An exploratory pilot study of the effect of modified hygiene kits on handwashing with soap among internally displaced persons in Ethiopia.

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Abstract

Background Internally displaced persons (IDPs) forced to flee from their homes due to conflict and drought are at particular risk of morbidity and mortality due to diarrhoeal diseases. Regular handwashing with soap could substantially reduce the risk of these infections, but the behaviour is challenging to practice while living in resource-poor, informal settlements. To mitigate these challenges, humanitarian aid organisations distribute hygiene kits including soap and handwashing infrastructure. Our study aimed to assess the effect of modified hygiene kits on handwashing behaviours among IDPs in Moyale, Ethiopia.

Methods The pilot study evaluated three interventions separately; liquid soap, a ‘good quality’ scented bar soap and a mirror as modifications to a standard hygiene kit. The hygiene kit was distributed to four study arms, with three of the arms receiving one of the interventions in addition. Three to six weeks after distribution, behaviour change and perceptions of the interventions was assessed through structured observations, surveys and focus group discussions.

Results At follow-up, handwashing with soap was rare at key times in all study arms. In the arm that received liquid soap, handwashing with soap was seen at 20% of key times but this was not indicated significantly different to the control arm were a prevalence of 17% (p-value=0.348). In the two other intervention arms prevalence was <11%. Participants in FGDs indicated that the liquid soap, scented bar soap and the mirror made handwashing more desirable. In contrast the standard bar soap distributed in hygiene kits was not viewed as being nice to use.

Conclusion This study did not identify any effect of the modified kits on handwashing behaviour. However, it did indicate that there is value in better understanding hygiene product preferences as this may contribute to increased acceptability and use among crisis-affected populations. The challenges of doing research in conflict-affected regions had considerable implications on the design and implementation of this study.

Trial registration The trial was registered at www.ClinicalTrials.gov 6 September 2019 (reg no: NCT04078633)

Background

Crisis-affected populations are at increased risk of diarrhoeal morbidity and mortality (1) and in conflict-affected settings children under five years of age are 20 times more likely to die from diarrheal disease than from violence associated with the conflict itself (2). This is because crises often force populations to be displaced to crowded, informal living environments enabling diseases to spread more easily from one person to the next. At the same time many of the institutions, infrastructure and social support systems that would normally support health break down, resulting in decreased diagnoses and treatment and increases in the severity of disease. Inadequate access to water, sanitation and hygiene remains a global challenge but these challenges are particularly pronounced in crisis-affected regions (3-6).

The seemingly simple act of handwashing with soap (HWWS) is associated with 23-47% reduction in diarrhoea morbidity and up to 25% reduction in respiratory illness (7-10). Convenient access to handwashing soap products and handwashing facilities is a crucial determinant for enabling handwashing behaviours (11, 12). Handwashing facilities with water and soap present act as a reminder or cue to perform handwashing behaviour at critical times. When infrastructure is lacking, the perceived psychological trade-off (such as perceiving handwashing to be a strenuous physical endeavour to complete) may make HWWS less likely to be performed (11). It has been argued that during humanitarian crises, the determinants of handwashing behaviour may differ from stable settings because crises typically cause such substantial disruptions of cultural and habitual norms (13). In such circumstances, health-protecting behaviours such as HWWS may be compromised given the multitude of other challenges that populations are dealing with. However, evidence about these behavioural shifts or the determinants of handwashing behaviour during crises remains limited (3, 11, 14).

Humanitarian crises differ from stable setting in other important ways. In a crisis, humanitarian actors typically provide hygiene items to populations rather than assuming communities can provide this themselves (as is the case in stable settings) (15). The Sphere Standards for Humanitarian Action provides a minimum list of items to be included in hygiene kits including water containers, soap for bathing, soap for laundry, a handwashing station per household or a handwashing station with soap and water at shared toilet facilities (16). However, there is no standard definition of hygiene kits and as a result the type, quantity and
quality of the components of hygiene kits vary widely between organisations (15, 17). The items included in hygiene kits can also vary based on the context its being distributed in. This can be influenced by the feasibility of transporting or procuring items for populations that are fleeing (16) population needs (e.g. water treatment products may be more needed in areas experiencing cholera outbreaks) (18, 19) and population preferences around hygiene products(15). An increasing trend of distributing cash or voucher-based assistance in combination or in place of hygiene kits or hygiene products has been seen the last years (15, 16, 20).

Hygiene kits aim to reduce the risk of disease transmission by encouraging increased levels of hygiene at the household level. However, there is limited evidence about the acceptability of hygiene kits, the use of hygiene kit products by crisis-affected populations and the effect of hygiene kit distributions on behaviour or health outcomes (13, 15, 21-23). Available evidence has predominantly focused on soap or hygiene kit distributions in camp settings or during cholera outbreaks and has documented mixed results (13, 22, 24-26). One study in Bangladesh distributed hygiene kits to cholera cases upon discharge from treatment centres and showed promising impacts on behaviour and health outcomes (24). The majority of other studies have focused on the feasibility of distributing hygiene kits, highlighting challenges with achieving sufficient coverage of the population (23, 27). Many of the studies of soap and hygiene kit distributions rely on self-reported measures or proxy measures of product use and behaviour (21, 27, 28), which are considered less reliable indicators of handwashing behaviour (29). Given this current state of evidence, a recent systematic review of health interventions for emergency settings called for further research into the behaviour change potential of hygiene kit components, particularly soap (3).

