connaway 2017: 124). The 41 ECD centres were allocated numbers one – 41, and the ballot method was utilised to select the sample. A total of 135 questionnaires were issued to educators and 121 questionnaires were returned.

A total of 3326 children attend the ECD centres and using the total population of children with a 95% confidence interval and a 5% margin of error, a minimum sample size of 384 parents/guardians of children was calculated. The parents/guardians were selected from the same schools that were randomly selected for the educators. The total questionnaires issued to parents/guardians were 616 and 385 questionnaires were returned.

The parent's questionnaires were placed in the children's school bag for parents/guardians to fill and return to the school. The educators would check each child's bag for returned questionnaires and place them in the collection box issued to each ECD centre by the researcher. Due to poor response from parents/guardians with this technique, the researcher subsequently administered questionnaires personally to parents/guardians during parents' meetings at the end of the term.

3.9 INCLUSION AND EXCLUSION CRITERIA

3.9.1 Inclusion criteria:

- all ECD centre educators in Mpumalanga Township; and
- all parents/guardians of children who are five years and under attending ECD centres in Mpumalanga Township.

3.9.2 Exclusion criteria

- ECD centres not registered with the Department of Social Development; and
- parents/guardians whose children are above five years.

3.10 RECRUITMENT OF RESEARCH PARTICIPANTS AND DATA COLLECTION

The study was presented to the ECD centres' principals and managers during their monthly meeting where all ECD centres in Mpumalanga Township meet with other stakeholders. The ECD centres were informed of the aim and objectives of the research and of the researcher's forthcoming sampling procedures.

Prospective participants who met the inclusion criteria (ECD centre educators and parents/guardians of children under five years attending the centres) were all given a Letter of Information and Consent Form (Appendix E). After receiving signed informed consent, parents/guardians of children under five years attending the ECD centres were given a self-administered questionnaire (Appendix A) to fill out. The questionnaire was in their language of choice (either English or isiZulu). Those ECD centre educators, who provided signed informed consent, were issued with a questionnaire (Appendix B) in their language of choice (either English or isiZulu).

Participants were informed to return the questionnaires to the ECD centres and place them in a sealed collection box which was left by the researcher at each centre. Completed questionnaires were collected by the researcher after a period of two weeks.

3.11 ETHICAL CONSIDERATIONS

Ethics in scientific research refers to conducting research that conforms to morally accepted norms and values (Brynard, Hanekom and Brynard 2014: 94). Gatekeeper permission was sought from the Department of Social Development (DSD). Prior to obtaining permission, the researcher was interviewed by the departmental managers. They also required an oral presentation of the study protocol.

The researcher ensured that the research was conducted in an ethically sound and acceptable manner by the following procedures:

- the research proposal was reviewed and approved by the DUT IREC (REC 133/17) (Appendix F);
- the researcher requested for gatekeepers' permission (Appendix C) and obtained gatekeepers permission from the institutional management (Appendix D);
- participation was voluntary and informed consent was obtained from all participants; and

- no names were requested on the questionnaires which were collected separately from the consent forms.

All collected data was coded, while personal details were not recorded. All collected data was securely stored in a locked cupboard accessible only to the researcher and the records will be kept for a period of five years before being shredded and disposed of appropriately. All electronic data was stored on a password protected file and will be deleted after five years.

3.12 DATA MANAGEMENT AND ANALYSIS

Data was initially captured into Microsoft Excel Software. Statistical analysis was performed using SPSS version 26.0. When the dependent variable was numerical and the independent variable(s) were nominal, then an effect size was determined using a partial eta squared value. Frequency distribution of categorical variables and means, standard deviation and ranges of continuous variables were calculated. Various graphs were used to illustrate variables. The Pearson's Chi-squared test was used where applicable for bivariate associations between categorical variables. Multivariate regression modelling was done with the inclusion of relevant covariates. Odds ratios were calculated for binary outcome variables. Confidence intervals of 95% were calculated and p values < 0.05 were considered statistically significant.

CHAPTER 4

RESULTS

4.1 INTRODUCTION

The data collection was divided into two phases, the first of which consisted of data collected from 385 parents/guardians of children attending the ECD centres in Mpumalanga Township. The second phase consisted of data collected from 121 ECD centre educators in Mpumalanga Township.

This chapter presents the descriptive statistics below. Tables and figures are used to represent the quantitative data. Inferential techniques include the use of correlations and chi square test values, which are interpreted using *p*-values.

4.2 PHASE ONE: PARENTS/GUARDIANS OF CHILDREN ATTENDING EARLY CHILDHOOD DEVELOPMENT CENTRES IN MPUMALANGA TOWNSHIP

4.2.1 Demographic data

A total of 385 parents/guardians of the children attending ECD centres, answered the questionnaire. The mean age for parents/guardians was 33.2 $\pm$ 11.0 years, where the minimum age was 16 years and the maximum age was 71 years. The age distribution of the participants is indicated in Table 4.1 below. The largest proportion of respondents were within the age category of 20 to 29 years (n=155, 41.8%), followed by 30 to 39 years (n=119, 32.1%). The age distributions are not similar as there are more respondents younger than 40 years (p<0.001).

Table 4.1 Parent /guardian age

Parent /guardian age in years	Frequency	Percent (%)
10 - 19	16	4.3
20 - 29	155	41.8
30 - 39	119	32.1
40 - 49	45	12.1
50 - 59	23	6.2
60 - 69	12	3.2
70 - 79	1	0.3

As indicated in Table 4.2, there were significantly more females than males in the sample population (p<0.001). The ratio of males to females was approximately 1:9 (10.5%: 89.5%).

Table 4.2 Parents/guardians gender

Parent/guardian gender	Frequency	Percent (%)
Female	346	89.9
Male	39	10.1

Figure 4.1 below indicates the marital status of the respondents. Nearly three-quarters of the respondents (n=282, 73.4%) were single, with approximately a fifth (n=81, 21.1%) being married (p<0.001).

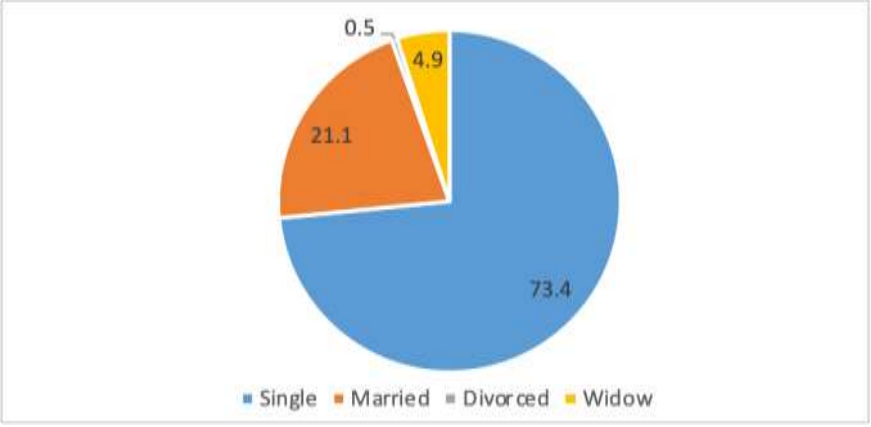

Figure 4.1 Marital status of parents/guardians

Figure 4.2 represents the parents/guardian's level of education. The level of education was significantly different across the participants (p<0.001). Half of the participants had secondary education (n=208, 54.6%) and less than a third (n=120, 31.5%) had a tertiary qualification. Some (10.5%) had only primary school education and a few (3.4%) had no education.

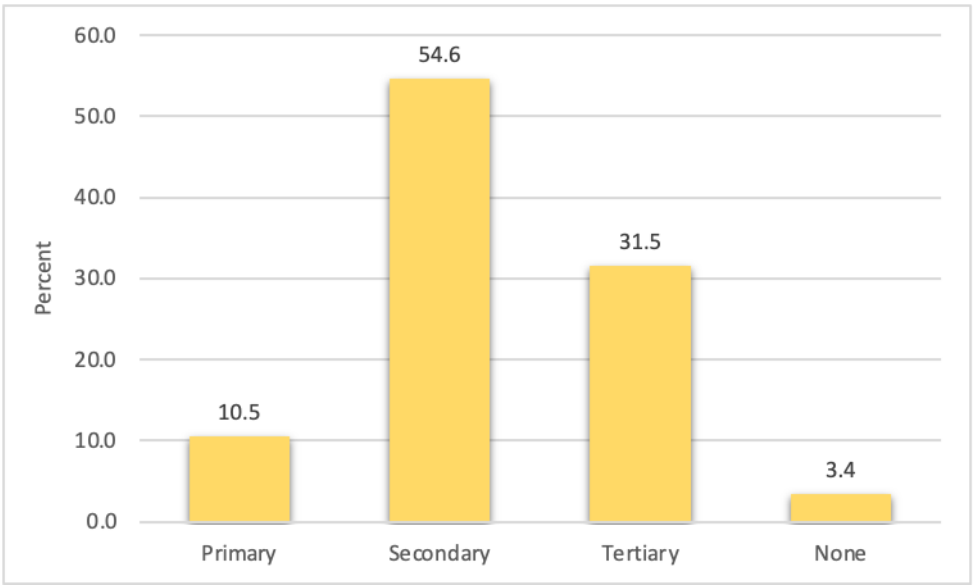

Figure 4.2 Parents/guardians level of education

Figure 4.3 below shows the occupational status of the parents/guardians. Just over half (n=201, 52.5%) were unemployed, with 44.4% (n=170) having some form of employment. A small proportion were pensioners (n=12, 3.1%; p <0.001).

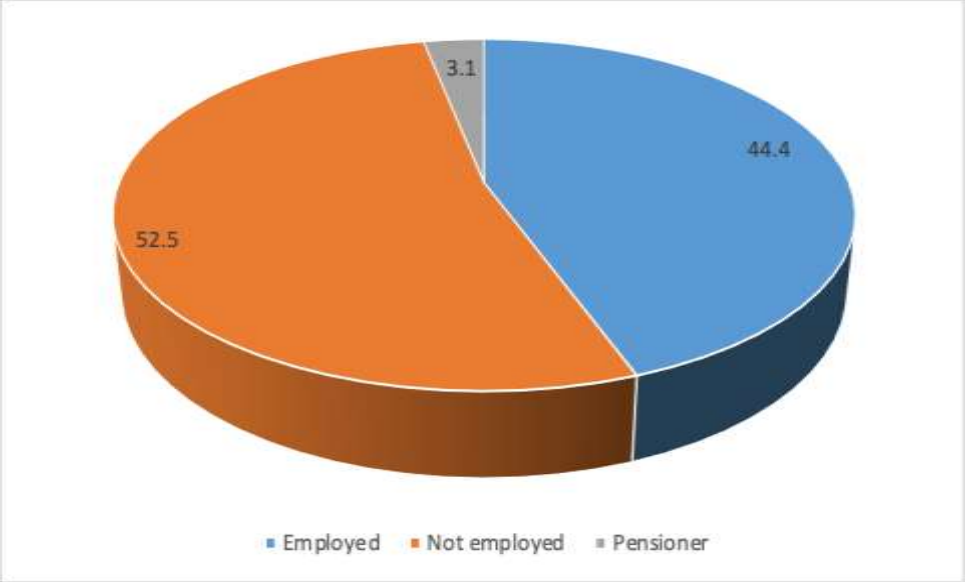

Figure 4.3 Parents/guardians occupational status

4.2.2 Household capacity

The mean number of people per household was 5.7 ± 2.2 people. It is noted that the overall pattern is similar, with slightly more males in all age categories except the three to five-year range which has slightly more females (Table 4.3). On average, there were approximately two children per household (mean=1.8, SD=1.3). Overall, there were slightly more males (n=303) than females (n=265). Most children were aged between three to five years with more females within this category.

Table 4.3 Age distribution of children (five years and under) per household

Age	Male		Female	
	Frequency	**Percent (%)**	**Frequency**	**Percent (%)**
0 - 6 months	45	11.7	32	8.3
6 - 18 months	48	12.5	34	8.8
18 months - 3 years	90	23.3	57	14.8
3 - 5 years	120	31.2	142	36.9
Total	303	78.7	265	68.8

4.2.3 Water accessibility

Table 4.4 indicated that the source of drinking water in the households were mainly from indoor taps (n=311, 80.8%). Only a few households used public taps (n=3, 0.8%) or received their water supply from a tanker (n=1, 3%, $p<0.001$).

Table 4.4 Household source of drinking water

	Frequency	Percent (%)
Indoor tap	311	80.8
Outdoor tap on premises	70	18.2
Public tap	3	0.8
Tanker-truck, vendor	1	0.3

Table 4.5 below reveals that the source of water of most households were on the premises (n=370, 96.1%) and twelve households (3.2%) had to travel less than 500m for water. Less than one percent (n=2, 0.5% and n=1, 0.3%) of households had to travel more than 500 m.

As most of the homes had either indoor taps or an outdoor tap on the premises, it is not surprising that 96% of the respondents indicated that the water source was on the premises.

Those respondents who did not have the source of water on the premises indicated that it took less than five minutes for them fetch water, as the source was less than 500 m away from the home.

Table 4.5 Distance of water source from household

	Frequency	Percent (%)
On premises	370	96.1
< 500 m	12	3.1
500 m – 1 km	2	0.5
More than 1 km	1	0.3

4.2.4 Sanitation

A majority of the parents/guardians (n=333, 86.5%) indicated that the toilet was located indoors, 45 parents/guardians (11.7%) had toilets within the yard, and only four households (1%) had to use a community toilet outside their yard (p<0.001; Table 4.6).

