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Original Article

Targeting caregivers with context specific behavior change training increased uptake of recommended hygiene practices during food preparation and complementary feeding in Dedza district of Central Malawi

Numeri C. Geresomo, Elizabeth Kamau Mbuthia, Joseph W. Matofari & Agnes M. Mwangwela

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ABSTRACT

The effect of a targeted training intervention on uptake of recommended hygiene practices by caregivers of children 6–23 months was assessed. A sub-sample of 40 mothers from 303 households was used for a detailed study of hygiene practices during preparation of complementary foods after training. Mothers and caregivers were observed for 6 months and evaluated using a questionnaire. Data were analyzed using SPSS and Chi-square test was used to determine the differences in proportions of mothers and caregivers who adopted recommended practices. Results showed significant increase in the proportions of mothers and caregivers who followed recommended hygiene practices after training. There was significant decrease in prevalence of diarrhea among the children (45% to 8.6%). It can be concluded that targeted training on practical hands-on activities such as hand washing, cleaning of cooking and serving utensils, covering of food and water increase adoption of recommended hygiene and sanitation practices.

KEYWORDS: Adoption, complementary feeding, hygiene practices, sanitation, targeted training

Introduction

The problem of malnutrition is widespread in Malawi with prevalence of stunting affecting 26.9% of infants and young children aged 6–23 months and 37% of under-five children (National Statistical Office 2017 {NSO} and ICF. 2017). Poor child feeding practices such as low

meal frequencies and lack of food diversity coupled with frequent illnesses are the immediate causes of undernutrition leading to growth faltering, inactivity, and apathy (UNICEF 1997). Preparation of complementary foods in unhealthy environments results in microbial contamination and frequent illnesses among the children leading to undernutrition through disease (Geresomo et al. 2017). The relationship between undernutrition and poor health is complex because poor health leads to undernutrition which in turn increases susceptibility to disease (Katona and Katona 2008). Stunting negatively affects the physical, mental, social, and emotional development of the child (Chiutsi-Phiri et al. 2016). Stunting among children has therefore, far reaching consequences on the development of a country including late school enrolment by children, poor school performance, leading to low education attainment, high medical expenses and reduced economic opportunities during adulthood (Lusweti 2014). One of the challenges in Malawi is that studies on complementary feeding have mostly focused on dietary diversity, dietary adequacy, and meal frequencies and not much on food safety and hygiene (Picado and Mtimuni 2010, Chiutsi-Phiri et al. 2016). There is limited information on interventions that integrated complementary feeding and caregivers' hygiene practices.

There is evidence that providing skills and knowledge to caregivers through training on practices that improve hygiene and sanitation of the environment in which complementary food is prepared, reduces contamination and foodborne diseases (Katona et al., 2008, Seetha et al. 2017). This intervention was therefore implemented to equip caregivers with knowledge and skills to ensure appropriate hygiene and food preparation practices to prevent food contamination and improve nutrition and the health of young children.

Literature review

Food safety is of paramount importance in complementary feeding. Children that are fed with contaminated food are at risk of frequent illnesses which is one of the immediate causes of undernutrition. The Food and Agriculture Organization (FAO) defined food security as "the condition that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO, 2006). This therefore implies that the food should be sufficient, acceptable and free from any materials that may be harmful to human life. Complementary foods therefore should be diversified, nutritious, acceptable and free from contaminants that may make it unsafe to the children. It is important to ensure that complementary foods are carefully handled because the transmission of infections occurs by direct contact and improper storage and processing of the food (Sheth and Dwivedi 2006). Improving complementary feeding may therefore contribute significantly to preventing and mitigating mortality and enhancing child growth and development (Lutter and Dewey 2003). Mothers and caregivers should be made aware of the dangers of feeding children with contaminated food and to train

them on recommended hygiene and feeding practices that ensure food safety and adequate nutrient intake.