Internally displaced persons (IDPs) residing outside of camps are systematically less studied due to the complexities of conducting research in these settings. For example, a recent systematic review found that of all water, sanitation and hygiene (WASH) literature published about crisis-affected settings only 17% related to populations residing outside of camps and that only 41% relates to IDP populations (30). This is concerning given that in 2019 there were 15.4 million more IDPs than refugees globally and an estimated 29 million IDPs who live in out-of-camp settings (31). In these out-of-camp settings, IDPs are more vulnerable because they are often overlooked by both governments and non-government organisations (31).

Our study aimed to explore the potential for locally available and rapidly deployable hygiene kit interventions to increase HWWS soap at critical times among IDPs living in an out-of-camp setting. Specifically out pilot was designed to explore whether minor modifications to improve the quality of hygiene kit products could. We pilot tested the inclusion of a ‘good quality’ bar of soap, liquid soap or mirrors within the hygiene kits distributed by Action Against Hunger (AAH). The bar soap we tested differs from standard bar soap included in AAH’s hygiene kits in 3 important ways: the soap was scented (whereas their standard bar soap was not), the soap had olive oil extracts in it, which was intended to make hands feel smoother after use (according to the manufacturer) and the cost of the soap was higher than the standard bar soap. The desire to smell nice has been found to motivate HWWS and therefore this was included as an intervention in our study (32). Our rationale for choosing liquid soap as an intervention was based on patterns of global soap usage; use of bar soap in stable and higher income settings is declining, and liquid soap now accounts for 47% of personal soap use (33). A study of perceptions of bar soap in the US found that over half of consumers found liquid soap more convenient to use than bar soap and 48% of consumers believed germs would remain on the bar soap after use (33). We also hypothesised that changes to the physical environment surrounding the handwashing facility could cue behaviour and make it seem more desirable and therefore result in handwashing facilities being used more frequently or for a longer duration. To test this, we distributed a mirror with the hygiene kits to be placed over the handwashing station. Adding a mirror is hypothesised to makes a handwashing facility more desirable (34), but its effect on handwashing behaviour has been poorly documented to date (35).

Methods

Study site

The research took place between September and November 2019 in Moyale District, southern Ethiopia. At the time of the research the district was facing a protracted and complex emergency due to prolonged drought and armed conflict (36). Regular violent clashes between unidentified armed groups and security forces (36) and recurring clashes between the district’s two
ethnic groups, the Borena Oromo and Garreh Somalis resulted in district-wide instability (37). There have been repeated cholera outbreaks in the district with a larger outbreak in 2016 (38). During the study period some suspected cholera cases were reported by local health officials and an outbreak was confirmed in January 2020 (39). The area remains a priority area for the delivery of life-saving health services by the Ethiopian government and aid agencies (39).

Moyale District has experienced a substantial influx of internally displaced persons (IDPs) who settled within and around existing villages in the district. There were no official displacement camps at the time of the study. As of October 2019 an estimated 110, 000 IDPs were thought to be living in the area (40). IDPs were responsible for constructing their own shelters which were typically dome-shaped and made of wood and plastic sheeting. Over time IDPs would improve their houses by adding solid mud walls and thatched roofs. The majority of the IDP population were pastoralists and typically lived in close proximity to their animals including cows, goats, sheep, camels and donkeys. Water was predominantly collected from surface water sources (lakes and ponds) and public taps, standpipes and boreholes, but often included an extended journey by foot for collection or prolonged waiting times at public water sources.

Moyale district was chosen as the study location because of the large influx of IDPs in the area and the identified need for WASH interventions in the area (40) that were currently not met by aid organisations. The area was also chosen because the study partner, AAH, were working in the area. Prior to this research commencing our partner organisation had not distributed hygiene products or conducted hygiene promotion in the area in the last year, but they had been running nutrition programmes. To the best of our knowledge, no other distributions of hygiene kits had taken place in the area prior to the research.

Study design, sampling and recruitment

This study was an exploratory pilot study with three intervention arms and one control arm. The villages for the study were purposefully selected by the Moyale District Disaster Risk Management Office who provided lists of 100 IDP households in each study site based on the following criteria: 1) at least 100 IDP households in the area, 2) the area was safe for the research team to work in. Some of the other selection criteria initially proposed by the study team were not possible to fulfil. This included a selection process were the study team could access maps of IDP households to allow for clustering prior to intervention distribution as well as the provision of full list of all IDP households in the study area but this was not accessible in the study setting. No randomisation at cluster level was possible, meaning the sample size was equal to one per study arm. The four study arms were randomised to receive one of the three interventions or the control using a random number generator. Figure 1 shows the exploratory pilot study design. In total, 400 households were recruited to the study (100 per study arm). Each study arm was located in a separate “kebele”, the smallest administrative unit in Ethiopia (similar to wards) and geographically separated by at least 3 kilometres. A minimum of 50 households per study arm were recruited to participate in the data collection. On average the selected villages were home to approximately 250-1500 household (40), although at the time no reliable estimates of populations existed given the dynamic population movement in the region. This relatively small sample size for both distribution and data collection was determined due to logistics, budget and security constraints.