Table 4.6 Location of household toilet

	Frequency	**Percent (%)**
Indoors	333	86.5
Within the yard	45	11.7
Outside the yard / Community toilet	4	1.0
Missing system	3	0.8
Total	385	100.0

Most respondents (n=350, 90.9%) indicated that the household had a flushing toilet (p<0.001) and only 7.8% (n=30) had pit latrines (Table 4.7).

Table 4.7 Type of toilet facility used in the household

	Frequency	**Percent (%)**
Flushing toilet	350	90.9
Pit latrine	30	7.8
Portable toilet	2	0.5
Missing system	3	0.8
Total	385	100.0

The toilets that were found indoors had a sink next to it, as indicated by the majority (n=323, 83.9%) of respondents in Table 4.8. Only five respondents (1.3%) indicated that there was no sink but used a dish to wash their hands.

Table 4.8 Distance of the handwashing sink from the toilet

	Frequency	**Percent (%)**
Next to the toilet	323	83.9
Outside toilet but in the dwelling	33	8.6
Within the yard	16	4.2
Other (No tap; No sink-used a dish)	5	1.3
Missing system	8	2.1
Total	385	100

4.2.5 Hygiene practices of parents/guardians

4.2.5.1 Frequency of handwashing

Figure 4.4 below indicates that 96.3% (n=368) of parents/guardians always washed their hands after defecating and 71.6% (n=270) always washed their hands after urinating. Most parents/guardians (n=354, 93.2 %) washed their hands after handling a child's faeces and 95.5% (n=359) washed their hands before preparing food.

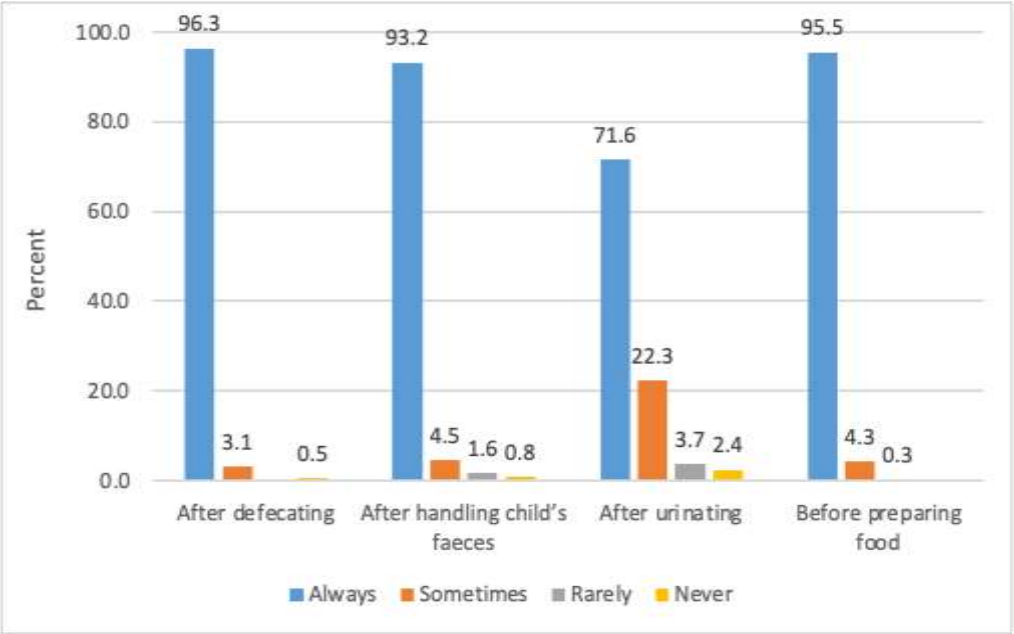

Figure 4.4 Handwashing practices of parents/guardians

Chi square tests indicated that the frequency of handwashing after defecating was associated with the source of water (p<0.001) as handwashing decreased when the water source was further away from the house. Those respondents who had an indoor tap washed their hands more often after defecating (n=307, 85%) than those with outdoor tap in premised (n=51, 14.1%) and public tap (n=3, 0.8%). There was also an association between the frequency of handwashing after defecating with the distance of the water source (p=0.012). The respondents whose source of water was on the premises washed their hands more frequently after defecating (n=354, 96.5%) than those who had to walk <500 metres (n=11, 3.0%) and up to 1km distance (n=2, 0.5%). The respondents who had a handwashing sink next to the toilet washed their hands more frequently after defecating (n=320, 87.9%) than those whose handwashing sink was within the house but some distance away from the toilet. (p<0.001).

Similarly, more parents/guardians washed their hands after handling child's faeces when the water source was indoors and less frequently when the further the source of water was from the household (p=0.011). Handwashing after

handling a child's faeces was also associated with the distance of the handwashing sink from the toilet (p=0.011).

Parents/guardians washed their hands more frequently before preparing food when they had an indoor tap (n=296, 84.3%) compared to those who had an outdoor tap in premises (n=52, 14.8%) and public tap (n=3, 0.9%). Furthermore, respondents who had a handwashing sink next to the toilet washed their hands more often before preparing food then those whose handwashing sink was further away (n=344, 96.1%). There was therefore a correlation of parents/guardians handwashing frequency before preparing food (p=0.010) and the distance of the handwashing sink (p<0.001) but no association was observed with the distance of the water source (p=0.098). The frequency of handwashing of parents/guardians after urinating was not associated with the source of drinking water (p=0.094), the distance of the water source (p=0.061), or the distance of handwashing sink from the toilet (p=0.864).

4.2.5.2 Handwashing methods

As indicated in Figure 4.5, three quarters of the respondents (n=280, 74.7%) indicated that they always used soap and water when they washed their hands, with approximately a fifth (n=72, 19.2%) indicating that they used water only (p<0.001). When asked whether the parents/guardian experienced any challenges when washing hands, while significantly more respondents (n=272, 73.1%) indicated that they did not experience challenges (p<0.001). A quarter (n=100, 26.9%) indicated that they did experience challenges and those were mainly the unavailability of soap (n=64, 63.4%) and inadequate water supply (n=23, 22.8%).

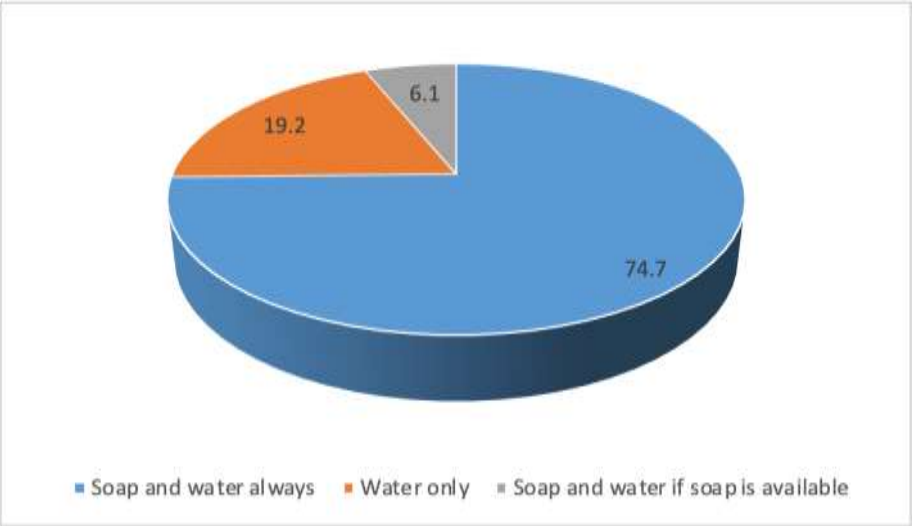

Figure 4.5 Parents/guardians method of washing hands

4.2.6 Prevalence of diarrhoea episodes in children under the age of five years

On average, at least one child under the age of five years had diarrhoea in the last 12 months.

Table 4.9 Children under the age of five years who had diarrhoea in the last 12 months

	N	**Mean ± SD from all children under**	**Range**
Children who had diarrhoea in the last 12 months	231	1.23 ± 0.53	1.0 - 5.0

The effect size of the total number of people within the household on diarrhoea was low (partial eta squared value, $\eta 2$=0.002, p=0.389). This implies that there was little or no effect of the total number of people in the house to the child having diarrhoea. However, there was a small to medium effect of the number of children in the house to a child having diarrhoea (partial eta squared value,

η2=0.036, *p*=0.000), showing that children are more likely to get diarrhoea from other children, compared to adults.

There was a significant association of children having diarrhoea with the location of the household toilet (*p*<0.001) and the type of household toilet (*p*<0.000). Forty-three percent of children whose households had indoor toilets (OR=1.2, 95%CI) had diarrhoea and 19.5% children whose household had toilets within the yard (OR=0.9, 95%CI) had diarrhoea. Four of the children with toilets located outside the yard all had diarrhoea.

There was little to no effect of the location of the toilet to the child having diarrhoea (partial eta squared value; *η2*=0.009, *p*<0.001) and a small to medium effect of type of household toilet (partial eta squared value; *η2*=0.062, *p*<0.000).

The method of parents/guardians washing their hands was not associated with the child getting diarrhoea (*p*=0.621). The type of toilet in the household was also associated with how many children under the age of five had diarrhoea (*p*=0.010). The odds of using a flushing toilet were 1.239 times that of using a portable toilet for a child having had diarrhoea in the past 12 months (OR=1.239, 95%CI=0.063-24.46, *p*=0.888). The way in which parents/guardians wash their hands was 1.239 times likely to contribute to number of children under the age of five getting infected with diarrhoea (OR=1.239, 95%CI=0.512-3.0, *p*=0.634).

4.2.7 Symptoms of the diarrhoea

As indicated in Table 4.10, only 165 (42.9%) parents/guardians responded to the questions regarding symptoms associated with diarrhoea. This could possibly be due to the parents/guardians not paying particular attention to the type of diarrhoea with which the child was infected. The participants responded to the symptoms of watery stool with mucus 57.6% (n=95); watery stool with fever 18.2% (n=30); and watery stool with blood 20% (n=33). Households with

pit latrines had more incidence of diarrhoea with watery stools (n=11, 91.7%) compared to those with a flushing toilet (n=84, 55.3%). The symptoms of diarrhoea were therefore associated with the type of toilet facility in the household (p=0.014). However, hand washing was associated with the symptoms of diarrhoea (p=0.001), but not associated with the toilet location (p=0.089). Parents/guardians who washed their hands with soap and water mostly reported watery stools as symptoms of diarrhoea (n=81, 65.9%). Watery stools with blood were reported by few parents/guardians who only washed their hands when soap is available (n=4, 36.4%). Watery stools with fever were mostly reported by parents/guardians who washed their hands with water only (n=13, 44.8%).

Table 4.10 Symptoms of the diarrhoea

	Frequency	**Percent (%)**
Watery stool with mucus	95	57.6
Watery stool with mucus or blood	3	1.8
Watery stool with blood	30	18.2
Watery stool with blood and fever	1	0.6
Watery stool with fever	33	20.0
Watery stool with mucus, blood and fever	3	1.8
Total	165	

4.2.8 Management of diarrhoea

Most of the parents/guardians (n=189) reported that they sought medical care during the child's last diarrhoea episode (p<0.001). Education was a significant factor in parents/guardians seeking medical care (p=0.001). Parents/guardians who had a tertiary qualification sought medical care more frequently than those with lower levels of education. Parents/guardians with a tertiary education were five times more likely to seek medical care than those with a primary education

(OR=5.201, 95%CI=1.48-18.28, *p*=0.010). Although not significant, parents/guardians with a secondary education were 2.276 times more likely to seek medical care than those with primary education (OR=2.276, 95%CI=0.808 to 6.415, *p*=0.120). Seeking medical care was not associated with the age of the parents/guardians (*p*=0.160).

Table 4.11 below indicates that 74.3% (n=139) of parents/guardians who sought medical care went to a clinic.

Table 4.11 Facilities where medical care was sought

	Frequency	**Percent (%)**
Clinic	139	74.3
Clinic and Private Doctor	6	3.2
Private doctor	27	14.4
Traditional healer	14	7.5
Other	1	0.5

Most of those parents/guardians who had a secondary level education sought medical care from a clinic. However, parents/guardians who had a tertiary education reported seeking medical care either from both the clinic and a private doctor (8.6%) or only from a private doctor. Traditional healers were consulted mostly by the respondents with no education (25.0%) and those with only primary school education (22.2%). Parents/guardians level of education was therefore associated with the type of medical care facility sought (*p*=0.024).

Table 4.12 indicates the reasons for parents not seeking medical care when the child presented with diarrhoea. A majority of parents/guardians who did not seek medical care reported that they did not have money to seek medical care (n=19, 55.9%), while some (n=8, 23.5%) thought that it was unnecessary.

Table 4.12 Reason for not seeking medical care

	Frequency	Percent (%)
The clinic/doctor was too far away from home	4	11.8
Did not have money to seek medical care	19	55.9
Did not have money for transport to go to the health care centre	3	8.8
Thought it was unnecessary	8	23.5

Table 4.13 below indicates the parent's/guardians management of diarrhoea during the last diarrhoea episode. There were 158 (76.7%) respondents who indicated that they only administered oral rehydration solution (ORS) and 17.9% (n=37) zinc tablets, syrup or ORS. Parents/guardians with primary education mostly administered oral rehydration solution (n=14, 56.0%), which was slightly more compared to parents/guardians with other levels of education. The majority of parents/guardians that administered homemade oral rehydration solution had primary education (n=5, 20.0%) and secondary education (n=21, 19.3%). The administering of ORS by parents/guardians was therefore associated with their level of education (p<0.001), but was not associated with their age (p=0.206).