Studies have shown that provision of nutrition education to caregivers may lead to behavior change that improves hygiene practices which reduces food contamination (Ickes, Baguma, Myhre, Adair, Bentley and Ammerman, 2017). A study conducted in Zanzibar identified maternal education as an important determinant of child survival (Kung'u et al. 2009). Kyung'u et al. (2009) indicated that food contamination varies from household to household reflecting existence of poor hygiene practices by mother and caregivers who have low education attainment. These findings imply that skilled and knowledgeable mothers and caregivers tend to have good health seeking behavior. It has been suggested that the various pathways through which maternal education promotes child survival include the acquisition of health knowledge, adherence to recommended feeding practices for children, and increased command over resources (Ranneileng 2013). Maternal education has also been linked to improvement in child nutrition and reduction of undernutrition (Ickes et al. 2017, Makoka 2013). Results of a study conducted in Egypt by Zotarelli, Sunil and Rajaram (2007), showed that the risk of being stunted was lower among under-five children of educated mothers than among children whose mothers were not educated. Another study conducted in a rural area in South Africa showed that malnutrition was lower among children of mothers who had attained higher levels of education than children of mothers with lower levels of education (Chopra 2003). This may be attributed to the fact that educated and literate mothers tend to adopt innovations easily and may read instructions on child care practices unlike those who are not literate (Kumar et al. 2015). There is also evidence that increased levels of education enhance women's productive capacities which directly impacts on household food security and nutrition (FAO, 2005). Education empowers women economically and mothers who have control over household resources tend to allocate more of the resources toward provision of adequate and diversified food to household members (FAO, 2005). In Malawi, however, education attainment among women is very low with 36% of all women not able to read or write (NSO 2014). In such cases, provision of non-formal education to mothers or caregivers in form of targeted training on specific child feeding and hygiene practices would assist to improve nutritional status and child feeding practices (Seetha et al. 2017).

Study population and location

This study was conducted among caregivers of children aged 6–23 months in Mayani Extension Planning Area in Traditional Authority Tambala of Dedza district in Central Region of Malawi between December 2016 and May 2017. The study determined caregivers' uptake of recommended hygiene and sanitation practices during food preparation and complementary feeding of children after being trained. Information was collected at baseline and after

caregivers were trained on recommended hygiene and sanitation practices in their communities. This work was part of a larger community-based cross sectional nutritional study that was conducted to develop and implement a training intervention to mitigate and prevent microbial contamination of complementary foods among rural communities in Dedza district in Central Malawi. In the larger study, a randomly selected sample of 303 households was used; and caregivers were interviewed on various aspects of child care and feeding practices. The results from those interviews have been published elsewhere (Geresomo et al. 2017). Nutritional status of 306 children aged 6–23 months was assessed using anthropometry and the findings have also been published elsewhere (Geresomo et al. 2017). Some critical factors that required behavior change among caregivers to improve child feeding and care practices and ensuring safety of complementary foods were identified in the larger study. The results necessitated the need to train caregivers on recommended hygiene and sanitation practices when preparing complementary foods and during child feeding. This manuscript is therefore a continuation of the previous studies and presents information on the training intervention that was designed and implemented in response to the gaps that were identified in the larger survey.

Study design

The 'Before-and-After Without Control Design' approach (Kothari and Garg 2014) was used to determine the effectiveness of context specific behavior change training on uptake of recommended hygiene practices during food preparation and complementary feeding by caregivers (figure 1). In the Before-and-After Without Control Design approach, the same sample is assessed at baseline (before training) and then trained and allow some time to pass so that participants can internalize the information and innovations passed on during the training before being re-assessed. In our case a period of 6 months was allowed to pass before final evaluation. A sub-sample (nested sample) of 40 households from the original 303 households was randomly selected from two communities (Kamgunda and Mtawanga villages) to make detailed assessment on complementary feeding and hygiene practices by caregivers. The nested sample is a useful approach to collect, interpret or verify data in detail from a small samplethat represents the original household sample size of 303 (Onwuegbuzie and Leech 2007). In this study, a nested sample of 40 mothers and caregivers and 40 children (6–23 months) is large enough to achieve data saturation (Flick 1998), it is suitable for within-case analyses that involve analyzing, interpreting, and legitimizing data in a context that makes up a single case for a small group or a community. Nested sampling strategies also facilitate credible comparisons of members of the same subgroup where one or more members of the subgroup represent a sub-sample of the full sample (Onwuegbuzie et al., 2007).

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Figure 1. Demonstration of hand washing during training.

Collection of data

In-depth interviews

In-depth interviews were conducted with caregivers using a pre-tested checklist of questions on hygiene practices and food handling (FAO, 2014). Caregivers with children aged 6–23 months, permanent residents to the community and who gave consent to participate in the study were recruited. Confidentiality was ensured during the interviews by not allowing other people to sit around and listen to the discussions. Data were collected on hygiene practices during food preparation which included hand washing, sorting of grain, and legumes during processing, cleaning of utensils for preparation and serving of complementary foods. Information was also collected on main source of drinking water for the communities and how caregivers protected the food and water from contamination. Caregivers were also asked to indicate whether their child had diarrhea or not 2 days before the interviews.