Intervention description

All four study arms received the interventions between the 18th to 24th September 2019. The hygiene kit that formed the basis for our intervention was a hygiene kit informed by the Sphere humanitarian standards (16), but altered to include only items that could be relevant to handwashing. Therefore, in this study we classify a hygiene kit (from now referred to as “standard hygiene kit”) to consists of 25 x 100 grams body soap (0.36 USD per bar of soap), 8 x 250 grams laundry soap (0.42 USD per bar of soap) and a handwashing facility (5 USD per facility). The handwashing facility is pictured in picture A, B and C of Figure 2 and was of 20 litre capacity, had a large round body with a tap and a narrow opening on top covered by a lid. In each of the intervention arms, 100 households received the standard hygiene kits and, in addition to this, they received one of the three interventions: Intervention arm 1 (IA1-Liquid) received liquid soap (Pictured in Figure 2A, 2x500ml bottles costing 1.48 USD per bottle), intervention arm 2 (IA2-Scented) received a scented bar soap (Pictured in Figure 2B 2x250gr bars, costing 1.2 USD per
180gram bar), and Intervention arm 3 (IA3-Mirror) received a mirror (Pictured in Figure 2C, size was 297x420mm and the price per mirror was 7.77USD). In the control arm 100 households received the standard hygiene kit only. All items in the hygiene kit were procured from central suppliers in elsewhere in Ethiopia, but they were also available to purchase locally.

Implementation of the intervention was conducted by AAH hygiene promotion staff. These individuals were not involved in any other study procedures and were unaware of the planned process for the data collection on HWWS behaviour. A record was compiled of all households receiving the kits. Hygiene promoters were instructed to assist households in IA3-Mirror to hang up the mirror next to the handwashing facility. All households were encouraged to build a stand for the handwashing facility and to keep the soap near the facility at all times.

**Outcomes of interest**

The primary outcome of our study was the prevalence of handwashing with soap at key events (after defecation, before preparing food, before eating, before serving/feeding another person food, after cleaning a child's bottom) by IDP household members of any age. The secondary outcomes were the perceived acceptability and desirability of the interventions among the IDP population in our study area.

**Structured observations and household surveys**

Handwashing events were measured through three-hour long structured observation sessions. The sessions took place from 7:30am to 10:30am or 8:30am to 11:30am, depending on varying daily security restrictions. The research assistants were trained to document critical handwashing opportunities which were defined as 1) after using the latrine or open defecation, 2) after cleaning a child's bottom, 3) before food preparation, 4) before eating, 5) before feeding a child or serving another person food. The research assistants captured the time of the event, who conducted the action (adult female/adult male, child between 5-18 or child under 5 years of age), if soap was used and if so, which type of soap was used. Missed opportunities for handwashing were also captured. The structured observations were conducted among a sample of 50 households (out of the 100 in total) within each study arm. Participating households were drawn randomly (using a random number generator) from the sampling frame that was developed by the study team of all households who received a hygiene kit. If a randomly selected household could not be located on follow-up, a new household was randomly selected for data collection. A household survey was administered once the observation was concluded to capture sociodemographic data, hygiene proxy indicators (41) and perceptions of benefits of soap. The survey respondent was the male or female head of household or other adult respondent available at the time of the survey. The survey included a spot-check which documented whether the handwashing facility was available, whether there was water in the facility and whether there was soap next to the facility. The data collection tools for structured observation and the household survey are available (see Additional file 1 and Additional file 2).

**Focus Group Discussions**

Focus group discussions (FGDs) were conducted in parallel with the quantitative data collection. Participants were randomly selected using a random number generator from a list of eligible participants. The list included households that received a hygiene kit in any of the four study arms but were not selected for structured observations or surveys. The FGDs aimed to explore barriers to handwashing and the acceptability and perceived usefulness of the hygiene kit products. Three FGDs with men and three FGDs with women were carried out, each with 4-8 participants. A FGD topic guide was developed (see Additional File 3). The facilitator of the FGDs first asked participants about current challenges faced by IDPs concerning HWWS. The facilitator then introduced the participants to six different types of soap: liquid soap (as used in IA1-Liquid), a scented bar soap (as used in IA2-Scented), a standard bar soap (as used included in the standard hygiene kit), an antibacterial bar soap, a low-cost bar soap and a bar of laundry soap (figure 3). Participants then tried out each of the soaps and reflected on what they enjoyed and did not enjoy about handwashing with each product. During the second part of the FGD the facilitator introduced the mirror that was distributed in IA3-Mirror. Participants were asked about what they liked and disliked about the mirror and where they would hang the mirror and why..
Consent

Written informed consent was sought from all the household members over the age of 18 who were invited to participate in the observation and surveys. Information sheets and consent forms were prepared in the local language, Afaan Oromo. Parents or guardians provided consent for household members under the age of 18. Observation participants were informed that the data collectors were hoping to understand the ‘daily routines of people in the area’ and were not explicitly told that hand hygiene was being observed so as to minimise reactivity bias. Written informed consent was sought from all FGD participants. All FGD participants were over 18 years old.

Data Collection

Data was collected at one time-point 3-6 weeks after the hygiene kit distribution. Structured observation lasted three hours, household surveys took approximately 20 minutes and FGDs took between 45-75 minutes. FGDs took place at the kebele leader’s office. The data collection team was comprised of sixteen people; 15 research assistants recruited locally by AAH and one researcher from the London School of Hygiene and Tropical Medicine (AHT). All the data collection staff were women. The research assistants received one and a half-day training by AHT on the study methods and then practised observation within the classroom and in a pilot study site. The research team were not connected to the intervention delivery. All data were captured on printed paper forms. At the end of each day of data collection, the lead author (AHT) checked all surveys and structured observation forms. If any discrepancies were found, the team would return to the household the following day to correct any inconsistencies. One of the data collection team played the role of a field supervisor whose job it was to conduct spot checks of research assistants during data collection for quality control.

Data management and analysis

Data from structured observations and surveys was double entered into Microsoft Excel and cleaned. The data was checked to identify discrepant entries against original paper surveys and consistency checks were completed. Descriptive analysis was conducted on observational data and survey data in Stata 16 (StataCorp 2015, College Station, TX, USA). Bivariate analysis (chi-square) was used to compare intervention arms with the control arm.