Table 4.13 Treatment given at the last diarrhoea episode

	Frequency	Percent (%)
Oral rehydration solution made from a packet	123	59.7
Oral rehydration solution made from a packet and prepared at home or zinc tablets or syrup	22	10.7
Zinc tablets or syrup	15	7.2

Homemade oral rehydration solution	35	17.0
Nothing	11	5.3
Total	206	

The majority of parents/guardians (74.4%) reported that they knew how to correctly prepare an oral rehydrate solution. There was no significant correlation between parent's/guardians' gender (p = 0.076), age (p=0.059) and level of education (p = 0.767) with whether they stated that they knew how to correctly prepare an oral rehydrate solution. Furthermore, the respondents who reported knowing how to prepare the ORS were asked to describe its preparation method. Only half (n=156, 52.9%) were able correctly describe composition of the ORS (Table 4.14).

Table 4.14 below reflects parents/guardians knowledge of preparing oral rehydration solution. Over a half of the respondents (n=156, 52.9%) knew how to correctly prepare ORS.

Table 4.14 Knowledge of preparing the oral rehydration solution

	Frequency	**Percent (%)**
Respondents that did not say how	60	20.3
Respondents that gave the correct ingredients and method of preparation (1 litre of boiling water, 1/2 teaspoon (tsp) of salt, 8 tsp of sugar)	156	52.9
Respondents that had a general idea but provided incorrect amounts of ingredients	79	26.8

4.2.9 Disposal of child's stools

Half of the respondents (n=185, 51.1%) indicated that their children were dependent on their parents (nappies and help in the toilet), with 43.1% (n=156) indicating that their children could manage on their own (p<0.001).

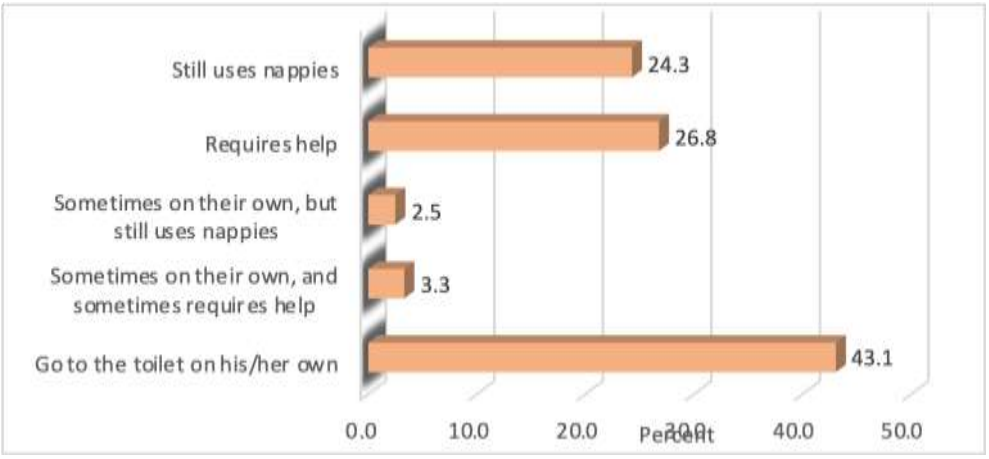

Figure 4.6 Number of children using the toilet on their own, requiring help or using nappies

Table 4.15 below indicates that a large number of respondents reported that their child used the toilet (n=210, 62.9%), with a further 22.8% (n=76) disposing of the waste in the garbage (p<0.001).

Table 4.15 Disposal of child's stools

	Frequency	**Percent (%)**
Child used toilet/latrine	210	62.9
Thrown into garbage (solid waste)	76	22.8
Put/rinsed into the toilet/latrine	19	5.7
Left in the open	12	3.6
Disposed of using the toilet or garbage	11	3.3
Buried	3	0.9

Put/rinsed into drain or ditch	2	0.6
Child used toilet/latrine or dispose in the toilet or garbage	1	0.3

4.2.10 Immunisation

A little more than two-thirds of the sample (n=260, 69.3%) had received rotavirus immunisation (p<0.001). Less than a quarter (n=79, 21.1%) of the respondents indicated that they did not know whether their child received rotavirus immunisation and 9.6% (n=36) said their child did not receive this vaccine. Of those parents/guardians whose child received rotavirus immunisation, 46.4% (n=111) reported that their child had diarrhoea in the last twelve months, and 53.6% (n=128) reported no diarrhoeal incidence. Parents/guardians whose child had rotavirus immunisation had mostly watery stool with mucus 65.9% (n=83), 17.5% (n=22) had dysentery, and 13.5% (n=17) had watery stools with fever. All the children who were reported as not receiving rotavirus immunisation had watery stools with mucus. Watery stool with fever were mostly reported by parents/guardians who reported not to know whether the child had received rotavirus immunisation (n=16, 45.7%). There were a significantly higher odd for receiving the vaccine (OR=8.4, 95%CI=3.043-23.19, p=0.001) compared to those who was not immunised. Almost a third (n=111, 32.6%) of respondents, who indicated their child had received rotavirus immunisation experienced diarrhoeal episodes with most reporting watery stools with mucus (n=83, 87.4%).

4.2.10 Washing of child's hands

Figure 4.7 depicts the percentage of parents/guardians washing their children's hands after specific activities. The majority of parents/guardians reported that they always washed their children's hands after defecating (n=331, 87.3%) and before handling and eating food (n=340, 89.5%). However, only half of the respondents reported always washing their child's hands after urinating (n=211,

55.7%). Parents/guardians were less likely to wash their hands after assisting a child who goes to the toilet on their own compared to a child who uses nappies (*p*=0.065).

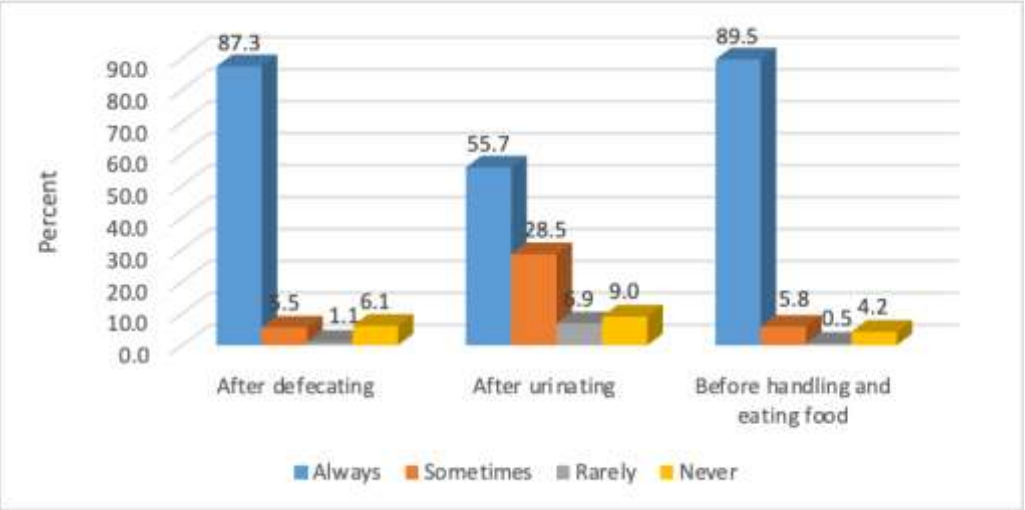

Figure 4.7 Frequency of hand washing after specific activities

4.3 PHASE TWO: EARLY CHILDHOOD DEVELOPMENT CENTRE EDUCATORS IN MPUMALANGA TOWNSHIP

A total 121 educators and 388 parents/guardians from the ten out of 41 ECD centres in Mpumalanga Township formed part of the study. The combined data for all the centres is presented below.

4.3.1 Biographical data

Age distribution of children in the Early Childhood Development (ECD) centres is illustrated in Figure 4.8.

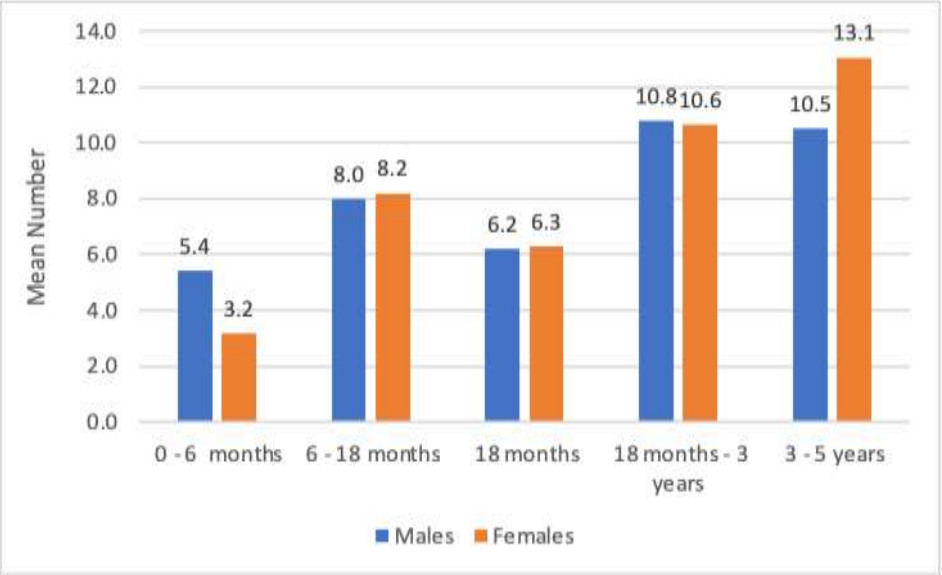

Figure 4.8 Age distribution of children at the ECD centres in Mpumalanga Township

Overall, the sampled population revealed an equal number of male and female children that attended the ECD centres (n=171 and n=172 respectively). There were slightly more males in the age category 0-6 months (mean=5.4 ± 2.97) compared to females in the same age category.

Educators level of education and training

Educators on average, had four years of experience teaching at ECD centres (mean = 4.6 ± 2.77 years).

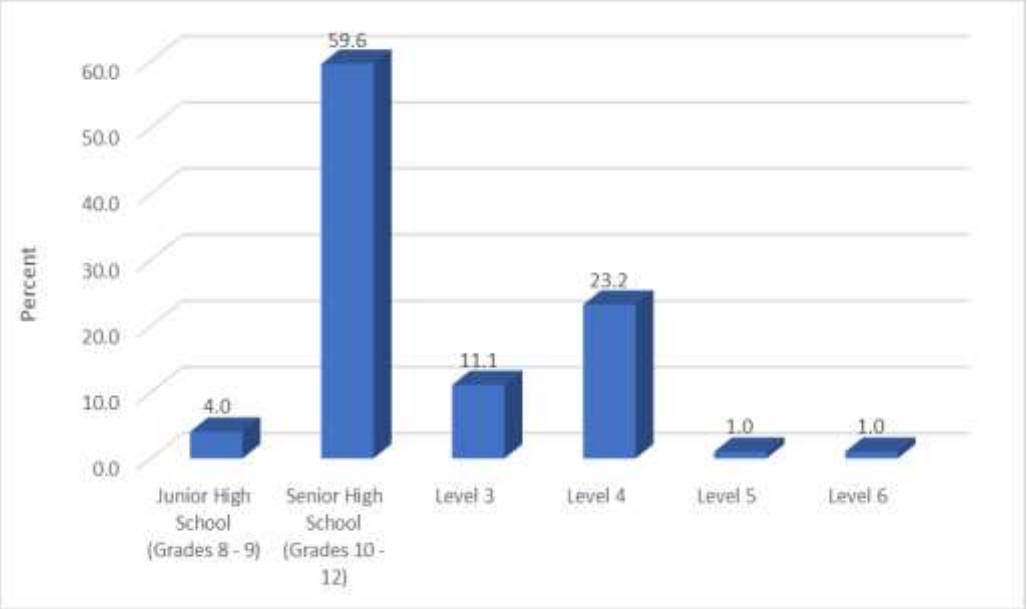

Figure 4.9 Level of education of ECD centre educators.

The minimum qualification of an Early Childhood Development educator is an NQF Level 1 Basic Certificate in Early Childhood Development from the South African Qualifications. NQF Level 3 refers to a Grade 11 or National vocational certificate Level 3, NQF Level 4 is a National Certificate in Early Childhood Development, NQF Level 5 is a Higher Certificate in Early Childhood Care and Education and Level 6 is the Advanced Certificate in Early Childhood Care and Education. As illustrated in Figure 4.9, the majority of educators only had senior high school education (n=59, 59.6%), and 23.2% (n=23) had an NQF Level 4 qualification, while 4% (n=4) of educators had not completed their high school. Children being taught the importance of hand washing was not associated with the level of training of ECD educators (p=1.000).

Table 4.16 below indicates that ECD centres had an average of four educators (mean=3.8 ± 1.3), between 0 to 2 cleaners and between 0-1 gardeners. Six (14.3%) ECD centres did not have a cleaner and 12 (10.3%) ECD centres did not have a gardener. Each ECD centre had at least one volunteer and one cook.

Table 4.16 ECD centres staff categories

	N	**Mean ± SD from all ECD centres**	**Range**
Educator	120	3.8 ± 1.3	1.0 - 7.0
Cleaner	42	0.9 ± 0.5	0.0 - 2.0
Cook	119	1.1 ± 0.4	1.0 - 3.0
Gardener	117	0.9 ± 0.3	0.0 – 1.0
Volunteer	47	1.4 ± 0.7	0.0 – 4.0

Almost all ECD educators (n=117, 99.2%) indicated that their centre had a governing committee and comprised 96.7% (n=117) of parents of children attending the centre. The majority of ECD centres (n=98, 81%) in Mpumalanga Township were registered as non-profit organisation (NPO) (Figure 4.10). Some (ECD centres n=22, 18.2%) were not registered at all, and 0.8% (n=1) had ECD Partial Care registration.