Observation of caregivers

Researchers visited caregivers in their homes to observe sanitation of the surroundings and how caregivers ensured hygiene during cooking of complementary food, storage of water for drinking, serving of food and the actual feeding of the children. Before the visit, caregivers were

not informed on the type of information that was going to be collected to prevent them from being biased when responding to questions. Checklists for hygiene practices were used to score caregivers hygiene practices during the visit. The criteria for hygiene during food preparation included cleaning of the kitchen or cooking place before cooking, washing of hands by caregiver, washing cooking utensils, use of water from clean and covered containers, use of clean utensils for carrying cooking ingredients, covering of food during cooking, covering of food after cooking and serving food on clean plates or in clean cups. Personal hygiene was assessed by checking the cleanliness of the clothes, covering of hair during cooking, short finger nails, and body cleanliness. These attributes were scored as "Yes = 1" representing correct practice and "No = 2" representing incorrect practices. The duration of cooking the food and consistency was also assessed using standard recipes for preparing complementary foods. After observations, researchers identified and recorded all the practices that were perceived as inappropriate and unhygienic among caregivers.

Intervention

From the gaps identified from in-depth interviews and observations, messages on recommended practices to improve hygiene and safety of complementary foods were formulated and compiled into a community training manual (Malawi Government 2014). The training manual was pre-tested in a different community to ensure that the messages were clear and conveyed the desired information to bring behavior change among the caregivers. Community-based training sessions were planned for caregivers in the two targeted communities. Training sessions were conducted in the two communities covering a period of 2 days for each community. Researchers trained caregivers on recommended hygiene and food preparation practices. Emphasis was put on practical aspects of hygiene where caregivers participated in hand washing, proper washing of utensils for cooking and serving food (Pic1), cleaning of cooking areas and child feeding. Caregivers were also taken through the negative consequences of not observing hygiene on the health and nutrition of the children and family members. Training materials included cooking utensils and food ingredients from the communities. Locally available materials from the communities were used to demonstrate to caregivers that it was possible to prepare complementary foods that were hygienic and nutritious using what was available in their communities. The topics covered during training are presented in table 1.

Evaluation

Six months after training, the caregivers were evaluated at the end of the month of May 2017 for hygiene practices and sanitation. The same checklists and questions used during the baseline study were used. Data were collected on hand washing, cleaning of cooking and water utensils, covering of food during preparation and storage, preparation of food in clean

environment and diarrhea among the children. Observations of the cooking places and environment in which water and food were stored by caregivers were also made. Personal hygiene of the caregiver was assessed by observing the cleanliness of the clothes, cleanliness of the body and care of hair and fingernails. Mothers were also asked to prepared food in the presence of the research team and observations were made on hygiene practices. Scores were awarded for all the observations using the same criteria of "Yes = 1" meaning correct practice and "No = 2" meaning not correct practice. Caregivers were also asked to recall some of the topics they learned during the training to demonstrate retention of knowledge.

Data analysis and management

Data were collated and entered into SPSS where they were coded into categorical variables for analysis. Data analysis included cross tabulation of baseline and final evaluation data to compare the variables of interest and to determine the magnitude of change in practices, 6 months after the training intervention. Chi-Square test was used to determine the differences in proportions of caregivers who followed recommended practices and those who did not. Qualitative information from observations was triangulated with household information collected using the checklist in addition to information collected during the training sessions.

Ethical consideration

This study was part of a larger research work whose ethical approval was obtained from the National Health Sciences Committee of Ministry of Health in Malawi under the Approval Number NHSRC #15/4/1432. Oral consent was also obtained from all mothers and caregivers who participated in the study.

Results

Socio-demographic characteristics of the respondents

A total of 40 caregivers were trained and assessed for behavior change in hygiene and child care practices. The mean age of the caregivers was 25.3 ± 7.6 years and the ages ranged from 16 to 42 years old. The mean household size was 5.0 ± 2.0 people and with an average of about two children (1.5 ± 0.6) under the age of 5 years. The majority of caregivers (82.5%) could read and write. Only 12.5% of caregivers attained secondary school education and 17.5 could not read or write while 20% had no formal education (table 2). The results further show that overall, 80% of the mothers and caregivers were married and 67.5% were monogamous (one wife, one husband) while 12.5% were in polygamous marriages. One fifth (20%) of the mothers and caregivers were single; either because of divorced (12.5%) or had never married before (7.5%).