FGDs were recorded, transcribed and translated from Afaan Oromo to English. The transcripts underwent thematic analysis informed by the methods outline by Braun and Clarke (42) and conducted with the aid of NVivo 12 (QSR International, Doncaster, Victoria, Australia). An inductive approach to identifying themes was used based on the topics covered by the FGD topic guide. This included barriers to handwashing with soap and the use of mirrors in the household. Ranking data from the FGD were summarised according to gender and analysed descriptively.

Ethics statement

The research received ethical approval from the London School of Hygiene and Tropical Medicine Ethics Review Committee (Ref: 17604) and Oromia Regional Health Bureau (Ref: BEFO/11BTP4/79/2011). The study was also approved by the Disaster Risk Management Office and Health Office at zonal level (Borena) and district level (Moyale) through face-to-face meetings with the study coordinator and AAH representatives.

Results

Sociodemographic characteristics of households who participated in structured observation and survey

In total, 400 households received a hygiene kit. Of these, 203 households were enrolled for structured observation. Despite the study regions being selected for their similarity, we found variation within population demographics. The control arm was a
mixture of people of the Borena and Gabbra ethnic groups, while the populations in the intervention arms consisted entirely of people from the Borena ethnic group. IA3-Mirror was located 13 km from the main road in an area more affected by drought and flooding, while the other study arms were located along or within 1 km of the main road. Of the randomly selected households, six households in IA3-Mirror were not available for data collection as floods hindered data collectors from reaching the household. Four households in IA1-Liquid and six households in IA2-Scented were not available on follow-up because the ongoing economic hardships, drought and conflict had caused them to move on. These variations between study arms were unfortunately unable to be identified prior to the study due security limitations in accessing the sites.

Animal ownership was over 90% in the three intervention arms but only 54% in the control arm. In the control arm results also showed slightly lower rates of educational attainment and household income and people in this study arm had to spend more time queuing to access water compared to the intervention arms. The majority of participants in all study arms had received no formal education. The mean number of people per household was similar across all study arms. All households in IA1-Liquid and the control arm were Muslims, while in IA2-Scented and IA3-Mirror participants were Protestants, Muslims or practiced Wakefata (a local religion). The majority of respondents were displaced due to conflict, but eight percent and thirty percent of respondents in IA2-Scented and IA3-Mirror respectively were displaced due to drought (Table 1).

Table 1. Sociodemographic data and household characteristics of the in a 4-armed exploratory pilot study in Moyale, Ethiopia.
| Variable                                                                 | Control arm n=50 | Intervention Arm 1: Liquid Scented n=50 | Intervention Arm 2: Scented n=51 | Intervention Arm 3: Mirror n=52 |
|-------------------------------------------------------------------------|------------------|-----------------------------------------|----------------------------------|-------------------------------|
| Number of people per household, mean (SD)                              | 6.94 (2.65)      | 6.52 (2.56)                              | 7.22 (2.15)                     | 6.60 (2.62)                   |
| Number of children <5 per household, mean (SD)                          | 1.4 (1.01)       | 1.72 (0.86)                              | 1.86 (1.51)                     | 1.15 (0.89)                   |
| Respondents education, % (n)                                            |                  |                                         |                                 |                               |
| No education                                                            | 80% (39)         | 62% (31)                                 | 63% (31)*                       | 73% (38)                      |
| Primary school completed                                                | 16% (8)          | 26% (13)                                 | 24% (12)*                       | 21% (11)                      |
| Secondary school completed                                              | 4% (2)           | 10% (5)                                  | 10% (5)*                        | 6% (3)                        |
| Higher education completed                                              | 0% (0)           | 2% (1)                                   | 2% (1)*                         | 0% (0)                        |
| Household Income per week (ETB), mean (SD)                              | 189.29 (212.85)  | 219.79 (223.98)*                         | 269.36 (272.53)*                | 222.06 (286.11)               |
| Animal ownership (owning at least one domestic animal cow, camel, donkey, goat, sheep or chicken), % (n) | 54% (27)         | 92% (46)                                 | 98% (50)                        | 98% (51)                      |
| Religion, % (n)                                                         |                  |                                         |                                 |                               |
| Muslim                                                                  | 100% (50)        | 100% (50)                                | 61% (31)                        | 46% (24)                      |
| Wakefata (local religion)                                               | 0% (0)           | 0% (0)                                   | 33% (17)                        | 38% (20)                      |
| Protestant                                                              | 0% (0)           | 0% (0)                                   | 4% (2)                          | 15% (8)                       |
| No religion                                                             | 0% (0)           | 0% (0)                                   | 2% (1)                          | 0% (0)                        |
| Reason for displacement, % (n)                                          |                  |                                         |                                 |                               |
| Conflict                                                                | 100% (50)        | 98% (49)                                 | 74% (37)*                       | 56% (28)                      |
| Drought                                                                 | 0% (0)           | 0% (0)                                   | 8% (4)*                         | 30% (15)                      |
| Other**                                                                | 0% (0)           | 2% (1)                                   | 18% (9)*                        | 14% (7)                       |
| Water collection duration (round trip) in minutes, mean (SD)            | 103 (77.15)      | 74 (60.19)                               | 56 (65.54)                      | 102 (71.29)                   |
| Water available per person in the household in litres, mean (SD)        | 14 (5.8)         | 13 (6.04)                                | 12 (5.09)                       | 14 (5.01)                     |

* Percentages were estimated from slightly smaller denominators than those shown at the top of the table for the following variables due to unanswered survey questions/missing values.