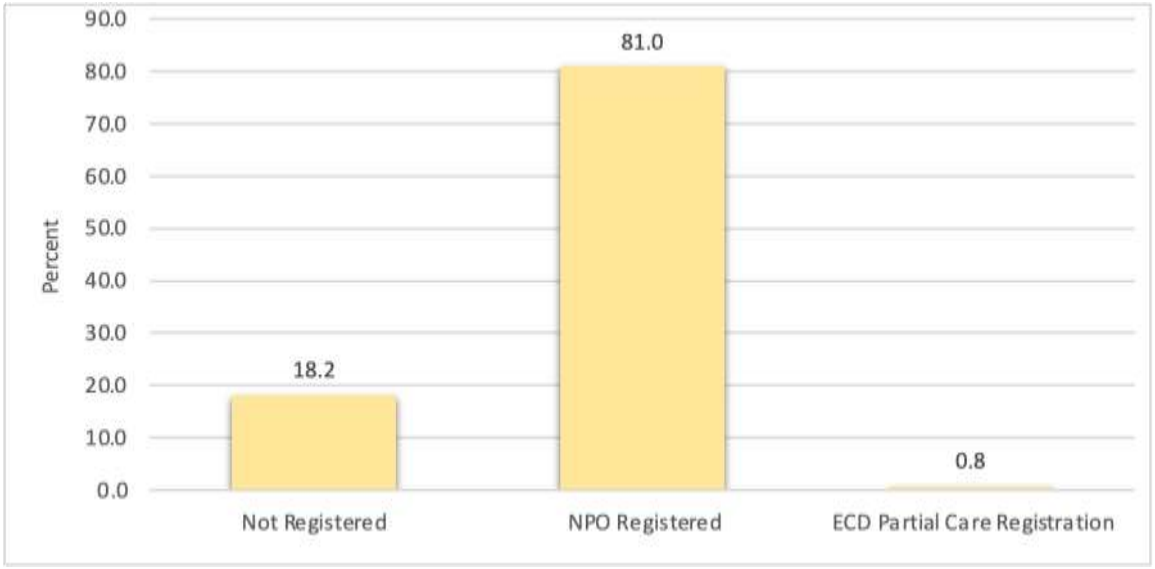

Figure 4.10 Early Childhood Development centre registration with the Department of Social Development

4.3.2 Water accessibility

Figure 4.11 indicates that 90.1% (n=109) of ECD educators reported that their centres had indoor taps and 1.7% (n=2) had outdoor taps on the premises. All ECD educators reported having the water source on the premises (n=121).

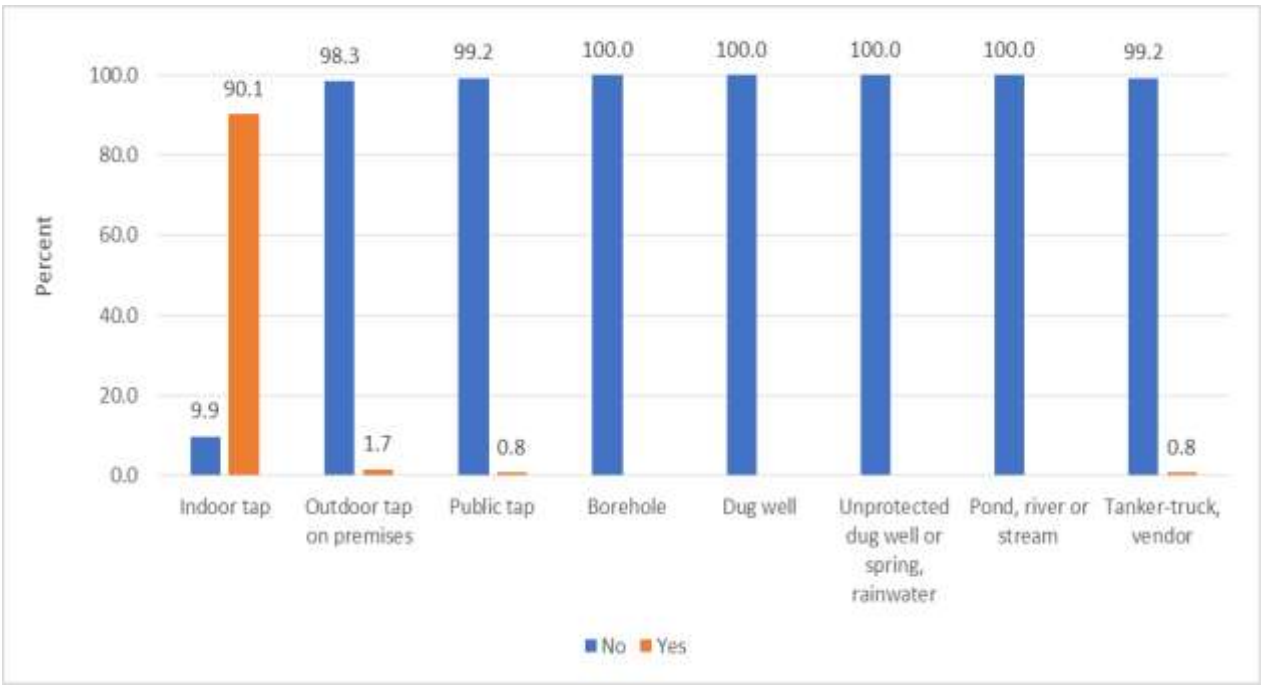

Figure 4.11 Source of water at the Early Childhood Development centres

4.3.3 Sanitation

The majority of ECD Centres had indoor toilets (n=105, 86.8%) and 16 (13.2%) had the toilet within the yard (Table 4.17). All ECD centres had flushing toilets.

Table 4.17 Location of the toilets at the centre

	Frequency	Percent (%)
Indoors	105	86.8
Within the yard	16	13.2

Most Early Childhood Development Centres had a handwashing sink next to the toilet (n=108, 89.3%) and only 13 (10.7%) had the handwashing sink outside the toilet but in the dwelling (Table 4.18).

Table 4.18 Distance of handwashing sink from the toilet

	Frequency	Percent (%)
Next to the toilet	108	89.3
Outside toilet but in the dwelling	13	10.7

4.3.4 Hygiene practices of ECD educators.

A majority of educators reported having received formal training on hand hygiene (n=115, 95%), while 5% did not receive any formal training. Hand hygiene training (n=115, 95%) was predominantly provided by the Department of Health and 0.8% (n=1) reported having received training from the Department of Social Development.

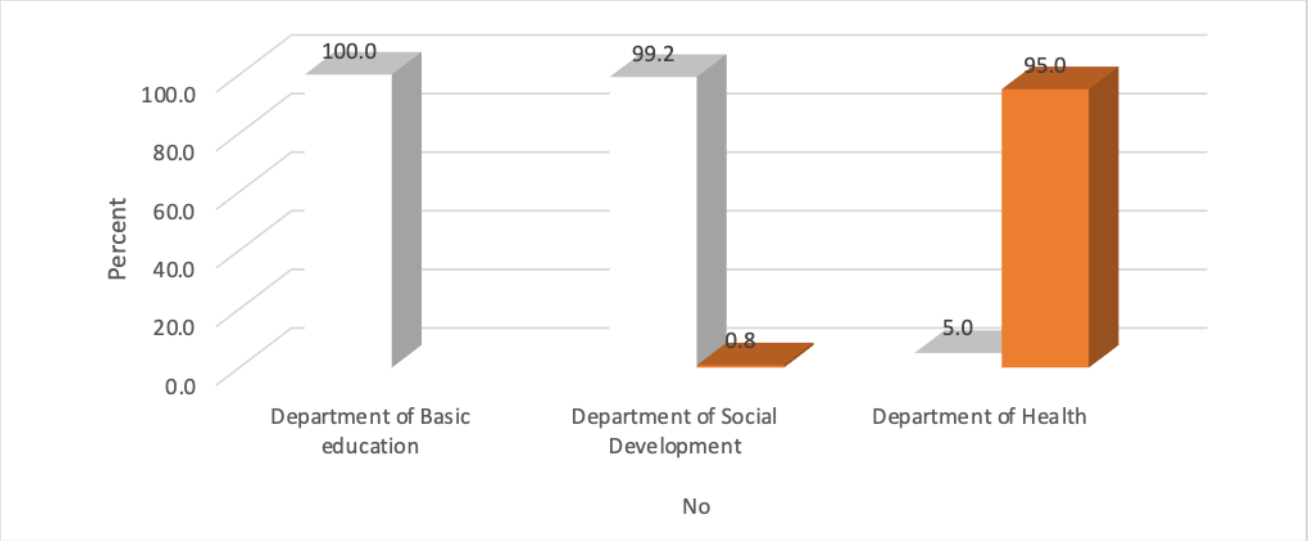

Figure 4.12 Provider of formal training in hand hygiene

4.3.5 Food provisions

All respondents reported that the ECD centre provided and prepared meals for children. Three-quarters (76.9%) respondents indicated that the ECD centre prepared two meals and 23.1% (n=28) provided more than two meals. Most of the ECD centres sourced food items from their own food garden initiatives.

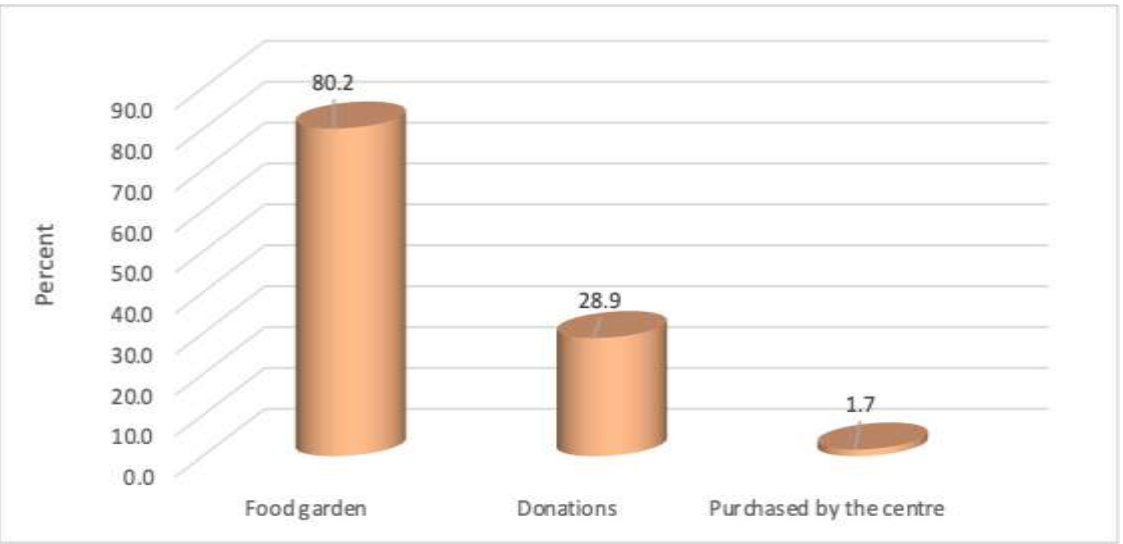

Figure 4.13 Source of food supply

4.3.6 Immunisation

All respondents indicated that all the children attending the ECD centres had a Road to Health card.

4.3.7 Incidents of diarrhoea

More than half of the respondents (n=73, 61.9%) indicated that a child had come to school while having diarrhoea. Children were less likely to come to school with diarrhoea when the ECD centre provided two meals a day compared to those that provided more than two meals a day (OR=0.288, 95%CI=0.116-0.711, *p*=0.011) but was not associated with the source of water at the centre (*p*=0.369). The majority of respondents (n=118, 97.5%) reported that children are assisted in the ECD centres when going to the toilet.

4.3.8 Washing of child's hands

The majority of the respondents (n=110, 90.9%) indicated that hand hygiene was of very high importance in their ECD centre. All the respondents indicated that children were taught the importance of hand washing and the children always used soap and water when washing hands. There was no association between ECD educators' level of training to children being taught the importance of hand washing (*p*=1.000).

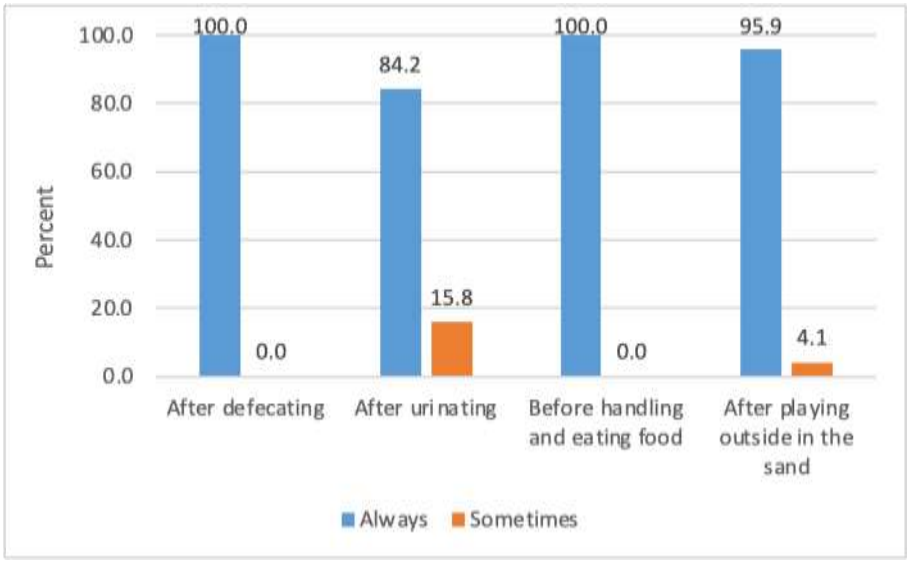

Figure 4.14 Frequency of hand washing after specific activities

All respondents reported always washing the child's hands after defecating and before handling and eating food. Most (n=115, 95.9%) washed the child's hands

after playing outside in the sand, and 84.2% (n=101) washed the child's hands after urinating. Educators were less likely to wash the children's hands after urinating than any activity (p=0.003).

