



Assessment of Mothers' Knowledge and Practices Regarding Home-Based Management of Under-Five Diarrhoea in John Laing, Lusaka, Zambia: A Cross-Sectional Study

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ABSTRACT

Background: Childhood diarrhoea remains an important cause of illness and death among children younger than five years, with dehydration and inappropriate or delayed management contributing to poor outcomes. In many households, mothers are central to the initial management of diarrhoeal episodes. This study assessed mothers' knowledge and reported household practices regarding home-based management of under-five diarrhoea in John Laing, Lusaka, Zambia.

Methods: A quantitative cross-sectional descriptive study was conducted among 138 mothers of children younger than five years who were residents of John Laing Compound and attended under-five services at Kanyama Level 1 Hospital. John Laing A and B were used to identify the study area, and eligible participants were selected as described in the study protocol. Data were collected using an interviewer-administered, closed-ended questionnaire and analysed using SPSS. Knowledge and reported practices were assessed using separate questionnaire items covering diarrhoea management, hygiene, sanitation, water, and prevention. Responses were analysed at item level; no composite knowledge or practice score was calculated. The reported ANOVA model involving family income assistance and diarrhoea-related variables was also examined.

Results: Of the 138 respondents, 69.6% were married, 19.6% were single and 10.9% were divorced. Half of respondents (50.0%) reported washing their hands after changing a baby, while smaller proportions reported handwashing before feeding (12.3%), before food preparation (12.3%), after feeding (13.8%), after disposing of baby waste (7.2%), after washing nappies (2.2%), or after using the toilet (2.2%). Baby stool was disposed of in toilets by 58.7%, disposable bins by 23.2%, and refuse pits by 18.1%. During diarrhoeal episodes, 50.7% gave less fluid, 5.1% the same amount, and 44.2% more fluid. For solid food, 28.3% gave none, 53.6% less, 6.5% the same amount, and 11.6% more. Regarding prevention, 45.7% identified drinking clean water, 26.8% frequent handwashing, 18.8% warming leftover foods, 5.8% thorough cooking, and 2.9% preparing food in a clean environment. Most respondents (92.8%) reported washing their hands after changing nappies. Pipe water was the main reported water source (80.4%), while 56.5% reported taking measures to make water safe. The reported ANOVA model was statistically significant ($F=11.417$, $p<0.001$), but its specification does not establish that family income predicts diarrhoea occurrence.

Conclusions: The findings demonstrate important gaps in mothers' knowledge and reported household practices concerning home-based management of under-five diarrhoea, particularly regarding fluid and food intake during diarrhoeal episodes, hand hygiene, stool disposal, and household water treatment. Because no composite knowledge or practice score was calculated, the findings should be interpreted from the individual questionnaire responses rather than as an overall knowledge or practice rating. Community health education should emphasise appropriate home management, hygiene, sanitation, safe water, and prevention.

Keywords: diarrhoea; knowledge; practices; management; under-five children; mothers; Lusaka; Zambia.

INTRODUCTION

Diarrhoeal disease is an important cause of morbidity and mortality among children younger than five years. The final report underpinning this manuscript describes diarrhoea as a major contributor to childhood mortality and identifies dehydration, delayed care and inappropriate home management as important concerns. Global and regional literature cited in the report similarly identifies diarrhoea as a substantial childhood health problem (Liu et al. (2012); UNICEF and WHO (2013)).

In Zambia, diarrhoea remains a public health concern. The final report cites national and local evidence indicating a substantial burden among children younger than five years and identifies environmental sanitation, unsafe water, poor disposal of child faeces and inadequate hand hygiene as relevant factors (Irena et al. (2011); Hamuganyu (2014)). In John Laing Compound, concerns about waste collection and disposal were specifically identified in the source report, providing a local rationale for examining household practices (Lusaka City Council (2010)).

Mothers and other caregivers often make the first decisions about fluid intake, feeding, hygiene, and whether and when to seek health care. The final report highlights that inadequate knowledge and practices can contribute to dehydration and other adverse outcomes. Understanding what mothers know and do in a specific community can therefore help identify practical health-education priorities.