** Other reasons for displacement included moving for job opportunities or family reasons.

**Availability of handwashing facilities, soap and water**

Table 2 presents the results from the household survey. Out of the 400 households that received the hygiene kits 16 households did not have the handwashing facilities available during the follow up visit. Among the households which had the handwashing facility present during the follow up visit, 88% of facilities had water in them. Soap presence at the handwashing facility (any
type of soap) was highest in control arm (66%) while in IA1-Liquid, IA2-Scented and IA3-Mirror soap was present in 44%, 27% and 42% of households respectively. At the time of distribution, households had been encouraged to build a stand for the handwashing facilities and this had been done in more than 83% of households in all study arms. Stands were created from locally available materials such as wood. In IA3-mirror, 77% of households had the mirror hung alongside the handwashing facility at the point of follow-up. Presence of soap in the household was high across all study arms (96-100%).

**Table 2.** Results from household survey on hygiene proxy indicators from the four study arms in an exploratory pilot study in Moyale, Ethiopia.

| Variable                                                                 | Control arm n=50 | Intervention Arm 1: Liquid n=50 | Intervention Arm 2: Scented n=51 | Intervention Arm 3: Mirror n=52 |
|-------------------------------------------------------------------------|------------------|---------------------------------|----------------------------------|---------------------------------|
| Hygiene Proxy indicator (Handwashing facility with soap and water present), % (n) | 64% (32)         | 44% (22)                        | 25% (13)                         | 40% (21)                        |
| Handwashing facility available on premises, % (n)                       | 96% (48)         | 92% (46)                        | 88% (45)                         | 92% (48)                        |
| Water available at handwashing facility, % (n)                         | 92% (44)**       | 93% (43)**                      | 87% (39)**                       | 83% (40)**                      |
| Soap available at handwashing facility, % (n)                          | 66% (33)**       | 44% (22)**                      | 27% (14)**                       | 42% (22)**                      |
| Constructed a stand or other mechanism to raise the facility off the ground, % (n) | 92% (44)         | 91% (42)*                       | 87% (39)                         | 83% (40)                        |
| Mirror available by handwashing facility, % (n)                        | 0% (0)           | 0% (0)*                         | 0% (0)                           | 77% (37)                        |
| Soap available in household, % (n)                                      | 98% (49)         | 100% (50)                       | 96% (49)                         | 98% (51)                        |
| Types of soap available in household, % (n)                             |                  |                                 |                                  |                                 |
| Liquid soap                                                             | 16% (8)          | 92% (46)                        | 22% (11)                         | 27% (14)                        |
| Scented bar soap                                                        | 26% (13)         | 26% (13)                        | 51% (26)                         | 17% (9)                         |
| Laundry soap                                                            | 72% (36)         | 66% (33)                        | 63% (32)                         | 81% (42)                        |
| Normal bar soap                                                         | 88% (44)         | 70% (35)                        | 76% (39)                         | 71% (37)                        |
| Number of households reporting that they have enough soap to meet their family's needs, % (n) | 45% (22)*        | 52% (26)                        | 45% (23)                         | 48% (25)                        |
| Number of households reporting that soap is affordable for them, % (n)  | 41% (20)*        | 51% (25)*                       | 52% (26)*                        | 42% (22)                        |

* Percentages were estimated from slightly smaller denominators than those shown at the top of the table for the following variables due to unanswered survey questions/missing values.

** Percentages were estimated from the total number of handwashing facility present in the respective study arm.

**Reported benefits of soap**

Respondents gave open-ended answers in the survey to what the benefits of soap were (Table 3). Despite the distribution of hygiene kits, a large number of respondents, 45-54% across all arms, still reported that they felt that their family did not have sufficient access to soap and that it was not affordable for them. When asked about the advantages of soap, most respondents
freely reported that handwashing with soap could protect health or prevent disease (Table 3). A few respondents particularly mentioned diarrhoea as a disease that can be prevented by HWWS. Respondents also listed cleanliness and comfort as advantages of HWWS.

**Table 3.** Advantages of soap freely listed by participants in the household survey in the 4-arm exploratory pilot study in Moyale, Ethiopia.

| Advantages listed by respondents, % (n) | Control arm n=50 | Intervention Arm 1: Liquid n=50 | Intervention Arm 2: Scented n=51 | Intervention Arm 3: Mirror n=52 |
|----------------------------------------|------------------|---------------------------------|---------------------------------|---------------------------------|
| To keep healthy                        | 48% (24)         | 44% (22)                        | 35% (18)                        | 48% (25)                        |
| To remove dirt and maintain cleanliness and hygiene | 34% (17)         | 42% (21)                        | 53% (27)                        | 31% (16)                        |
| To remove germs and protect against disease in general | 34% (17)         | 48% (24)                        | 51% (26)                        | 46% (24)                        |
| To feel comfortable                    | 8% (4)           | 4% (2)                          | 8% (4)                          | 2% (1)                          |
| To prevent antibiotic resistance       | 6% (3)           | 4% (2)                          | 0% (0)                          | 4% (2)                          |
| To prevent diarrhoea                   | 4% (2)           | 2% (1)                          | 6% (3)                          | 0% (0)                          |
| To prevent malnutrition                | 2% (1)           | 2% (1)                          | 0% (0)                          | 2% (1)                          |
| To reduce absence from school          | 0% (0)           | 2% (1)                          | 0% (0)                          | 0% (0)                          |
| Don’t know                             | 0% (0)           | 2% (1)                          | 4% (2)                          | 0% (0)                          |

**Observations of handwashing**

In total, 1458 opportunities for handwashing were observed by our research team (Table 4). Out of those opportunities, HWWS was observed only 218 (14%) times. HWWS prevalence is presented in (Table 4). IA1-Liquid had the highest prevalence of HWWS overall for all key times for HWWS. In this study arm, HWWS prevalence was 20% but exploratory statistical analysis indicates that this prevalence was not significantly different when compared to the control group. In IA2-Scented, HWWS prevalence at end line was 7% lower than in the control arm, indicating that distribution of scented soap may have had a negative effect on HWWS prevalence. Exploratory statistical analysis indicates that this negative effect may be significant when compared to the control arm.