The majority of respondents (n=81, 66.9%) indicated that inadequate water supply was a major challenge for handwashing, followed by a combination of inadequate water supply, and soap not being available (n=15, 12.4%). Ten (8.3%) respondents reported that children could not wash their hands properly (Table 4.19).

Table 4.19 Challenges experienced when washing hands

	Frequency	**Percent (%)**
Inadequate water supply	81	66.9
Inadequate water supply + Soap not available	15	12.4
Soap not available	5	4.1
Some children cannot wash hands properly	10	8.3
Some children need assistance	8	6.6
Missing data	2	1.7

4.4 CONCLUSION

The results have shown that diarrhoea was prevalent in children five years and under who attended Early Childhood Development centres in Mpumalanga Township. There was adequate sanitation in the households to facilitate good personal hygiene, and knowledge of administering oral rehydration therapy of parents/guardians was high.

CHAPTER 5

DISCUSSION

5.1 INTRODUCTION

This chapter discusses the study findings which are reported in the previous chapter. Literature is used to compare this study results to those conducted by previous authors.

5.2 PREVALENCE OF DIARRHOEA

The mean number of children under five years who had diarrhoea in the 12 months preceding this study was 1.23 (SD=0.53) although 69.3% (n=260) of children were reported to have received rotavirus immunisation. The WHO estimates childhood diarrhoeal disease cases to be nearly 1.7 billion per year globally (WHO 2017), and that in KwaZulu-Natal, diarrhoea is the main cause of morbidity and mortality 16 (Department of Health Province of KwaZulu-Natal 2016: 47-48). These estimates were translated to the outcome of this study where all children have had diarrhoea at some point 12 months prior to the commencement of this study. The ECD centre educators also indicated that more than 60% of children came to school while having diarrhoea. The ECD policy states that ECD staff ought to be regular trained in childhood illnesses, infections, and notifiable diseases (Department of Social Development 2006: 42). They should learn how illnesses are spread, and how to prevent this in the centre (Department of Social Development 2006: 43). If a child is ill, they should notify parents immediately and facilitate for the child to rest away from other children (Department of Social Development 2006: 42).

5.2.1 Symptoms of diarrhoea

More than half of those parents/guardians who reported the symptoms of the child's diarrhoea, mentioned that the stools were watery. Rotavirus and *cryptosporidium* infections are the main causes of acute watery diarrhoea (WHO 2005: 4). More than two-thirds of parents/guardians indicated that their child had

received the rotavirus immunisation, as rotavirus immunisation is part of the Expanded Programme on Immunisation (EPI) in South Africa, and is administered in children before the age of 20 weeks (Department of Health 2016: 316). *Cryptosporidium* infection is therefore the most likely cause of the watery diarrhoea in this population. However, this can only be verified by laboratory tests, which were not conducted. Previous studies have suggested that living in poverty increased the risk of *cryptosporidium* infections due to overcrowding and inadequate sanitation (Murugesan, Ganesan and Ajjampur 2017: 24). Overcrowding increases the chance of contact with pathogens (Godana and Mengistie 2013: 2337); especially where hygiene practices are limited due to inadequate supply of water, and adequate sanitation. The sample was drawn from a poverty stricken area where the majority of parents/guardians were unemployed.

5.2.2 Overcrowding

Although the total number of people living in the household did not affect the incidence of diarrhoea, the incidence was higher in those homes that had more children under the age of five years. Numerous studies have reported similar findings regarding the presence of young siblings in the household. A study in India reported that households with siblings under the age of five years had a higher incidence and duration of diarrhoea (Kattula *et al.* 2015: 3044). Another study in Ethiopia reported the occurrence of acute childhood diarrhoea was associated with the number of children under the age of five in the household (Godana and Mengistie 2013: 2332). In Iceland, younger siblings also increased the risk of diarrhoea independent of attendance at preschools (Gudnason *et al.* 2012: 155). Increased number of children in the family results in overcrowding, which adversely affects hygiene conditions and increases the chance of contact with pathogens when the children interact (Godana and Mengistie 2013: 2332). The mother might also be overwhelmed by the little children competing for attention (Godana and Mengistie 2013: 2332) thereby neglecting to practice adequate hygiene.

5.3 SANITATION

5.3.1 Infrastructure

The results indicated that 91.6% (n=350) of parents/guardians had flushing toilets and all the ECD centres had flushing toilets. The majority of parents/guardians (n=333; 87.2%) and ECD educators (n=105; 86.8%) reported that their toilets were indoors. This study found that childhood diarrhoea was associated with the type of toilet (p<0.001), but not with the location of the toilet (p<0.000). Those households with pit latrines had a higher incidence of diarrhoea with watery stools, compared to those with flushing toilets. High incidences of diarrhoea were associated with open defecation, where defecation was done in bushes and near the river banks (Demberere *et al.* 2016: 121). A similar study in Ethiopia found that children from homes without any type of toilet and defecting in the open field were more likely to have diarrhoea than children whose families had a toilet (Bitew, Woldu and Gizaw 2017: 4). Another study in India found that lack of toilets resulted in unsafe disposal of stools thereby increasing the risk of exposure to diarrhoeal causing pathogens (Bawankule *et al.* 2017: 3).

5.3.2 Disposal of stools

The data revealed that over 60% (n=210) of parents/guardians said their child uses the toilet and 22.8% (n=76) had children who used nappies, thereby disposing the stools in the municipal collected waste. Only 0.9% (n=3) of parents said they buried the stools and 3.6% (n=12) said they left the child's stools in the open. Children whose stools were disposed of unsafely were more likely to suffer from diarrhoea than children whose stools were disposed of safely (Bawankule *et al.* 2017: 7). This was also reported by Demberere *et al.* (2016: 121), where the disposal of children's stools was associated with the high childhood diarrhoea in the Mawabeni, South Africa.

5.3.3 Water accessibility

Drinking water was easily accessible in this study population. The majority of households have indoor taps (n=311, 80.8%) and an outdoor tap on the premises (n=70, 18.2%). Early Childhood Development centres also reported that their source of water was indoor taps (n=109 90.1%). This was in line with WHO standard of 30 minutes round trip to collect water (Demberere *et al.* 2016: 121). Mothers who took more than 30 minutes to collect water used it sparingly, which meant that the cleaning of toilets and having handwashing facilities were considered a waste of water (Demberere *et al.* 2016: 121). Long-time taken to collect water compromises hygiene practices, resulting in high diarrhoeal incidences (Demberere *et al.* 2016: 121).

5.3.4 Frequency of handwashing

The data reports that 41.5% (n=148) parents/guardians washed their hands after assisting a child who goes to the toilet, and 22.4% (n=80) washed their hands after changing the child's nappies. A study in the Eastern Cape, South Africa reported similar results of low handwashing of mothers after changing nappies, which was associated with the lack of hand washing facilities next to the toilet (Demberere *et al.* 2016: 124).This finding is consistent with a study in Nigeria, where Dairo, Ibrahim and Salawu (2017: 112) observed that mothers

sometimes or never washed their hands after cleaning a child's bottom. This study indicated that parents/guardians washed their hands more frequently when the source of water was on the premises than further away from the house. Approximately 85% (n=307) of parents/guardians washed their hands more frequently after defecating when there was an indoor tap. Furthermore, parents/guardians who had handwashing sinks closer to the toilet washed their hands more frequently compared to those with handwashing sinks furthest (*p*=0.000). These results were similar to a study conducted by (Biran *et al.* 2009: 1311), who observed handwashing practiced in households having a closer and more convenient water source.

All ECD educators reported always washing the children's hands after defecating and before handling and eating food, and 95.9% (n=115) washed the children's hands after playing outside. Approximately 87.3% (n=331) of parents/guardians washed their children's hands after defecting and 89.5% (n=340) before handling and eating food. This validates the observation made by Islam *et al.* (2018: 9) in their study that adults who prioritised good hygiene practices behave similarly with their children.

The results indicated that 55.7% (n=211) of parents/guardians always washed the child's hands after urinating, compared to the 87.3% (n=331) who always washed the child's hands after defecating and the 89.5% (n=340) before handling and eating food. Early childhood development centre educators also revealed a slightly lower (n=101, 84.2%) facilitation of handwashing of a child's hands after urinating compared to after defecating (n=120, 100%), before handling and eating food (n=120, 100%) and after playing outside in the sand (n=116, 95.9%). The respondents were therefore not washing a child's hands after urinating.

5.3.5 Handwashing methods

Over three quarters of parents/guardians (n=280, 74.7%) indicated that they always used soap and water when washing their hands. This finding differed from a study in the Eastern Cape, South Africa, which reported less than a

quarter of mothers who washed their hands with soap and water after defecating (Demberere *et al.* 2016: 123). Washing hands with soap and water is effective in preventing diseases, because the soap breaks down grease and dirt that carry pathogens (Demberere *et al.* 2016: 123). A study in Kenya found that the presence of soap in the household was associated with fewer days of diarrhoea (Kamm *et al.* 2014: 402). Similarly, Gebru, Taha and Kassahun (2014: 399) also found that children whose mothers did not practice handwashing with soap at critical were more likely to develop diarrhoea. This study found no association of the method of handwashing of parents/guardians with the child having diarrhoea (p=0.621), but found an association of method of handwashing hands with the symptoms of diarrhoea in children (p<0.001). Children whose parents/guardians washed their hands with soap and water had incidents of having watery stools with blood (n=21, 17.1%) and watery stools with fever (n=17, 13.8%) compared to their counterparts. Parents/guardians who mostly washed their hands with water only observed the child's diarrhoea to be mostly watery stools with fever (n=13, 44.8%), compared to watery stools with mucus (n=10, 34.5%). Similarly, children whose parents/guardians washed hands with soap and water only when available had mostly water stools with blood (n=4, 36.4%), and water stools with fever (n=3, 27.3%). Overall, the results of this study indicate that handwashing at critical time, which included prior to eating, after defecation, before preparing food, and after handling child's stools (Demberere *et al.* 2016: 123), was done in the study population.

5.4 MANAGEMENT OF DIARRHOEA

5.4.1 Seeking medical care

Of the 84.8% (n=189) of parents/guardians who reported seeking medical care during their child's last diarrhoeal episode, 90.6% (n=58) had a tertiary qualification. The study found that parents/guardians with a tertiary qualification were five times more likely to seek medical care than parents/guardians with a primary education education (OR=5.201, 95%CI=1.48-18.28, p=0.010). A similar finding was reported by Onwukwe, Van Deventer and Omole (2016: 44) in their study, where the level of education of caregivers had a significant

association with how they managed diarrhoea. Furthermore, parents/guardians who had tertiary education sought medical care from private doctors, whilst medical care from a clinic was mostly sought by parents/guardians with only a secondary education. Treatment from a traditional healer was mostly sought by parents/guardians, with the primary schools education and those without any education. Other studies have found that mothers above the age of twenty-five years were more likely to know how to manage diarrhoea at home using ORT than younger mothers (Desta, Assimamaw and Ashenafi 2017: 7). However, in the current study, there was no association of parents/guardians seeking medical care and parental/guardian age (p=0.160). Furthermore, there was no association between administering ORT and parental/guardian age age (p=0.206).

5.4.2 Oral rehydration treatment administration

Oral rehydration treatment adopted by United Nations Children's Fund (UNICEF) and WHO in the late 1970s have been successful to aid the management of diarrhoea among children (UNICEF 2004: 2). A study in Sedibeng District, South Africa found that the majority of caregivers did not know the exact function of oral rehydration and why it should be given at the onset of diarrhoea (Onwukwe, Van Deventer and Omole 2016: 45). Oral rehydration treatment promotes the absorption of sodium and water that is lost during diarrhoea (WHO 2005: 33), thereby preventing dehydration. The administering of oral rehydration solution in this study was high. Above 76% (n=158) of the parents/guardians reported of administering ORS during their child last diarrhoeal incident. Desta, Assimamaw and Ashenafi (2017: 7) in their study found that an increased knowledge of diarrhoea with an increased education level. However, in the present study, the administration of ORT was consistent across all levels of parental/guardian education. This might be because the correct way of preparing ORT was demonstrated in the Road to Health handbook provided by the South African Department of Health. Parents/guardians high knowledge of ORT administration might also be from the frequent visits to health care facilities (n=172, 91.9%), which exposes them

to awareness sessions undertaken by the nurses. A study by Ghimire *et al.* (2018: 8) reported that frequent visits to health care facilities by caregivers resulted in improved management of diarrhoea, including the use of ORT. This study observed a similar finding since 92% (n=172) of parents/guardians who sort medical care visited medical professionals (p<0.001). Significantly, homemade oral rehydration solution was mostly administered by parents/guardians with primary (n=5, 20.0%) and secondary education (n=21, 19.3%), compared those with tertiary education.

5.4.3 Immunisation

Two-thirds (n=260, 69.3%) of the respondents reported that their child had received Rotavirus immunisation. It is highly possible that all the children did receive Rotavirus since is formed part of South Africa's Expanded Programme on Immunisation (EPI) and is given the child in two doses at 6 weeks old and 14 weeks old. Furthermore, ECD centres require an updated Road to Health card on admission of the child. Rotavirus immunisation reduces the burden of Rotavirus disease in children (Groome and Madhi 2011: 178). Caregivers should therefore ensure that children receive all immunisations as scheduled in the Expanded Programme on Immunisation.

5.5 CONCLUSION

Knowledge around diarrhoea must be strengthened, more so in prevention, as well as when to seek medical care. Caregivers should be encouraged to have oral rehydration treatment readily available to be used as needed.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This study is assumed to be the first to assess the prevalence of diarrhoea in children under five years, to identify risk factors that contribute to diarrhoea in children and to assess KPA of parents/guardians and Early Childhood Development educators to diarrhoea and hygiene in KwaZulu-Natal.

