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**TRANSFORMATION TOWARDS SUSTAINABLE
AND RESILIENT WASH SERVICES**

Good food hygiene practices in urban informal settlements of Kisumu, Kenya

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Good food hygiene practices reduce faecal contamination in child food, but do not reduce enteric infections and child diarrhoea. Children in urban settlements are more susceptible to diarrhoea because of poor sanitation and overcrowding. The purpose of this study was to delineate food handling practices in urban settlements, to inform an intervention aimed at reducing enteric infections. Data was collected using observation and in-depth interviews. Twenty one out of 31 caregivers who participated in the study were biological mothers, the remaining were relatives or nonrelatives. Over half the infants had several alternative caregivers providing care in or outside the home. Food preparation and feeding was done by the caregiver providing care when the child was hungry. These findings imply that child care in the informal settlements is done by multiple caregivers, suggesting that food hygiene interventions should give attention to all likely child caregivers to reduce diarrheal disease.

Introduction

The major cause of child death in developing world is diarrhoeal disease (Liu et al., 2012). Diarrhoea occurs when a person develops enteric infections as a result of ingesting organisms such as bacteria, virus or protozoa, found in faeces. These pathogens maybe transmitted to humans by hands or from food that has been contaminated. Studies have shown that child weaning foods are highly contaminated with diarrhoeal causing pathogens (Motarjemi et al., 1993; Lanata, 2003; Toure et al., 2013; Islam et al., 2013).

Food hygiene intervention studies have been conducted to reduce child food contamination in both urban informal settlements (Toure et al., 2013; Luby et al., 2018) and rural settings (Islam et al., 2013; Null et al., 2018). These studies focused on changing food hygiene practices. They concentrated on hand washing before preparing the infant's food and feeding the infant, hygienic food storage and keeping an infant's utensils separate and clean. They also looked at source and safety of drinking water, purchasing of cooked food for the infant, child feeding methods, and other studies applied the hazard analysis and critical control points (HACCP) during food preparation.

Food hygiene interventions have shown consistent reductions in child food contamination but have not shown associations between good food hygiene and reduced diarrhoea in children (Agustina et al., 2013; Null et al., 2018 and Luby et al., 2018). Nevertheless, the effect of social cultural factors such as child care practices on food handling in these communities has been neglected.

Mehra et al. (1992) described three methods of child care practice often used in developing countries by mothers of children under the age of six. The authors described informal arrangement as one of the practices in which a child receives care in the home or away from home. In this setting, care may be provided by the parents of the child, immediate or distance relatives of the child such as an older sibling, and non-relatives such as neighbors or neighbor's children. The second child care practice is taking the child to a family care where a non-relative provides care to several children outside of the home. The third practice is where a non-relative provides care to one or more children in the child's home. In the latter two options, caregivers may or may not be trained or licensed to provide care to children. Research shows that when a group of children are cared for in one setting, infectious disease transmission such as respiratory tract and gastrointestinal

occurs at a higher rate (Holmes et al., 1996). Therefore, we hypothesized that children are exposed to enteric infections not only due to poor food hygiene practices from the mother or primary caregiver, but also from the alternative caregivers and from other children either at the place where they receive care or from children brought to their home for care. Based on this hypothesis, we sought to find out who provides child care in these communities, who prepares children's food and feeds the children, and what are the caregiver's food hygiene practices.

Study model

Two frameworks informed the study. The integrated behavioural model for water, sanitation and hygiene (IBM-WASH) (Dreibelbis et al., 2013) and the behaviour centred design (BCD) (Aunger and Curtis, 2016). The IBM model describes the social and behavioural factors that affect adoption of behaviours. It helps with identifying factors to investigate that describe the reasons for water sanitation and hygiene (WASH); it helps with the designing of the intervention and instruments for data collection to measure the effect of interventions on determinants of WASH behaviours. The BCD model provides a roadmap for transitioning our understanding of the various aspects of a selected behaviour to a specific intervention strategy by changing both the behavioural setting and the cognitive processes associated with that behaviour. The study explored environmental, cognitive, and cultural determinants of specific behaviours, concepts of disease risk, and broad determinants of child health.