**Table 4.** Observed handwashing behaviour at all key times (after defecation, before preparing food, before eating, before serving/feeding another person food, after cleaning a child’s bottom).

| Study Arm                        | Total number of observed possibilities for handwashing | Handwashing prevalence % (n) | P Valuea |
|----------------------------------|-------------------------------------------------------|------------------------------|----------|
| Intervention Arm 1: Liquid (n=50)| 409                                                   | 20% (82)                     | 0.348    |
| Intervention Arm 2: Scented (n=51)| 385                                                   | 10% (40)                     | 0.005    |
| Intervention Arm 3: Mirror (n=52)| 302                                                   | 11% (33)                     | 0.018    |
| Control arm (n=50)               | 362                                                   | 17% (63)                     |          |
aPearson Chi-square test.

Reported barriers to handwashing from focus group discussions

A total of 33 people participated in the six FGDs. When asked about current barriers to HWWS the most common challenge was the affordability of soap. Participants made it clear that knowledge was not the problem as most people knew about the importance of handwashing to protect them against disease and to maintain their health.

“Everyone now knows that it’s important to wash our hands with soaps, but affording it [soap] is the problem” (Woman, FGD2)

“In the old times, the problem was illiteracy. Nowadays though, everyone including the kids have the knowledge [about handwashing]. But people are different, in that some are tidy while others don't care a lot about cleanliness. But I can generalize and say the main problem is the lack of money for soap affordability.” (Man, FGD1)

“There are variety of challenges, among which affording soap is an issue. People also don’t buy soaps on a regular basis in the same way they buy other home goods when they run out of it. So people also don’t look at soaps as a priority” (Man, FGD3)

In addition to affordability, forgetting to HWWS or only doing it when absolutely necessary were mentioned as reasons for not washing hands regularly. Some people reported only washing their hands when they were visibly dirty, or when participants had been in contact with chemicals such as paint.

“Some cannot afford soaps. The other factor is people’s style of life. Some are not used to washing with soap after using the toilet, they don’t remember to wash their hands with soaps after normal routines except when we deal with some rare activities where the need of using soap become a necessity, like after painting.” (Man, FGD3)

IDPs shared that humanitarian organisations would sometimes provide soap in hygiene kits and do hygiene promotion in the area. The irregularity of distributions appears to have created variations in handwashing behaviour, since when distributions ceased populations often resorted to handwashing with ash or not handwashing at all. Some mentioned long distances from their house to shops and markets as barriers to purchasing soap regularly.

“We do not get soap distributions regularly. We used to wash our hands properly when the supplies were given to us, but once they were done with the distributions, we could not go out and buy soap because of money issues.” (Man, FGD4)

Water scarcity was also a common challenge raised, with participants explaining that water was prioritised for other household tasks rather than HWWS.

“In this zone when water becomes scarce, people don’t even wash their faces, let alone washing hands, so water shortage could be a reason” (Man, FGD1)

“Due to drought, famine, and conflict in our area, there is a water and money shortage which means we don’t have enough water for hand washing and money for affording soap, even though we have the knowledge about cleanliness.” (Man, F1)

Ranking of different types soap by focus group discussion participants

Table 5: Results from soap ranking activity where FGD participants were asked to rank different types of soap against a list of criteria describing different qualities of the soap (1= the highest ranking and 6= the lowest ranking).
Table 5 summarises the results from the soap ranking activity, in which FGD participants were asked to rank each soap against a number of criteria. They were asked to consider the use of the soap for handwashing only rather than also for other purposes. The scented bar soap came out the highest overall, ranking first or second for both women and men for five criteria; desirability, pleasantness, long-lasting, ‘A soap I would like to use’ and water saving. Participants from one FGD (F1) remarked that they enjoyed the smell of the scented bar soap and that they had not seen a green bar of soap before. However, one participant said that nice smelling bar soap might be a ‘waste’ in their community because they regularly touch and come into contact with animals which have an unpleasant smell. Men and women both found the liquid soap easy to use, and believed that the antibacterial soap was the most effective in killing germs, but ranked these soaps inconsistently in other categories. The low-cost bar soap was most familiar to the participants as it was available to purchase in most local shops and markets, but otherwise ranked consistently poorly. It was ranked as the soap that utilised the most water, was least pleasant to use and was consumed the quickest. Men and women generally ranked soaps similarly, but had mixed attitude’s on liquids soap’s ability to be water saving. On this criterion, men considered liquid soap to be the most water saving while women considered it to be the soap that wasted the most water. There were mixed attitudes towards the use of laundry soap for handwashing. Laundry soap was ranked highest by women has the soap that would last the longest, however the women did not find this type of soap easy to use.

Perceptions about the mirrors based on FGD discussions

The last part of the FGD aimed to understand community perceptions towards mirrors placed in close proximity to handwashing facilities. The mirror was very well received by the participants who valued the size of the mirror, reflecting that it would allow them to see their entire bodies and not just the face. The only thing participants listed as a concern about the mirror was that they did not think it would be affordable to them should they have to buy it themselves.