The findings in this study demonstrated that the main contributing factors for diarrhoea in children five years and under in Mpumalanga Township, KwaZulu-Natal was the parents/guardians level of education, the presence of young siblings in the home and the location of the toilet and handwashing sink.

6.2 KEY FINDINGS

Children were more likely to get diarrhoea from other children, compared to adults. This finding was expected, since literature has proven that the presence of young siblings was associated with childhood diarrhoea (Kattula *et al.* 2015: 3044).

Household with six or more people were associated with acute diarrhoea (Adane *et al.* 2018: 403), however, this study did not find the same association even though the average number of people in the households were six (mean=5.7, SD=2.2).

Households with indoor taps washed their hands more frequently than households where the water source was further from the home. Having a handwashing sink next to the toilet increased the frequency of handwashing than when the handwashing sink was further away. Handwashing after urinating was less frequent in both parents/guardians and ECD centre educators.

How parents/guardians washed their hands was 1.239 times likely to contribute to children under the age of five getting infected with diarrhoea. The *p*-value of

0.010 was obtained in the association of type of toilet in the household and a child having diarrhoea.

Education was significant in parents/guardians seeking medical care, the type of medical care sought, and the administration of oral rehydration solution. Other studies found that parents/guardians age and their experience in childhood diarrhoea influences their decision of seeking medical care and administering ORS. This study expected a similar finding, however no significance was found of parents/guardians age in them seeking medical care and administering ORS.

Most parents/guardian knew how to prepare ORS using correct ingredients. In general, there was adequate infrastructure of toilets and water within the population with only a few households having inadequate sanitation.

6.3 RECOMMENDATIONS

Based on the data analysis of the study, it is recommended that:

Sanitation infrastructure, which include toilets, tap water, and hand washing sinks, must be located in or in close proximity to households and ECD centres in order to ensure frequency of handwashing after critical times.

Both parents/guardians and ECD educators must ensure that children wash their hands even after urinating, in order to ensure that pathogen they might have come in to contact with during their visit to the toilet are removed.

It is imperative that health education and health promotion initiatives are an ongoing practice in communities where diarrhoea is a challenge due to poor sanitation and poverty. This will equip parents/guardians in ensuring they adhere to good hygiene practices in order to manage diarrhoea and ultimately prevent diarrhoeal deaths in children. The correct method of homemade ORS must also form part of awareness in health care facilities, especially at the paediatric sections.

In conclusion, the general knowledge, attitudes and practices of ECD educators and parents/guardians towards diarrhoea and hygiene were adequate. However, the implementation of adequate hand washing during every toilet visit

and the availability of soap in the households is of concern, as this increased the risk of infection from diarrhoea causing pathogens. Upscaling awareness on the importance of washing hands, preferably at healthcare facilities, will result in increased improved hygiene practices in household where there is overcrowding.

6.4 LIMITATIONS

The researcher relied on self-reporting by the respondents who were willing to participate. The ECD centres were sparsely located in Mpumalanga Township, and some areas lay in the outskirts, making them difficult to reach. Although the researcher was invited to the Early Childhood Development centres' monthly meetings to present the study, some ECD centres were not willing to be part of the study. This was evident when the researcher received zero responses from the educators and parents/guardians of that ECD centre. The questionnaires for parents/guardians could not be personally delivered, since the majority of children were either transported by an "uncle" to the ECD centre or accompanied by an older sibling. They were therefore placed in the children's bags for the parents/guardians to answer, which made data collection very challenging.

6.5 STRENGHTS

This is the first study done in South Africa that assessed the risk factors contributing to diarrhoea in children five years and under that attend at Early Childhood Development centres according to our knowledge.

The strengths of this study include:

- this is the first study in South Africa to assess the prevalence of diarrhoea in children 5 years and under at ECD centres;
- this is the first study in South Africa to assess the knowledge, attitudes and practices of ECD educators and parents/guardians to diarrhoea and hygiene.

6.6 AREA FOR FURTHER RESEARCH

It must be noted that there was a high prevalence of acute diarrhoea in the population, even though children had received rotavirus immunisation. Although the literature suggests that diarrhoea in children might be caused by *cryptosporidium* infection, the researcher recommends further investigation involving children's stool sampling.

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APPENDICES

APPENDIX A (1)

QUESTIONNAIRE FOR PARENTS/GUARDIANS OF CHILDREN ATTENDING EARLY CHILDHOOD DEVELOPMENT CENTRE

(Please answer the following questions or tick where appropriate)

1. Parent /guardian gender:

Female$_1$	
Male$_2$	

2. Parent /guardian age in years:

3. Marital status:

Single$_1$	
Married$_2$	
Divorced$_3$	
Widow$_4$	

4. Parent /guardian level of education:

Primary$_1$	
Secondary$_2$	
Tertiary$_3$	
None$_4$	

5. Parent /guardian occupational status:

Employed$_1$	
Not employed$_2$	
Pensioner$_3$	

6. Religion:

Christian$_1$	
Shembe$_2$	
Muslim$_3$	
Zionist$_4$	
Other$_5$ (please specify):	

7. How many people are living in your house?

8. Number of children 5 years and under in the household:

Children	Male$_1$	Female$_2$
0 - 6 months$_1$		
6 - 18 months$_2$		
18 months$_3$		
18 months - 3 years$_4$		

3 - 5 years$_5$		

9. What is the source of drinking water for members of your household?

Indoor tap $_1$	
Outdoor tap on premises$_2$	
Public tap$_3$	
Borehole$_4$	
Dug well$_5$	
Unprotected dug well or spring, rainwater$_6$	
Pond, river or stream$_7$	
Tanker-truck, vendor$_8$	
Other$_9$ (please specify):	

10. How far is this water source from your dwelling?

On premises$_1$	
Less than 100m$_2$	
100 - 500m$_3$	
500 – 1km$_4$	
More than 1km$_5$	

11. If the source of water is not on the premises, how long does it take to fetch water and come back?

0 – 5 minutes$_1$	
15 – 30 minutes$_2$	
30 – 45 minutes$_3$	
45 – 60 minutes$_4$	
Above 60 minutes$_5$	

12. Where is your household toilet located?

Indoors $_1$	
Within the yard$_2$	
Outside the yard / Community$_3$	
Other$_4$ (please specify):	

13. What kind of toilet facility does your household use?

Flushing toilet$_1$	
Pit latrine$_2$	
Portable toilet$_3$	
Other$_4$ (please specify):	

14. How far is the handwashing sink from the toilet?

Next to the toilet$_1$	
Outside toilet but in the dwelling$_2$	
Within the yard$_3$	
Other$_4$ (please specify):	

15. How often do you wash your hands after the following activities:

a) After defecating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

b) After handling child's faeces?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

c) After urinating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

d) Before preparing food?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

16. How do you wash your hands?

Soap and water always$_1$	
Water only$_2$	
Soap and water if soap is available$_3$	
Other$_4$ (please specify):	

17. (a) Do you experience any challenges when washing hands?

Yes$_1$	
No$_0$	

(b) If yes, what are the challenges (you can tick more than one option)

Inadequate water supply$_1$	
Soap not available$_2$	
No water supply$_3$	
Water source is too far$_4$	
Time consuming$_5$	
I don't think it is important$_6$	
Other$_7$ (please specify):	

18. Has your child had diarrhoea in the last twelve (12) months?

Yes$_1$	
No$_0$	

19. If yes, how many children under the age of 5 had diarrhoea in the last 12 months?

20. What were the symptoms of the diarrhoea?

Watery stool with mucus$_1$	
Watery stool with blood$_2$	
Watery stool with fever$_3$	

21. During the last diarrhoea episode, did you seek medical care?

Yes$_1$	
No$_0$	

22. If no, please state why:

The clinic/doctor was too far away from my home$_1$	
I did not have money to seek medical care$_2$	
I did not have money for transport to go to the health care centre$_3$	
I could not get time off work$_4$	
I did not think it was necessary$_5$	
Other$_6$ (please specify):	

23. If yes, where did you seek medical care:

Clinic$_1$	
Private doctor$_2$	
Traditional healer$_3$	
Other$_4$ (please specify):	

24. During the last diarrhoea episode, did you give your child any of the following:

Oral rehydration solution made from a packet$_1$	
Oral rehydration solution already prepared$_2$	
Zinc tablets or syrup$_3$	
Homemade oral rehydration solution$_4$	
Nothing$_5$	
Other$_6$ (please specify):	

25. a) Do you know how to correctly prepare an oral rehydration solution?

Yes$_1$	
No$_0$	

(b) If yes, explain how:

_____
_____
_____
_____

26. Does your child :

Go to the toilet on his/her own$_1$?	
Requires your help$_2$?	
Still uses nappies$_3$?	

27. How do you dispose of your child's stools?

Child used toilet/latrine$_1$	
Put/rinsed into the toilet/latrine$_2$	
Put/rinsed into drain or ditch$_3$	
Thrown into garbage$_4$ (solid waste)	
Buried$_5$	
Left in the open$_6$	
Other$_7$(please specify):	

28. Has the child received rotavirus immunisation?

Yes$_1$	
Don't know$_2$	
No$_0$	

(Child receive rotavirus immunisations between six weeks and 24 weeks of age)

29. How often do you wash your child's hands after the following activities?

(a) After defecating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

(b) After urinating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

(c) Before handling and eating food?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

Thank you for taking the time to answer the questionnaire

APPENDIX A (2)

UHLWA LEMIBUZO YABAZALI NABAQAPHI BABANTWANA ABAFUNDA ENKULAKAHLE

(Sicela uphendule lemibuzo elandelayo noma ofake uphawu(√) endaweni efanelekile)

30. Ubulili bomzali /umqaphi womntwana:

Owesifazane$_1$	
Owesilisa$_2$	

31. Iminyaka kamzali/ umqaphi womntwana:

32. Isimo sobudlelwane:

Ungayedwana$_1$	
Ushadile$_2$	
Udivosile$_3$	
Umfelokazi$_4$	

33. Izinga lemfundo kamzali/umqaphi wontwana:

Izinga eliphansi$_1$	
Izinga eliphezulu$_2$	
Izinga lemfundo ephakeme$_3$	
Angifundanga$_4$	

34. Umsebenzi womzali/umqaphi womntwana:

Uyasebenza$_1$	
Awsebenzi$_2$	
Uhhola impesheni$_3$	

35. Inkolo:

UmKrestu$_1$	
UShembe$_2$	
UyiMuslim$_3$	
UmZioni$_4$	
Enye$_5$ (sicela uchaze):	

36. Bangaki abantu ahlala nabo endlini?

37. Bangaki abantwana abanemyaka ewu 5 nangaphansi ohlala nabo:

Abantwana	Abesilisa$_1$	Abesifazane$_2$
0-6 wezinyanga$_1$		
6-18 wezinyanga$_2$		
18 wezinyanga$_3$		
18 wezinyanga kuya ku 3 weminyaka$_4$		
3-5 weminyaka$_5$		

38. Endlini niphuza amanzi asuka kuphi?

Umpompi osendlini $_1$	
Umpompi osegcekeni$_2$	
Umpompi womphakathi$_3$	
Amanzi ambelwayo$_4$	
Amanzi asemthonjeni ovikelekile$_5$	
Amanzi asemthonjeni ongavikelekile noma amanzi emvula$_6$	
Umfula noma isiphathu$_7$	
Imito yamanzi/estolo$_8$	
Enye indawo$_9$ (sicela uchaze):	

39. Kukude kangakanani lapho ukha khona amanzi nasendlini?

Kungaphakathi endlini/egcekeni$_1$	
Kungaphanzi kwama mitha awu 100$_2$	
Amamitha awu100 kodwa kungaphansi kwawu 500$_3$	
Amamitha aw500 kuya kwi khilomitha elilodwa$_4$	
Kungaphezu kwe khilomitha elilodwa$_5$	

40. Uma amanzi ungawatholi egcekeni, kukuthatha isikhathi esingakanani ukukha amanzi ebese ubuyela endlini?

0 – 5 imizuzu$_1$	
15 – 30 imizuzu$_2$	
30 – 45 imizuzu$_3$	
45 – 60 imizuzu$_4$	
Ngephezu kwemizuzu ew 60$_5$	

41. Likephi ithoyilethu lakho?

Endlini$_1$	
Egcekeni$_2$	
Ithoyilethi lomphalathi$_3$	
Enye indawo$_4$(sicela uchaze):	

42. Kunanhloboni yethoyilethi kwakho?

Ithoyilethi eliflashwayo$_1$	
Ithoyilethi lomgodi$_2$	
Ithoyilethi elihambayo$_3$	
Elinye$_4$ (sicela uchaze):	

43. Usinki wokugeza izandla ukude kangakanani nethoyilethi?

Eduze kwethoyilethi$_1$	
Ungaphandle kwethoyilethi kodwa engcekeni$_2$	
Usegcekeni$_3$	
Enye indawo$_4$(sicela uchaze):	

44. Kukangaki ugeza izandla zakho ngaphambi kokulandelayo:
    e) Emuva kokuzikhulula?

Njalo$_1$	

Ngenye inkathi$_2$	
Angijwayele$_3$	
Angikwenzi$_4$	

f) Emuva kokuthinta uthuvu lomntwana?

Njalo$_1$	
Ngenye inkathi$_2$	
Angijwayele$_3$	
Angikwenzi$_4$	

g) Emuva kokuchama?

Njalo$_1$	
Ngenye inkathi$_2$	
Angijwayele$_3$	
Angikwenzi$_4$	

h) Ngaphambi kokuthinta ukudla?