The majority of caregivers did not observe the recommended sanitation and hygiene practices before the training (table 3). Table 3 further shows that the majority of mothers and caregivers followed recommended practices 6 months after the training. There were highly significant differences ($p < 0.05$) in hygiene practices before and after training. The majority of mother and caregivers washed hands with soap before and used water from protected sources such as boreholes and protected wells. The changes in the practices are described in table 4. Mothers and caregivers started making conscious decisions to wash clean cooking utensils with detergent before cooking and also getting rid of refuse and animal wastes around homesteads to keep the surroundings clean. The cooking areas were also cleared of dust and refuse by sweeping and sprinkling water to prevent dust from contaminating the food. In general, there is significant change in the proportion of mothers and caregivers following recommended practices.

Discussion

In this study, training interventions to promote recommended hygiene practices among mothers and caregivers of children aged 6–23 months during complementary feeding were implemented using a nested sample of 40 mothers and caregivers. The results have shown significant change in hygiene practices among mothers and caregivers. The findings agree with results of other studies conducted in South Africa (Phaswana-Mafuya and Shukla 2005), Indonesia (Greenland, Iradati, Ati et al., 2013) and Pakistan (Saleem et al. 2014) where mothers demonstrated significant behavior change after an education intervention. Targeting individuals with training on specific health behaviors may result in adoption of positive practices and improved outcomes of health and nutrition attributes of interest when the trained individual is motivated with the outcome of the intervention. The motivators may include improved child health, improved nutrition and reduced morbidity among the children (Nankumbi and Muliira 2015). A study conducted by Saleem et al. (2014) in Pakistan showed that training mothers for 30 weeks in use of a high protein food in complementary foods led to increased linear growth in children. In a study conducted in Eastern Cape Province of South Africa by Phaswana-Mafuya and Shukla (2005), regular water supply, availability of sanitation facilities and consumer knowledge were highlighted as motivators to improved hygiene practices. In this study, caregivers reported that practices such as washing hands before preparing food and feeding the child, washing cooking and eating utensils resulted in children not having diarrhea frequently. In a study conducted in Mchinji and Balaka districts in Malawi by Seetha et al. (2017) in which mothers were trained for 21 days using the Positive Deviance Hearth concept, the results showed significant improvement in child care practices which resulted in reduced incidences of diarrhea among the children. The results further showed significant reduction of wasting among the children. Reduction in prevalence of diarrhea among the children in this

study demonstrated the effectiveness of the training intervention in improving hygiene and child care practices.

In this study, the majority of mothers and caregivers were in the reproductive age category (15–49 years). The relationship between age and adoption of new technology has been reported in some studies (Mwangi and Kariuki, 2015). Young people have been reported to be less risk averse and more willing to try new technologies than old ones. This implies that targeting young mothers and caregivers with training might contribute to an increase in adoption of recommended practices. The mean household size of 5.0 ± 2.0 people and an average two children per household reflect larger family sizes than the national household size of four persons per household (NSO and ICF Macro 2011). Families with large household sizes tend to be constrained in terms of resources and this makes it difficult for caregivers to provide adequate care and support to children (Mostue and Huttly 2008). Large size families also tend to have overcrowded households where sanitation and hygiene may be poor. Children in such households may fall sick frequently leading to increased malnutrition (Katona et al. 2008). Training of mothers and caregivers therefore created awareness of the importance of following recommended hygiene practices that prevent food contamination leading to reduced frequency of illnesses including diarrhea and undernutrition.

Some of the challenges encountered in this study were that some mothers and caregivers were single (table 2) and these were constrained in terms of financial resources. Poverty tends to be high among single family women who need to fend for themselves. Due to limited resources, sometimes it may be difficult to access materials such as soap and detergents that may assist in observing good hygiene practices. The other challenge was that majority of mothers and caregivers (75%) had only attempted primary education and over one fifth (22.5%) had not attempted any formal education. This implies that literacy levels were low among the mothers and caregivers. Women who have more years of schooling tend to have better health and well-being and healthier behaviors (Feinstein et al. 2006). Literacy may also determine the methods and approaches used to pass on technical messages to mothers and caregivers during training. Mothers and caregivers who cannot read or write may not understand messages that are disseminated using printed materials. In such circumstances, demonstrations and role plays may be helpful. In this study, emphasis was put on hands-on practical activities to ensure that every mother and caregiver was able to follow the recommended hygiene practices during complementary feeding. Assessment of hygiene practices and prevalence of diarrhea after the intervention showed improvement in the practices and reduction in prevalence of diarrhea, respectively.

The study therefore demonstrates the importance of providing tailor-made training to mothers and caregivers during complementary feeding period. The significant reduction in prevalence of

diarrhea among the children (from 45% to 8.6%) reflects effectiveness of the training on improvement in hygiene practices among mothers and caregivers.