This study assessed mothers' knowledge and reported household practices concerning home-based management of under-five diarrhoea in John Laing Compound, Lusaka, Zambia. The specific objectives were to assess mothers' knowledge of under-five diarrhoea management, describe their reported practices during diarrhoeal episodes and in prevention, and examine the reported relationship between family income assistance and diarrhoea-related variables.

MATERIALS AND METHODS

Study design and setting

A quantitative cross-sectional descriptive study was conducted in John Laing Compound in Lusaka District, Zambia. The study area comprises John Laing A and John Laing B. The final report describes the area as a low-income community in which households commonly depend on small businesses and other forms of informal or low-income employment. The study was concerned with household-level management of diarrhoea among children younger than five years.

Study population and sampling

The study population comprised mothers who had children aged 0–60 months, were residents of John Laing Compound, and consented to participate. Mothers with children older than 60 months, non-residents of John Laing, and those who declined participation were excluded. Participants were recruited from mothers who brought children for under-five services at Kanyama Level 1 Hospital. John Laing A and B were used to define the study area, and participant selection was conducted using the randomisation procedure described in the final report. The sample size was calculated using the Fisher formula at a 95% confidence level, with the parameters reported in the final report, resulting in a target sample of 138 participants.

Data collection

Data were collected using a closed-ended, interviewer-administered questionnaire with the assistance of five research assistants. Participants were mother's resident in John Laing Compound who brought children for under-five services at Kanyama Level 1 Hospital. The questionnaire covered socio-demographic characteristics, water supply and treatment, hygiene, sanitation, diarrhoea experience, household income, knowledge related to diarrhoea management and prevention, and reported household practices.

Validity, reliability and pilot testing

The questionnaire was pretested during a pilot study conducted in Kanyama, outside the actual study area. The purpose was to assess whether the questions were understandable and whether the instrument was suitable for collecting the intended information. Five research assistants participated in data collection, and the participant-selection procedure was implemented as described in the final report. The questionnaire did not specify a validated composite scoring system. Accordingly, knowledge was assessed from respondents' answers to knowledge-oriented questions about diarrhoea prevention, hygiene, sanitation, water safety and management, while practices were assessed from self-reported behaviours during diarrhoeal episodes and at household level. Responses were analysed individually rather than combined into overall knowledge or practice scores.

Ethical considerations

Ethical approval was obtained from the Levy Mwanawasa Medical University Review Ethics Committee, Lusaka District Health Office, and Kanyama Level 1 Hospital. The study consent form records approval number REF.No. LMMU-REC 000059/23. Participation was voluntary, participants could decline or withdraw without penalty, and confidentiality was maintained by not recording participant names. The consent form states that written or thumbprint consent was obtained.

Data analysis

Completed questionnaires were checked for completeness and internal consistency. Data were entered and analysed using Statistical Package for the Social Sciences (SPSS). Frequencies and percentages were used to summarise categorical variables. Knowledge and reported practices were presented using the individual questionnaire items and their response distributions; no composite knowledge or practice score was calculated. An ANOVA model was used to examine the reported relationship between family income assistance and diarrhoea-related variables. Statistical significance was assessed at the 5% level.

Results

Participant characteristics

A total of 138 mothers were assessed. Most respondents were married (69.6%), followed by single mothers (19.6%) and divorced mothers (10.9%) (Table 1).

Table 1. Marital status of respondents.

Marital status	n	%
Single	27	19.6
Married	96	69.6
Divorced	15	10.9
Total	138	100.0

Knowledge-related responses on diarrhoea management

Respondents reported a range of situations in which they washed their hands (Table 2). This item was treated as a knowledge-related response concerning critical handwashing occasions. The most frequently identified occasion was after changing the baby (50.0%). Smaller proportions reported handwashing before feeding the baby (12.3%), before cooking or preparing food (12.3%), after feeding the baby (13.8%), after disposing of baby waste (7.2%), after washing the baby's nappies (2.2%), and after using the toilet (2.2%).

**Table 2. Reported occasions for handwashing.**

Occasion	n	%
After changing the baby	69	50.0
Before feeding the baby	17	12.3
Before cooking/preparing food	17	12.3
After feeding the baby	19	13.8
After washing the baby's nappies	3	2.2
After disposing of baby's waste	10	7.2
After using the toilet	3	2.2
Total	138	100.0

Reported household practice: baby stool disposal

Table 3. Methods used to dispose of baby stool.