Njalo$_1$	
Ngenye inkathi$_2$	
Angijwayele$_3$	
Angikwenzi$_4$	

45. Uzigeza ngani izandla zakho?

Ngensipho namanzi njalo$_1$	
Amanzi kuphela$_2$	
Ngensipho namanzi uma ikhona insipho$_3$	
Okunye$_4$(sicela uchaze):	

46. (a)Kukhona ubunzima oke ubhekane nabo mayelana nokugeza izandla?

Yebo$_1$	
Cha$_0$	

(b) Uma uyebo, luhlobo luni lobunzima (ungakhetha kaningi)

Amanzi abuye ashode$_1$	
Insipho ibuye ingabikho$_2$	
Awekho amanzi$_3$	
Indawo yokukha amanzi ikude$_4$	
Kuthatha usikhathi$_5$	
Angibonu kubalulekile$_6$	
Okunye$_7$ (sicela uchaze):	

47. Umntwana wakho useke waba nesifo sohhudo ezinyangeni eziyishumi nambili (12) ezedlule?

Yebo$_1$	
Cha$_0$	

48. Uma uyebo, zingaki izingane kwakho ezibe nesifo sohhudo ezineminyaka eyisihlanu (5) nangaphansi ezinyangeni eziyishumi nambili (12) ezedlule?

49. Beziyini izinkomba zesifo sohudo?

Uhhudo olunenamafinyilana$_1$	
Uhhudo olunegazi$_2$	
Uhhudo kanye nemfiva$_3$	

50. Ngesikhathi umntwana enesifo sohhudo, walufuna usizo emtholampilo?

Yebo$_1$	
Cha$_0$	

51. Uma cha,sicela usho ukuthi kungani ungalifunanga:

Kuyibanga elide ukuya emtholampilo/uDokotela$_1$	
Bengingenayo imali yokufuna usuzo kwempilo$_2$	
Bengingenayo imali yokugibela ngiye emtholampilo$_3$	
Angisitholanga isikhathi ngenxa yomsebenzi$_4$	
Bengingasiboni isidingo$_5$	
Okunye$_6$(sicela uchaze):	

52. Uma uyebo, ulifunephi usizo lwempilo:

Emtholampilo$_1$	
uDokotela$_2$	
Isangoma$_3$	
Okunye$_4$(sicela uchaze):	

53. Ngesikhathi umntwana enesifo sohudo, wamunika umntwana okunye kokulandelayo:

Iglukhosi esephaketheni$_1$	
Iglukhosi esiyenziwe$_2$	
Amaphilisi eZinc noma umuthi$_3$	
Iglukhosi ozenzele ekhaya$_4$	
Lutho$_5$	
Okunye$_6$(sicela uchaze):	

54. a) Uyakwazi ukwenza iglukhosi?

Yebo$_1$	
Cha$_0$	

(b) Uma yebo, chaza uyenza kanjani:

_____
_____
_____
_____

55. Umntwana wakho:

Uyaziyela yedwa ethoyilethi$_1$?	
Udinga usizo$_2$?	
Usagqoka inabukeni$_3$?	

56. Uwulahla kanjani uthuvu womntwana?

Umntwana usebenzisa ithoyilethi$_1$	
Ngiwafaka ethoyilethi$_2$	
Ngiwafaka esitamukoko$_3$	
Ngiwafaka kumgqoko kadoti$_4$	
Ngiyawagqiba$_5$	
Ngiwalahla esigangeni$_6$	
Okunye$_7$	

57. Umntwana useke wagonyelwa isifo sohhudo?

Yebo$_1$	
Angazi$_2$	
Cha$_0$	

(Umntwana uthola umgomo wesifo sohhudo phakathi kwamaviki ayisithupha (6) ezelwe kuya emashumini amabili nesine ezelwe (24))

58. Uzigeza kangaki izandla zomntwana emuva kokulandelayo?

(d) Ngemuva kokuzikhulula?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

(e) Ngemuva kokuchama?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

(f) Ngaphambi kokuthinta nokudla ukudla?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

Ngiyabonga ngokuthatha isikhathi sokuphendula imibuzo

APPENDIX B (1)

QUESTIONNAIRE FOR EDUCATORS AT EARLY CHILDHOOD DEVELOPMENT CENTRE

(Please answer the following questions or tick where appropriate)

1. How many children are registered in your centre?

Children	Male$_1$	Female$_2$	Total
0 - 6 months$_1$			
6 - 18 months$_2$			
18 months$_3$			
18 months-3 years$_4$			
3 - 5 years$_5$			
Grade R$_6$			
TOTAL			

2. What is your level of training and experience?

Level of Training$_1$	
Years of experience$_2$	

3. How many other staff do you have in the following categories in the centre:

Category	
Educator$_1$	
Cleaner$_2$	
Cook$_3$	
Gardener$_4$	
Volunteer$_5$	

4. Does the centre have a governing committee?

Yes$_1$	
No$_0$	

5. Does the governing committee consist of parents of children who attend at the centre?

Yes$_1$	
No$_0$	

6. Is the centre registered with the Department of Social Development?

NPO Registered $_1$	
ECD Partial Care Registration $_2$	
No$_0$	

7. What is the source of drinking water in the centre?

Indoor tap $_1$	
Outdoor tap on premises$_2$	
Public tap$_3$	
Borehole$_4$	
Dug well$_5$	
Unprotected dug well or spring, rainwater$_6$	
Pond, river or stream$_7$	
Tanker-truck, vendor$_8$	

Other$_9$ (please specify):

8. How far is this water source from the centre?

On premises$_1$	
Less than 100m$_2$	
100 - 500m$_3$	
500 – 1km$_4$	
More than 1km$_5$	

9. If the source of water is not on the premises, how long does it take to fetch water and come back?

0 - 5 minutes$_1$	
15 - 30 minutes$_2$	
30 - 45 minutes$_3$	
45 - 60 minutes$_4$	
Above 60 minutes$_5$	

10. Where is the toilet of the centre located?

Indoors $_1$	
Within the yard$_2$	
Outside the yard / Community$_3$	
Other$_4$ (please specify):	

11. What kind of toilet facility does your centre use?

Flushing toilet$_1$	
Pit latrine$_2$	
Portable toilet$_3$	
Other$_4$ (please specify):	

12. How far is the handwashing sink from the toilet?

Next to the toilet$_1$	
Outside toilet but in the dwelling$_2$	
Within the yard$_3$	
Other$_4$ (please specify):	

13. Has the centre received formal training in hand hygiene in the last two years?

Yes$_1$	
No$_0$	

14. If yes, who provided the training?

Department of Basic education $_1$	
Department of Social Development $_2$	
Department of Health$_3$	
Other$_4$ (please specify):	

15. Do you prepare meals at the centre?

Yes$_1$	
No$_0$	

16. If yes, how many meals do you provide a day?

One$_1$	
Two$_2$	
More than two$_3$	

17. Where does your centre obtain its food from?

Food garden$_1$	
Purchased by the centre$_2$	
Donations$_3$	
Government issued$_4$	
Other$_5$ (please specify):	

18. Do all children at the centre have a Road to Health card?

Yes$_1$	
No$_0$	

19. Has any child come to school while having diarrhoea?

Yes$_1$	
No$_0$	

20. Do you assist children in going to the toilet?

Yes$_1$	
No$_0$	

21. If yes, how often are children assisted in washing hands after the following activities?
    a) After defecating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

    b) After urinating?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

    c) Before handling and eating food?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

d) After playing outside in the sand?

Always$_1$	
Sometimes$_2$	
Rarely$_3$	
Never$_4$	

22. Are children taught on the importance of hand washing?

Yes$_1$	
No$_0$	

23. How do you wash your hands?

Soap and water always$_1$	
Water only$_2$	
Soap and water if soap is available$_3$	
Other$_4$:	

24. (a) Do the children experience any challenges when washing hands?

Yes$_1$	
No$_0$	

(b) If yes, what are the challenges (you can tick more than one option)

Inadequate water supply$_1$	
Soap not available$_2$	
No water supply$_3$	
Water source is too far$_4$	
Time consuming$_5$	
I don't think it is important$_6$	
Other$_7$ (please specify):	

25. How important is hand hygiene at your centre?

Not important$_1$	
Low importance$_2$	
Moderate importance$_3$	
High importance$_4$	
Very high importance$_5$	

Thank you for taking the time to answer the questionnaire

APPENDIX B (2)

UHLWA LEMIBUZO YAZINKULAKAHLE

(Sicela uphendule lemibuzo elandelayo noma ofake uphawu (√) endaweni efanelekile)

26. Bangaki abantwana ababhaliswe enkulakahle?

Abantwana	Abesilisa$_1$	Abesifazane$_2$
0-6 izinyanga$_1$		
6-18 izinyanga$_2$		
18 izinyanga$_3$		
18 izinyanga -3 iminyaka$_4$		
3-5 iminya$_5$		
Grade R$_6$		
ISIBALO		

27. Iliphi izinga lemfundo yakho?

Izinga lemfundo$_1$	
Iminyaka yokusebenza$_2$	

28. Bangaki abasebenzi abenza okulandelayo enkulakahle:

Isigaba	
Uthisha$_1$	
Iklina$_2$	
Umpheki$_3$	
Usebenza engadini$_4$	
Ivolontiya$_5$	

29. Inkulakahle inayo ikomidi eliphethe?

Yebo$_1$	
Cha$_o$	

30. Ikomidi eliphethe linawo yini amalunga angabazali bezingane ezifunda enkulakahle?

Yebo$_1$	
Cha$_o$	

31. Inkulakahle ibhalisile ngaphansi kwe Department of Social Development?

Ibhalisiwe kwi NPO$_1$	
Ibhalisiwe kwi ECD Partial Care$_2$	
Ayibhaliswanga$_o$	

32. Athololaka kephi amanzi asEnkulakahle?

Umpompi osendlini$_1$	
Umpompi osegcekeni$_2$	
Umpompi womphakathi$_3$	
Amanzi ambelwayo$_4$	
Isiphethu$_5$	

Amanzi asemthonjeni ongavikelekile noma amanzi emvula$_6$	
Umfula noma idamu$_7$	
Imoto yamanzi noma estolo$_8$	
Okunye$_9$ (sicela uchaze):	

33. Kukude kangakanani lapho ukha khona amanzi nenkulakahle?

Kungaphakathi endlini/egcekeni$_1$	
Kungaphanzi kwama mitha awu 100$_2$	
Amamitha awu100 kodwa kungaphansi kwawu 500$_3$	
Amamitha aw500 kuya kwi khilomitha elilodwa$_4$	
Kungaphezu kwe khilomitha elilodwa$_5$	

34. Uma amanzi engatholakali egcekeni,kuthatha isikhathi esingakanani ukukha amanzi ebese ubuyela enkulakahle?

0 – 5 imizuzu$_1$	
15 – 30 imizuzu$_2$	
30 – 45 imizuzu$_3$	
45 – 60 imizuzu$_4$	
Ngephezu kwemizuzu ew 60$_5$	

35. Litholakala kephi ithoyilethu enkulakahle?

Endlini$_1$	
Egcekeni$_2$	
Ithoyilethi lomphalathi$_3$	
Enye indawo$_4$(sicela uchaze):	

36. Kunahloboluni lwamathoyilethi enkulakahle?

Ithoyilethi eliflashwayo $_1$	
Ithoyilethi lomgodi$_2$	
Ithoyilethi elihambayo$_3$	
Elinye$_4$ (sicela uchaze):	

37. Usinki wokugeza izandla ukude kangakanani nethoyilethi?

Eduze kwethoyilethi $_1$	
Ungaphandle kwethoyilethi kodwa engcekeni$_2$	
Usegcekeni$_3$	
Enye indawo$_4$(sicela uchaze):	

38. Inkulakahle iyaluthola uqeqesho ngendlela efanelekile yokuhlanza izandla?

Yebo$_1$	
Cha$_o$	

39. Uma uyebo, ubani owenza uqeqesho?

Department of Basic education$_1$	
Department of Socials Development$_2$	
Department of Health$_3$	
Enye indawo$_4$(sicela uchaze):	

40.

Niyakupheka ukudla enkulakahle?

Yebo$_1$	
Cha$_0$	

41.

Uma uyebo, kungaki ukudla inkulakahle ekunikeza abantwana?

Okukodwa$_1$	
Okubili$_2$	
Okungaphezu kokubili$_3$	

42. Inkulakahle ikuthola kanjani ukudla?

Engadini$_1$	
Iyakuthenga$_2$	
Iminikelo$_3$	
Uhulumeni ophayo$_4$	
Okunye$_5$ (sicela uchaze):	

43. Bonke abantwana banalo ikhadi lomgomo?

Yebo$_1$	
Cha$_0$	

44. Bake beza abantwana enkulakahle ngesikhathi benesifo sohhudo?

Yebo$_1$	
Cha$_0$	

45. Niyabalekelela abantwana ekusebenziseni ithoyilethi?

Yebo$_1$	
Cha$_0$	

46. Uma uyebo, abantwana bayaluthola ukulekelwa uma begeza izandla emuva kokulandelayo?

e) Emuva kokuzikhulula?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

f) Emuva kokuchama?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

g) Ngaphambi kokuthinta ukudla nokudla?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	

Angikwenzi$_4$	

h) Emuva kokudlala ngaphandle enhlabathini?

Njalo$_1$	
Ngesinye isikhathi$_2$	
Akuvamisile$_3$	
Angikwenzi$_4$	

47. Bayafundiswa abantwana ngokubaluleka kokugeza izandla?

Yebo$_1$	
Cha$_0$	

48. Uzigeza ngani izandla zakho?

Ngensipho namanzi njalo $_1$	
Amanzi kuphela $_2$	
Ngensipho namanzi uma ikhona$_3$	
Okunye$_4$(sicela uchaze):	

49. (a) Kukhona ubunzima oke ubhekane nabo mayelana nokugezwa kwezandla?