“This mirror is big enough to show the all of my body. This is why we say it’s so good.” (Woman, FGD2)

“I like the way it allows me to see my whole self, what I don’t like about it is the money I lack to get such a mirror,” (Man, FGD4)

When asked where they would place a mirror like this, most participants said that a nice mirror like this should be kept inside the house. Participants expressed concerns about keeping the mirror outside because they believed that the reflection of the sun
shining onto the mirror was harmful to their health. They were also concerned that it might get stolen or that children or animals might break it.

“When it is sunny, the mirror gives out a reflection which is not good for our health. It might get stolen too, cattle might break it also” (Man, FGD3)

“It should not be kept outside because it might get broken, it is meant to be inside the house.” (Man, FGD3)

The majority of participants said they would not want to keep the mirror by the handwashing facility, as this was often located near the toilet, some distance from the house.

“Firstly, that place is at a distance from our house. Secondly, children might just grab it away, the other factor is that our toilet has no suitable wooden place where we can hang the mirror.” (Woman, FGD7)

Nonetheless, participants did see that there could be some benefits by keeping the mirror next to the handwashing facility. Some participants said keeping the mirror close to the toilet would allow them to identify dirt and therefore make cleaning themselves an easier task. Some also reported that if they had two mirrors, they would consider keeping one in the household, and one by the handwashing facility.

“Yeah it has a benefit and that is that after toilet usage we would stand there to see which part to clean and wash our hands and our face.” (Man, FGD4)

“It shows me the cleanliness of my body, for example, after toilet usage, it shows me whether I have gotten rid of the dirt or not.” (Man, FGD1)

“It can show you dirt. Had we had other extra mirrors, we would spare one for that spot.” (Woman, FGD4)

Discussion

Our study was not able to detect an effect of modified hygiene kits on handwashing behaviour in IDP populations. The HWWS prevalence data indicates that the intervention arm that received liquid soap in addition to the standard hygiene kit had slightly higher prevalence of HWWS at key times. However, the prevalence was not significantly different to HWWS prevalence in the control arm. During our FGDs study participants reported the standard bar soap distributed in hygiene kits was not particularly desirable to use. Liquid soap was reported to be the easiest type of soap to use. It is possible that the increased rates of handwashing with soap observed within IA1-Liquid occurred because liquid soap together with a dedicated handwashing facility helped to cue behaviour at the right time and make it more convenient for the population to practice. This was particularly the case for handwashing after using the toilet, given that most families chose to locate their handwashing facilities near the toilet.

The scented bar soap was generally well-liked by FGD participants and considered desirable and pleasant to use. However, rates of HWWS were poor in IA2-Scented which received this type of soap in their hygiene kits. In FGDs participants reported that they had never seen a green bar of soap before and it is possible that this new, foreign type of soap caused participants to use it more sparingly or prioritise it for purposes other than HWWS. In refugee camp setting, reliance on soap distribution may have led to refugee households using soap sparingly, not knowing when the next distribution might take place (13). Participants also reported concern that using a nice smelling soap would be “wasted” as the smell would not last long as they frequently interact with animals.

In IA3-Mirror we found that the distribution of mirrors and the placement of these above the handwashing facility did not result in rates of HWWS that were higher than the control arm. Similar ‘nudges’, or environmental cues designed have been successful in increasing handwashing with soap after toilet use, however, most of these interventions have been tested in schools or areas where there is already good quality infrastructure and a constant supply of soap and water - something not available in the IDP settlements in Moyale District (43, 44). In our study, FGD participants shared some challenges with hanging a mirror outside by the handwashing facility including being afraid of theft of the mirror or it being broken by children or animals. Nonetheless, in IA3-Mirror 77% of households had placed the mirrors by the handwashing facility at the time of the follow-up visit. These high
levels of use by communities and the expressed desirability for mirrors merit further studies to explore the potential impact on handwashing behaviour.

The soap products distributed in this study do not come at a substantially higher cost; 250 grams of the body soap normally distributed in the hygiene kits would cost 0.9 USD while a scented bar soap of the same size cost 1.65 USD and a 500ml bottle of liquid soap is 1.48 USD making it a feasible intervention to implement by humanitarian actors.

Limitations

The challenges of the research setting, particularly that the setting was experiencing an ongoing conflict, created numerous limitations for interpreting the findings from our work. The heterogeneity of socio-demographic characteristics across the study arms meant that it is not possible to draw clear conclusions from this research. In addition to the variations described, there were other visible characteristics that we did not formally collect data on but which may have influenced the findings. For example, IA1-Liquid, IA2-Scented and the control arm were located close to the main road. In contrast IA3-Mirror was located 13km off the main road in an area that was more affected by drought and water availability. This water scarcity may contribute to the low rates of HWWS observed in this study arm. The control arm had the longest duration for water collection and this might have biased results also. The control arm was the site of a violent conflict in 2018, and households in the area still carried the scars of this conflict, with some houses damaged and many water points destroyed. Settlements in the three intervention arms did not bear these visual scars of the ongoing conflict in the region. The study sites also experienced change between the delivery of the intervention and the data collection. For example, the long-term drought was interrupted with heavy rains that caused flooding and damage in IA3-Mirror and the control arm.

Structured observation can be subject to reactivity bias (45), but while having its limitations it is considered the most reliable method of studying handwashing behaviours (46) and is regarded as much more accurate than self-reported measures. We further attempted to reduce bias by employing female observers only. Research has found that female observers are considered less intimidating in most cultures and allow for reactivity bias to be minimised (47).