Conclusion

This study has demonstrated that targeted training of mothers and caregivers may lead to positive behavior change towards adoption of recommended complementary feeding and hygiene practices. Provision of skills in caring and cleaning of cooking utensils and washing hands during processing, cooking, and feeding the children may contribute to significant reduction in prevalence of diarrhea among the children. These findings imply that training of mothers and caregivers should not only target behavior change but also provide skills to ensure that mothers and caregivers correctly process and prepare complementary foods in the manner that is safe and hygienic.

Table 1. Description of topics covered during training.

Topic covered	Key messages	Demonstrations conducted
Personal hygiene	Always wash hands with clean soapy water after using the toilet, before cooking food, before feeding the child, after blowing nose, after touching raw foods to prevent food contamination.	Washing hands with soap
		Trimming finger nails.
	Always wear clean clothes when cooking food and when feeding the child to prevent contamination	Wearing clean clothes during food preparation
	Keep finger nails short and cover hair when preparing and serving food to prevent contaminating the food	Covering hair during washing of utensils and food preparation
Cleaning utensils	Always use clean utensils when keeping, preparing, serving food, and feeding the child	Cleaning pots and plates with detergents
	Always clean utensils after feeding the child.	Using clean and running water
Sorting grains for preparing complementary foods	Remove and discard damaged, discolored, molded, and shriveled grains before milling into flour.	Sorting maize grain before milling.
	Soak maize grain to remove impurities and mold	Soaking maize before

Topic covered	Key messages	Demonstrations conducted
	spores before milling into flour.	milling.
Complementary feeding of children of different age categories	Feed children diversified foods; porridge should not be watery but thick to provide adequate energy and nutrients. Feed children frequently Give children snacks in between meals every day	Chart of the six food groups in Malawi Examples of food in each food groups
Food preparation	Cook food thoroughly to ensure that the starch in maize flour is well gelatinized. Cook foods at high temperatures to kill harmful bacteria. Cover food when cooking and after cooking Prepare food in clean environment. Reheat food at high temperatures to kill harmful bacteria	Cleaning the surroundings and working surfaces Cleaning pots and plates Cooking porridge Serving food to children Covering food
Water hygiene	Get water from protected and safe sources, collect water in clean and covered utensils, and keep water covered in clean environment. Keep animals away from sources of drinking water to prevent contamination	Cleaning water utensils Covering water

Table 2. Education attainment, literacy, and marital status of caregivers.

Variable	n	%
Can caregiver read or write?		
Yes	33	82.5
No	7	17.5
Highest level of education attained		
None	8	20.0
Primary grade 1–4	12	30.0
Primary grade 5–8	14	35.0
Junior secondary education (Form 1–2)	5	12.5
Adult literacy	1	2.5
Marital status		
Married (monogamy)	27	67.5
Married (polygamy)	5	12.5
Divorced	5	12.5
Single	3	7.5

Table 3. Hygiene practices and prevalence of diarrhea during the baseline survey and at 6 months after training

Recommended practice	Before training		After training			
	n	%	n	%	χ2	p-Value
Cleaning cooking utensils before cooking	26	65.5	40	100.0	16.97	<0.01
Preparing food in clean environment	21	52.5	35	87.5	11.67	<0.01
Washing hands with soap and clean water before handling food	6	15.0	39	97.5	55.31	<0.01
Observing personal cleanliness during cooking food	15	37.5	34	85.0	19.01	<0.01
Covering food during cooking	16	40.0	36	90.0	21.97	<0.01
Covering food during keeping	20	50.0	37	92.5	17.64	<0.01
Using water from protected sources	33	82.5	39	97.5	5.00	0.03
Covering water during storage in the home	9	22.5	38	95.0	43.38	<0.01
Water stored in clean utensils	20	50.0	38	95.0	20.31	<0.01

Table 4. Observed change in hygiene and food preparation practices among mothers and caregivers before and after training.

Practice before intervention	Practice 6 months after intervention
Personal hygiene	
Clothes not clean Hands rarely washed Hair not covered during cooking	Wearing clean clothes when preparing food and feeding children Hair was covered always when handling food Hands washed regularly with soap and clean running water before handling food
Cooking pots and serving plates	
Pots not thoroughly washed with detergents Washed with water in which other items were washed Pots cleaned only inside Plates not cleaned after feeding the child	Pots were always washed thoroughly inside and outside with clean water before and after cooking
Water hygiene	
Water not covered in storage Obtained from unprotected sources Leaves put in water buckets during transportation to household	Majority of caregivers obtained water for cooking and cleaning from safe sources Water was covered always during storage
Environment for food processing and preparation	
Homestead surroundings littered with animal dung and refuse	No animal droppings around homesteads Homesteads cleared of refuse and well swept and clean

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