Yebo$_1$	
Cha$_0$	

(b) Uma uYebo, luhlobo luni lobunzima (ungakhetha kaningi)

Amanzi abuye ashode$_1$	
Insipho ibuye ingabikho$_2$	
Awekho amanzi$_3$	
Indawo yokukha amanzi ikude$_4$	
Kuthatha usikhathi$_5$	
Angibonu kubalulekile$_6$	
Okunye$_7$ (sicela uchaze):	

50. Kukho konke okubalulekile ngokuphepha kwabantwana, kubaluleke kangakanani ukugezwa kwezandla enkulakahle?

Akubalulekile neze$_1$	
Kubalulekile nokho$_2$	
Kubalulekile kakhudlwana$_3$	
Kubalilekile kakhulu$_4$	
Kubaluleke kakhulu impela$_5$	

Ngiyabonga ngokuthatha isikhathi sokuphendula imibuzo

APPENDIX C

INFORMATION AND PERMISSION LETTER

Ms Samukelisiwe Nomonde Ntshangase

Durban University of Technology

Department of Community Health Studies

Durban

20 March 2018

To: The Circuit Manager

Department of Social Development: Durban Region

Dear Sir/Madam

Re: Request to collect data from staff and parents of children 5 years and under for research at all Crèche's and Preschools in Mpumalanga Township on "Hygiene practices as a contributing factor to diarrhoea in preschool children in Mpumalanga Township, KwaZulu-Natal".

I am an Environmental Health Practitioner by profession, currently employed as an Environmental Compliance Officer for the South African Police Services; Forensic Science Laboratory in Amanzimtoti and a permanent resident of Mpumalanga Township. I am currently pursuing a Master's Degree at the Durban University of Technology as a part time student. The proposed research is a requirement in acquiring this Degree.

My research topic is on **"Hygiene practices as a contributing factor to diarrhoea in preschool children in Mpumalanga Township, KwaZulu-Natal".**

The objectives of the study are:

1. To assess the prevalence of diarrhoea in children 5 years and under at crèches and preschools in Mpumalanga Township.
2. To identify risks factors that may contribute to diarrhoea in children.
3. To assess the knowledge, attitudes and practices of staff, educators, parents and/or guardians to hygiene.

The study will benefit the country at large and communities surrounding the research area in the following ways:

- The researcher will identify and further describe the association of hygiene practices of staff, educators, parents and/or guardians to diarrhoea in children in crèches and preschools and obtain solutions that will assist the Early Childhood Development Centres in implementing educational material that can be included in the training of staff members to promote good hygiene practices.
- Research findings will assist parents and/or guardians in understanding the impact of poor hygiene practices at home and implement good hygiene practices as well as empower them to demonstrate such practices to their children from a young age.

- The researcher's recommendations aim to achieve one of the targets of the Sustainable Development Goal 3: Ensure healthy lives and promote wellbeing for all at all ages by reducing diarrhoeal infection through achieving solutions around the focus area.
- The researcher will be willing to present research finding at conferences and workshops that may be held by Department of Social Development regarding ECD, the Department of Health and NGO's.
- The research findings will be published thereby benefitting other researchers.

In order to successfully achieve the objectives of this study, the following information is required:

- Access to collect data from ECD staff and parents of children five years and under in at Mpumalanga Township.

All ethical guidelines will be adhered to at all times. Approval to conduct the study will be sought from DUT Institutional Research Ethics Committee (IREC).

I trust that my request will be received favourably.

Thanking you in advance

Sincerely

Ms SN Ntshangase

Supervisor: Mrs S Ghuman

Co-Supervisor: Dr F Haffejee

APPENDIX D

social development

Department:
Social Development
PROVINCE OF KWAZULU-NATAL

FAX : 033-264 2075
Telephone/Ucingo/Telefoon: 033 264 2078
Enquiries/Imibuzo/Navrae : Mr. VW Gumede
Email address : velaphi.gumede@kznsocdev.gov.za
Reference/ Inkomba/ Navrae: S6/5/3

HUMAN RESOURCE DEVELOPMENT
174 Mayors Walk Road
Private Bag X9144
Pietermaritzburg
3200

Ms. SN Ntshangase
A 932 Gumede Road
Mpumalanga Township
HAMMARSDALE
3700

Contact No: 072 906 7553
Email: smaken.ntshangase@gmail.com

Dear Ms Ntshangase

PERMISSION TO CONDUCT RESEARCH IN EARLY CHILDHOOD DEVELOPMENT CENTRES UNDER MPUMALANGA TOWNSHIP

This matter has reference.

Kindly be informed that permission has been granted by the Head of Department for you to approach Preschool Teachers and Food handlers employees under registered ECD centres and funded by the Department for the purpose of conducting research under Mpumalanga Township for you to fulfill the requirement of your study.

The permission authorizes you to: -

(a) Approach and distribute your survey questionnaires to relevant personnel willing to participate in order to solicit information intended for your research; and
(b) Interview management at their consent deemed relevant to your research project and maintain high level of confidentiality; and
(c) Share your findings with the Department.

Wishing you success during your research project.

Yours Faithfully

DR ML NGCONGO
CHIEF DIRECTOR: HUMAN RESOURCE MANAGEMENT
DATE: 16/08/2018

APPENDIX E (1)

LETTER OF INFORMATION

Title of the Research Study: The association between hygiene practices and diarrhoea in preschool children in Mpumalanga Township, KwaZulu-Natal

Principal Investigator/s/researcher:
Samukelisiwe N. Ntshangase: B-Tech Environmental Health

Co-Investigator/s/supervisor/s: Shanaz Ghuman: M Public Health; Dr Firoza Haffejee: PhD (Physiology)

Brief Introduction and Purpose of the Study: I am undertaking a study at all preschools located in Mpumalanga Township. The purpose of the study is to learn if hygiene practiced of parents and preschools staff has an association with diarrhoea in preschool children and to find feasible solutions.

Outline of the Procedures:

- If you agree to participate in the study, you will be given a consent form to fill that shows you agree to be part of the study.
- You will be issued with questionnaires written in either English or IsiZulu as preferred which will be personally delivered by the researcher at your home. The questionnaire will be collected from your home after two days.
- Parents from other preschools will also be issued with questionnaires at their homes as well,

Risks or Discomforts to the Participant: None

Benefits: The study will help in finding ways of improving our knowledge and practices regarding hygiene for parents, preschool staff and the general public in order to ensure that diarrhoea infection are prevented in children.

Reason/s why the Participant May Be Withdrawn from the Study: You are free to withdraw from participating in the study at any point and your child will receive the same care and attention from the preschool as before.

Remuneration: You will not receive any money for taking part in the study.

Costs of the Study: You will not pay anything towards the study.

Confidentiality: Your personal identify information will not be shared to anyone. A unique number or a code will be used instead of your name throughout the study.

Research-related Injury: None

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher: Samukelisiwe on 073 906 7553

Supervisors: Shanaz Ghuman on 083 588 3245/ Dr. Firoza Haffejee on 083 291 8796

The Institutional Research Ethics Administrator: 031 373 2375.

Complaints can be reported to:

The Director: Research and Postgraduate Support, Prof. S. Moyo on 031 373 2577 or moyos@dut.ac.za

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance
  Number: _____,
- I have also received, read and understood the above written information (Participant Letter of
  Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may
  relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, _____ (name of researcher) herewith confirm that the above participant has been fully

informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

_____

Full Name of Legal Guardian (If applicable) Date Signature

APPENDIX E (2) - IsiZulu

INCWADI YOLWAZI

Isihloko salolucwaningo: Ubudlelwano kokuhlanzeka nesifo sohhudo ezinganeni ezihamba izinkulisa endaweni yase Mpumalanga, KwaZulu-Natal.

Inhloko yalolucwaningo:
Samukelisiwe N. Ntshangase: B-Tech Environmental Health

Abaphathi: Shanaz Ghuman: M Public Health; Dr Firoza Haffejee: PhD (Physiology)

Incazelo efingqiwe mayelana nalolucwaningo kanye nenhloso yalo: Ngizokwenza lolucwaningo kuzozonke izinkulisa eziseLokishini lase Mpumalanga. Ngihlose ukubheka ukuba inhlanzeko eyenziwa ngabazali nabasebenzi bezinkulisa inawo yini umthelela wesifo sohhudo ezinganeni zasenkulisa nokubheka izixazululo.

Kuzolandelwa lemigomo:

- Uma uvuma ukuba ingxenye lalolucwaningo, uzonikwa incwajana ozoyigcwalisa ekhombisa ukuba uyavuma ukuba ungxenye yalolucwaningo.
- Uzonikezwa uhlwa lemibuzo ebhalwe ngesiNgisi noma isiZulu, kuzoya ngawe ukuthi uncamela luphi ulimi, lemibuzo umncwaningi uzoyiletha kuwe ekhaya. Imibuzo izolandwa kuwe ngaphambi kwezinsuku izimbili unikiwe.
- Abazali bezingane kwezinye izinkulisa nabo bazonikwa lemibuzo emakhaya abo.

Ubungozi noma ukungakhululeki kwabazobamba iqhaza: Akukho

Ukusizakala: Lolucwaningo luzosiza ekutholeni kwezindlela zokwandisa ulwazi nezenzo zenhlanzeko kubazali, abasebenzi enkulakahle nanomphakathi jikelele ikhona sizokwazi ukunqanda isifo sohhudo ezonganeni.

Isizathu esingadala ukuba obambe iqhaza ahoxe kucwaningo: Unelungelo lokuhoxa ekubambeni iqhaza kulolucwaningo noma ingasiphi isikhathi futhi angeke ingane yakho ithole imphatho eyehlukile enkulisa.

Inkokhelo: Angeke ukhokhelwe mali ngokuba ingxenye lalolucwaningo.

Izindleko zocwaningo: Angeke ukhokhe lutho ekwenzeni kwalolucwaningo.

Izimfihlo: Igama nayoyonke inqukatha yakho angeke idalulwe. Kuzosetshenziswa inamba noma uphawu oluzomela igama lakho kusukela ekuqaleni kocwanungo kuya emaphethelweni.

Ukulimala ukuhlangene nalolucwaningo: Angeke kwenzeke

Abantu ongaxhumana nabo uma unenkinga noma unemibuzo:
Umcwaningi: Samukelisiwe ku 073 906 7553
Ubaphathi: Shanaz Ghuman ku 083 588 3245 noma Dr. Firoza Haffejee ku 083-291 8796
Abaqondene nenqubo yokuziphatha kwemicwaningo: 031 373 2375.
Ukukhononda ungakubika kuMhholi wezocwaningo nemfundo ephakeme: Phrofesa S. Moyo ku 031 3732577/moyos@dut.ac.za

IMVUME

Isivumelwano sokubamba iqhaza kucwaningo:

- Ngiyavuma ukuba umcwaningi,_____ (bhaka igama lomcwaningi) ungazisile ngenhloso yocwanigno, indlela elizokwenziwa ngalo, imivuzo yalo kanye nobungozi obungahle buxhumelane nalolucwaningo-inombolo yenqubo yokuziphatha kwemicwaningo enikiwe: _____.
- Nginikiwe, ngafunda futhi ngaqonda ngemininingwane ebhalwe encwadini (Incwadi yolwazi) mayelana nocwaqningoregarding.
- Ngiyaqonda ukuthi imiphumela yocwaningo kanye nemininingwano yami mayelana nobulili bami, iminyaka, usuku lokuzalwa, uphawo legama lami noma ugugula kwanhloboni kwami kuzosetshenziswa ngemfihlo emiphumelweni yalolucwaningo.
- Ekubhekeni okudingekayo kulolucwaningo, ngiyavuma ukuba imininingwane etholakale ngalolucwaningona ukuba ifakwe kwi khomphutha ngumcwaningi.
- Ngingakwazi noma inini ukuhoxisa imvume yami kanye nokubamba iqhaza kulolucwaningo.
- Ngilitholile ithuba elanele lokubuza imibuzo fithi ngiyavuma (ngokwami) ukuthi ngizimisele ukubamba iqhaza kulolucwaningo.
- Ngiyaqonda ukuthi imininingwano ebalulekile engatholwa olumayelana neqhaza engilithathile luzodalulwa kimina lusaqhuba lolucwaningo.

_____	_____	_____	_____
Igama eligcwele lobamba iqhaza soludla	**Usuku**	**Isikhathi**	**Sayina /Isithupha sesandla**

Mina u, _____ (igama lomuncwaningi) ngiyavuma ukuba lo obhalwe ngaphezulu ozobamba iqhaza, ukuba wazisiwe ngokuphelele mayelana nenhloso yocwanigno, indlela elizokwenziwa ngalo, imivuzo yalo kanye nobungozi obungahle buxhumelane nalolucwaningo.

_____	_____	_____
Igama iligcwele lomcwaningi	**Usuku**	**Sayina**
_____	_____	_____
Igama eligcwele lofakazi(Uma edingeka)	**Usuku**	**Sayina**
_____		
Igama eligcwele lobheke ingane (Uma edingaka)	**Usuku**	**Sayina**

DUT
DURBAN UNIVERSITY OF TECHNOLOGY

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lawishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

APPENDIX F

30 August 2018

IREC Reference Number: **REC 133/17**

Ms S N Ntshangase
A932 Gumede Road
Mpumalanga Twonship
Hammarsdale
3700

Dear Ms Ntshangase

Hygiene practices as a contributing factor to diarrhoea in preschool children in Mpumalanga Township, KwaZulu-Natal

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2018 -08- 30
INSTITUTIONAL RESEARCH ETHICS COMMITTEE
P.O BOX 1334 DURBAN 4000 SOUTH AFRICA