This study was designed without a baseline assessment of handwashing behaviour. This was due to logistical, budget and security constraints, but also encouraged by other behaviour change intervention studies recommended no baseline observation to reduce reactivity bias (48). Reflecting on the constraints we faced, a baseline observation would have allowed us to more accurately comment on the overall improvement that the modified hygiene kits might have had on HWWS. It is clear that handwashing rates remained sub-optimal at the point of follow up and that on many critical occasions hands were washed with water only (see Additional file 4 for HWWS prevalence disaggregated by key time). Other studies of handwashing behaviour in refugee camps receiving regular soap distributions in Ethiopia found HWWS rates of 4% (26) and 19% (22). A recent review of national survey data estimated that rates of HWWS after toilet use are likely to be about 8% within the World Health Organisation African region (49). Our study measured behaviour shortly after the distribution of the hygiene kits. It is possible that over time, with the repeated distribution of soap and with increased familiarity of the handwashing facility, behaviour may increase.

It is also possible that it was the distribution of the handwashing facility itself, rather than soap or mirrors, that made a more substantial contribution to encourage handwashing behaviour (both with water only and with soap) but this study was not designed to measure this. In other settings the presence of a dedicated handwashing facility has been found to increase handwashing behaviour (11). In our study it seemed that the handwashing facilities that we distributed were valued by the population because 83% of people were willing to invest time and effort into constructing stands to make them easy to use. This may be an early indication that the provision of higher quality handwashing products encourages higher levels of ownership and maintenance among crisis-affected populations.

Further work may be needed to explore the fact that we observed high rates of handwashing with water only despite the availability of soap in households (See Additional file 4). Similar findings were identified following soap distributions in a South Sudanese refugee camp (13). In this study 95% of participants reported that they had soap available but hands were normally washed with water only (<20% of occasions with soap compared to <70% with water only)(13). In the case of this research this finding may act as a reminder that distributions in the absence of hygiene behaviour change activities may only go part of the
way to enabling the desired behaviour. If our intervention was combined with hygiene promotion it may have been possible to conduct activities which emphasised the importance of using soap and that handwashing with water only doesn't leave hands truly clean.

For others considering research of this nature in dynamic, crisis-affected settings we would recommend including a baseline study and taking time to understand qualitatively and quantitatively the characteristics of the study settings so as to understand in advance how they could impact the research outcomes. The pilot study recruited 400 households and the study team had capacity to observe 13 households per day, meaning that it took four weeks of data collection to reach the target of 50 households per study arm. For a small scale-study, it would have been preferable to have a narrower data collection period but that was not feasible in our setting as it would have required a larger study team and this was not possible due to logistics and security constraints. To mitigate this issue, data was collected rotating schedule, with one day in IA1-Liquid, next in IA2-Scented, IA3-Mirror, control arm and then back in IA1-Liquid. Given that we faced limitations in drawing conclusions from our primary outcome data it was valuable to be able to learn from the complementary qualitative methods and this is something that should be included where possible in future research in such environments.

**Conclusion**

The modified hygiene kits were found to have no effect on handwashing behaviour among IDPs in Moyale District, Ethiopia. However, this pilot study indicates that there is likely to be some value in understanding the hygiene product preferences of crisis-affected populations and modifying hygiene kits accordingly. Theory-driven formative research prior to hygiene kit distribution could also help to design complementary hygiene promotion activities. In our study liquid soap achieved the highest rates of handwashing at key times and the mirror and scented soap that was distributed was desired by participants. A more detailed qualitative and quantitative assessment of the comparability of the study arms and an assessment of handwashing behaviours at baseline may have aided this study in achieving clearer results on the impact its interventions. Given the limitations of this research we recommend further studies into the use of hygiene kit products, prior to major changes in humanitarian practice.

**List Of Abbreviations**

FGD: Focus group discussion
IDP: Internal Displaced Person
HWWS: Handwashing with soap
WASH: Water, Sanitation and Hygiene

**Declarations**

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**Authors’ contributions**

SW and TH secured the funding for this study. AHT and SW designed the study. AHT and MH conducted the data collection. AS, TH and SW assisted with logistics and field operations. AHT and SW conducted data analysis. This paper was written by AHT and SW. All authors have reviewed and approved the submitted manuscript.
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Competing interest

The authors and their institutions have no financial or other conflicts of interest.

Ethics approval and consent to participate

The research received ethical approval from the London School of Hygiene and Tropical Medicine Ethics Review Committee (Ref: 17604) and Oromia Regional Health Bureau (Ref: BEFO/11BTP4/79/2011). The study was also approved by the Disaster Risk Management Office and Health Office at zonal level (Borena) and district level (Moyale) through face-to-face meetings with the study coordinator and Action Against Hunger representatives. Informed consent was gained from all participants in the study.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable

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Figures
Figure 1

Study design of the 4-armed exploratory pilot study of the effect of modified hygiene kits on handwashing with soap among internally displaced persons in Moyale District, Ethiopia.

Figure 2

Picture A, B and C display the handwashing facilities distributed in all four study arms. Picture A shows a handwashing facility and liquid soap from IA1-Liquid, picture B shows a handwashing facility and a scented bar soap laying on top of the facility in IA2-Scented and picture C shows a mirror and handwashing facility as distributed in IA3-Mirror.
**Figure 3**

The soaps used for the soap ranking activity. These soaps were purchased at a local market in Moyale District, Ethiopia.

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile2.pdf