Methods

Site

Kisumu is the third largest city in Kenya, located in the western region of the country and covers an estimated 417 Km². Kisumu is surrounded by peri-urban informal settlements which have emerged through the years as a result of migration from rural and neighbouring urban centres (UN-Habitat, 2005). The population of Kisumu city is 409,928 (KNBS, 2009). Approximately 60 percent of the city's population reside in peri-urban communities (UN-Habitat, 2005). The current study was conducted in Obunga, an informal settlement within Kisumu city with over 20,000 households (Othuon and Chavene, 2012). Lack of sanitation facilities is a major challenge in Kisumu slums (Simiyu, 2015). Obunga does not have public constructed sewer lines. Some of the residents in Obunga construct their own toilets and empty them when they are full, while others use bushes for defecation (Karanja, 2010). Such poor living conditions have implications on the health and well-being of inhabitants.

Study design

Observations and in-depth interviews were used to collect data on child care and hygiene practices.

Sampling households

The sampling frame was based on the community health volunteers (CHV) catchment distribution in Obunga. Entry process permission was sought and granted by the area chief. All fifteen CHVs in Obunga trained by the government were recruited to participate in the study. Twenty-five households with children between the ages of 6 to 9 months were enrolled in the study. Enrolment was done over a one-week period in August of 2016. CHVs accompanied the enumerators during household visits. Participating households were selected purposively based on the study criteria. Other inclusion criteria was for the index child to have been living in Obunga area for the past three months, and that the caregiver was willing to give consent to participate in the study.

Training of enumerators

Data was collected by students from GLUK, referred to here as enumerators. All enumerators received training on data collection and completed an online national institute of health (NIH) human participant protection before commencing data collection. Enumerators were also trained on how to use the open data kit (ODK) to collect data. Data collection was piloted in Nyalenda A. All data was uploaded to a secure central server the same day of collection for storage.

Data collection

Structured observations

Structured observations were used to document care-giver interactions with the child. A structured observation guide was used to help the enumerators carry out activities in a chronological manner. The

guide contained brief instructions on the consenting process, identifying of the index child and the right positioning of the enumerator at the household.

Observations identified the number of people involved in care-giving, the dynamic role these individuals had in caring for the child. The primary caregiver was described as the person who was directly responsible for the index child and all activities pertaining to the index child at any given time. The secondary caregiver was described as any other person apart from the primary caregiver, who watched the child, or supported the primary caregiver. Observations were carried out either during the morning hours (7.00 am to 1.00 pm) or in the afternoon (1.00 pm to 7.00 pm), with each session lasting up to six hours.

In-depth interview

Each enumerator carried out a 30-minute in-depth interview with the caregiver at the household. The purpose of the in-depth interviews was to identify and explore environmental, cognitive and cultural determinants of child care and food hygiene behaviours. The in-depth interviews involved asking open ended questions, systematically recording and documenting responses coupled with intense probing for deeper meaning and understanding of the responses. The in-depth interview questions were divided into six sub-themes. The sub-themes included questions referring to the general care of the child, child food preparation, child food storage, reheating of child's food and weaning practices.

Data analysis

For qualitative data, we followed the procedures of thematic content analysis. An initial review of the data based on the research questions used the specific thematic areas for further analysis and coding. The themes were used as the categories for analysis. This was done through the process of coding in phases to establish meaningful patterns which resulted to the final report.

Ethical approval

The study was approved by the ethical review committees of both the Great Lakes University of Kisumu (Ref. No. GREC/010/248/2016) and the London School of Hygiene and Tropical Medicine (Ethics Ref: 11928).

Findings

A total of 31 caregivers from 25 households participated in the study. Nineteen households had one caregiver (Primary caregiver) and six households had two caregivers (Primary and secondary) per household. Twenty one out of the 31 caregivers were biological mothers and the remaining 10 were fathers of the children, older siblings, relatives (aunt and grandmother) living in the same household, paid house help or neighbours (Table 1). Caregivers hand washing practices are reported elsewhere (Davis et al., 2018).