Method	n	%
Refuse pits	25	18.1
Disposable bins	32	23.2
Toilet	81	58.7
Total	138	100.0

During an episode of diarrhoea, respondents reported varying practices regarding fluid intake. Half (50.7%) reported giving their children less fluid, 5.1% maintained the same amount, and 44.2% gave more fluid (Table 4).

Table 4. Reported fluid intake during childhood diarrhoea.

Fluid intake	n	%
Less	70	50.7
Same	7	5.1
More	61	44.2
Total	138	100.0

For solid food during diarrhoea, 28.3% reported giving no food, 53.6% gave less food, 6.5% maintained the same amount, and 11.6% gave more food (Table 5).

Table 5. Reported solid-food intake during childhood diarrhoea.

Food intake	n	%
None	39	28.3
Less	74	53.6
Same	9	6.5
More	16	11.6
Total	138	100.0

Reported household practices for prevention and hygiene

When asked about measures used to prevent diarrhoea, 45.7% identified drinking clean water, 26.8% reported washing hands more frequently, 18.8% warming leftover foods, 5.8% cooking food thoroughly, and 2.9%

preparing food in a clean environment (Table 6). These responses represent item-level knowledge/practice information rather than a composite prevention score.

Table 6. Reported household measures for preventing under-five diarrhoea.

Preventive measure	n	%
Wash hands more frequently	37	26.8
Cook food thoroughly	8	5.8
Warm leftover foods	26	18.8
Prepare foods in a clean environment	4	2.9
Drink clean water	63	45.7
Total	138	100.0

Most respondents (92.8%) reported washing their hands after changing a baby's nappies, whereas 7.2% reported that they did not (Table 7). This item was treated as a reported hygiene practice.

Table 7. Handwashing after changing baby's nappies.

Response	n	%
Yes	128	92.8
No	10	7.2
Total	138	100.0

Pipe water was the predominant reported source of drinking water (80.4%), while 19.6% reported using borehole water (Table 8).

Table 8. Reported source of drinking water.

Water source	n	%
Pipe water	111	80.4
Borehole	27	19.6
Total	138	100.0

Regarding household efforts to make water safe for children, 56.5% of respondents reported taking some action, while 43.5% reported doing nothing to the water (Table 9).

Table 9. Reported efforts to make drinking water safe for children.

Response	n	%
Yes	78	56.5
No	60	43.5
Total	138	100.0

Relationship between family income and diarrhoea-related variables

The ANOVA model reported in the final report was statistically significant. The regression sum of squares was 3.477 with 2 degrees of freedom, the residual sum of squares was 20.559 with 135 degrees of freedom, and the total sum of squares was 24.036 with 137 degrees of freedom. The model had an F statistic of 11.417 and a significance value reported as .000 (Table 10), corresponding to $p < 0.001$. Importantly, the final report specifies family income assistance as the dependent variable and "ever had diarrhoea" and "last episode of diarrhoea" as

predictors. Consequently, the reported analysis demonstrates that the specified model was statistically significant, but it does not establish that family income predicts diarrhoea occurrence. The direction and interpretation of the association should therefore be treated cautiously.

Table 10. ANOVA examining the reported relationship between family income and diarrhoea-related variables.

Source	Sum of squares	df	Mean square	F	p-value
Regression	3.477	2	1.739	11.417	<0.001
Residual	20.559	135	0.152	—	—
Total	24.036	137	—	—	—

Dependent variable: family income assistance. **Predictors** reported in the final report: ever had diarrhoea and last episode of diarrhoea.

DISCUSSION

This study assessed mothers' knowledge and reported household practices concerning home-based management of under-five diarrhoea in John Laing Compound. Because the questionnaire did not specify a validated composite scoring system, knowledge and practices were interpreted from individual response items rather than categorised using an overall score. The findings indicate strengths in some reported hygiene behaviours alongside important gaps in diarrhoeal fluid and food management, hand hygiene knowledge, stool disposal, and household water treatment.