Child Caregiver	Number of participants	Percent
Aunt	2	6.5
Father	3	9.7
Grandmother	1	3.2
House help	1	3.2
Mother	21	67.7
Neighbour	1	3.2
Sibling	2	6.5
Total	31	100

In most cases, the infant's food was prepared the same time family meals were prepared (Table 2). More than half of caregivers prepared food for the infant during the morning hours and then again during the afternoon or in the evening when they were preparing supper for the family. Sometimes the mother prepared

the infant's food in the morning before she left for work or to attend to other activities. When the child needed to eat, the caregiver who was providing care at that time was responsible for preparing or heating the infant's food and feeding the infant.

Majority of the caregivers said that they prepared the infant's food in advance and stored it for the child to be fed at a later time. Many caregivers preferred to use the flask or thermos to keep the infant's porridge or tea warm. Some caregivers kept milk, tea or porridge in a jug, and others left these cooked foods in the cooking pan (pot). Food items that were kept in a jug or left in the cooking pan was either kept in the cupboard, left on the kitchen table or on the floor. The most popular foods that were fed to infants were milk, porridge and mashed Irish potatoes. Children were fed water from as early as one day old.

Care givers were asked to give reasons for giving the baby water at an early age. Here is what some had to say. 'The baby gets thirsty,' 'water is good for the baby,' 'when a baby is born, they sometimes have a stomach ache, there is a woman here who told us that we boil water with salt or sugar and give him when he is having pain so it just happened the following day after he was born. We asked the caregivers where they learned to care for their children from. Here is what some caregivers had to say; 'I learned on my own' 'I learned from my aunt in Nairobi' 'I learned from the hospital. We also asked caregivers to explain what they know about child care. Some said they know how to feed the baby and how to give bath to a baby. Still, a large number of care givers had no response to these questions.

Food activity	Response	Percent
Time infant food is prepared	Morning Afternoon Evening	66 16 18
Number of times food is prepared	1 2 3	34 63 3
Most popular methods of food storage	Flask Jug Pan/pot	38 23 18
Reheating of food	Yes No	79 21
Method of infant feeding	Cup Hand Feeding bottle Spoon Plate	26 10 29 28 7

Majority of caregivers said they re-heated the infant's food before feeding. However, they did not believe that all infant foods needed re-heating. Milk, porridge and cooked potatoes came up as the most re-heated foods. Caregivers said they re-heated food to make it warm for the infant. Some caregivers added ingredients such as glucose, water, milk or cooking oil to the infant's re-heated food to improve taste or cool it down. More than half of the caregivers added milk to the infant's porridge.

Infants were fed using the feeding bottle, a cup, a spoon, or by hand. Feeding by hand was done in one of two ways; for foods that were non-liquid, the caregiver picked small amounts of food with her or his fingers to put in the infant's mouth. For foods that were more liquid, like porridge, caregivers used forceful hand feeding method to feed the infant.

Discussion

Food hygiene intervention studies have unsuccessfully tried to reduce prevalence of child diarrhoea in urban informal and rural communities (Agustina et al., 2013; Null et al., 2018, Luby et al., 2018). One common thread in these studies is that the researchers have been targeting the infant's primary caregiver at the household for food hygiene intervention. For mothers living in the informal settlements, balancing work, whether it is formal or informal employment, school, or other activities and child care is particularly difficult (Mehra et al., 1992).

Majority of caregivers in Obunga are young mothers with primary education level on average. A few made it to high school but even those; majority did not complete high school. Therefore, most of the caregivers have limited resources and are not able to afford formal care for their infants while they are out for work, school or carrying out other activities.

Child care is usually the responsibility of the infant's parents. The parents may seek the help of extended family members living in the same household or within the community to help with providing care when they are not available. Such informal arrangements may be made with extended family members to provide care to the infant at home or outside the home. In these arrangements, caregivers are usually not paid in cash or in kind. Some caregivers may provide care to their own children as well as those of their relatives or neighbours in their home while they run business or other activities in the community.

This study shows that child care providing phenomenon in the informal settlement is dynamic in nature. An infant is most likely to receive care from multiple caregivers in a day or have a different care provider from time to time. Therefore, if the aim of an intervention study is to reduce infant food contamination, it would make more sense to target all likely child food handlers in the home with the food hygiene intervention.

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