Knowledge and practices related to hygiene and sanitation

Half of the respondents identified handwashing after changing a baby as the main handwashing occasion, while the remaining responses were distributed across other occasions. In contrast, 92.8% reported washing their hands after changing nappies. The distinction between these findings is important: the first item reflects respondents' identification of a critical handwashing occasion, whereas the second reflects a reported behaviour. Thus, the results should not be interpreted as a single overall handwashing knowledge or practice score.

Baby stool disposal was another important finding. Although 58.7% reported using a toilet, nearly two-fifths reported using disposable bins or refuse pits. The final report associates inadequate disposal of child stool and poor hygiene with diarrhoeal risk in comparable Zambian settings (Hamuganyu (2014)). The finding therefore supports the report's recommendation that environmental health personnel strengthen community education on the risks associated with inappropriate disposal of children's stool.

Fluid and food intake during diarrhoea

The most important gaps in the reported management responses were observed in fluid and food intake during diarrhoeal episodes. More than half of the mothers reported giving less fluid, and 28.3% reported giving no food while the child had diarrhoea. The discussion in the final report indicates that some mothers believed increased fluid intake could worsen diarrhoea and that solid foods could increase diarrhoeal episodes. These beliefs are concerning because the literature cited in the report emphasises early recognition of dehydration, oral rehydration and continued feeding as important components of diarrhoea management (Shah et al. (2012); Arabi et al. (2012)).

The findings are also consistent with evidence cited in the report showing that caregivers may recognise diarrhoea as serious while having incomplete knowledge of dehydration and oral rehydration. Previous studies cited in the report found gaps in recognition of dehydration and in the practical use of oral rehydration solutions (Shah et al. (2012); MacDonald et al. (2011)). The current findings therefore reinforce the need for practical,

repeated health education that demonstrates what caregivers should do during an episode rather than relying only on general messages.

The reported ANOVA model was statistically significant ($F=11.417$, $p<0.001$). However, the statistical table identifies family income assistance as the dependent variable and diarrhoea-related variables as predictors. This specification does not support the stronger interpretation that income predicts diarrhoea. In addition, the cross-sectional design does not establish temporality or causality. The finding should therefore be reported as a statistically significant model involving the measured variables, with the direction of association interpreted cautiously.

Water access and household water treatment

Most respondents reported access to pipe water, while the remainder used boreholes. More than half reported taking measures to make water safe, but 43.5% reported doing nothing. The final report notes that some mothers considered water safe because it came from a tap or borehole. This finding is important because access to an improved source does not necessarily guarantee safe water at the point of consumption. The literature reviewed in the report links unsafe water and sanitation with childhood diarrhoeal disease (Mills (2014); Das et al. (2014)).

Family income and diarrhoea

The reported ANOVA model was statistically significant ($F=11.417$, $p<0.001$). However, the statistical table identifies family income assistance as the dependent variable and diarrhoea-related variables as predictors. This specification does not support the stronger interpretation that income predicts diarrhoea. In addition, the cross-sectional design does not establish temporality or causality. The finding should therefore be reported as a statistically significant model involving the measured variables, with the direction of association interpreted cautiously.

Implications for public health practice

The findings point to several practical priorities. Health education should focus on early and appropriate management of dehydration, continued feeding, hand hygiene with soap, safe disposal of child stool, and household water treatment. Messages should address specific beliefs identified in the study, particularly the belief that reducing fluids or food is helpful during diarrhoea. The final report also recommends strengthening preventive health education and community-level implementation of rotavirus vaccination (WHO (2017)).

Study limitations

The final report identifies two principal limitations. First, the questionnaire was initially intended to be self-administered but was changed to interviewer administration because some participants could not complete the questionnaire independently. This required the researcher to record participants' responses and was time-consuming. Second, delayed response from the data collection site led the researcher to collect information from mothers who brought children for under-five services rather than sampling the community directly. The latter may limit generalisability to all mothers living in John Laing Compound.

CONCLUSIONS

Mothers in John Laing Compound showed a mixture of appropriate and inappropriate knowledge-related responses and reported household practices concerning home-based management of under-five diarrhoea. Important gaps were identified in fluid and food intake during diarrhoeal episodes, the range of handwashing occasions recognised, stool disposal, and household water treatment. Although post-nappy handwashing was widely reported, the range of situations identified as requiring handwashing was limited. Because no composite knowledge or practice score was calculated, the study does not support a single overall rating of mothers' knowledge or practices. The reported ANOVA model was statistically significant, but its documented specification does not permit a firm conclusion that family income predicts diarrhoea occurrence.

The findings support an integrated community approach combining health education, environmental sanitation, safe water practices, hygiene promotion and broader diarrhoea-prevention measures. These interventions should be tailored to the beliefs and household circumstances identified in John Laing Compound.

RECOMMENDATIONS

1. Strengthen health education for mothers on the risk factors and prevention of under-five diarrhoea.
2. Promote appropriate treatment and safe storage of household drinking water.
3. Educate caregivers on adequate fluid intake, continued feeding, and early recognition of dehydration during diarrhoeal episodes.
4. Promote hand hygiene, safe food preparation and other household diarrhoea-prevention practices.
5. Strengthen community-level implementation of rotavirus vaccination.
6. Promote proper disposal of babies' stool to reduce diarrhoeal disease risks.
7. Enhance handwashing with soap among child caregivers.

Ethics statement

Ethical approval was obtained from the Levy Mwanawasa Medical University Review Ethics Committee, Lusaka District Health Office and Kanyama Level 1 Hospital. The study consent form records approval number REF.No. LMMU-REC 000059/23. Participation was voluntary and confidentiality was maintained.

Funding

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Competing interests

The author declares that no competing interests were reported.

Data availability

The underlying participant-level dataset was not supplied with the final report used to prepare this manuscript. Before submission, the authors should deposit a de-identified minimal dataset in an appropriate public repository or provide a PLOS-compliant explanation of any ethical or legal restriction on data sharing.

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Supporting information

S1 Appendix. Study questionnaire

Part A: Socio-demographic profile

Age (years)

☐ 18–27 ☐ 28–37 ☐ 38–47 ☐ 48–57

Sex

☐ Male ☐ Female

Marital status

☐ Single ☐ Separated ☐ Married ☐ Divorced

Education status

☐ Primary ☐ Secondary ☐ Tertiary

Residence: _____

Employment status

☐ Unemployed ☐ Self-employed ☐ Employed

Relationship with child

☐ Mother ☐ Guardian ☐ Other

Diarrhoea experience in the past 1 year by child

☐ No ☐ Yes

Income level



☐ < K500 ☐ K500–K1000 ☐ > K1000

Part B: Water supply

Liu L, Johnson HL, Cousens S, Perin J, Scott S and Lawn JE (2012). Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. The Lancet, 379, pp.2151–2161.

☐ River ☐ Tapped water ☐ Rainwater harvest

☐ Any other (specify): _____

UNICEF and WHO (2013). Diarrhoea: why children are still dying and what can be done. New York/Geneva: United Nations Children’s Fund/World Health Organization.

☐ No ☐ Yes

Irena HA, Mulenga V and Mwambazi M (2011). Diarrhoea is a major killer of children with severe acute malnutrition admitted to in-patient set in Lusaka, Zambia. Nutrition Journal, 10, 110.

☐ Boil ☐ Chlorinate ☐ Decant

☐ Any other (specify): _____

Part C: Hygiene

Liu L, Johnson HL, Cousens S, Perin J, Scott S and Lawn JE (2012). Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. The Lancet, 379, pp.2151–2161.

☐ No ☐ Yes

UNICEF and WHO (2013). Diarrhoea: why children are still dying and what can be done. New York/Geneva: United Nations Children’s Fund/World Health Organization.

☐ After using the toilet ☐ Before eating and after eating

☐ After changing baby’s nappies ☐ Before cooking

☐ Others (specify): _____

Part D: Sanitation

Liu L, Johnson HL, Cousens S, Perin J, Scott S and Lawn JE (2012). Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. The Lancet, 379, pp.2151–2161.

Method	Yes	No
Flushing in the toilet		
Pit latrine		
Digging shallow pits		
Nearby bushes		
Nearby streams		



UNICEF and WHO (2013). Diarrhoea: why children are still dying and what can be done. New York/Geneva: United Nations Children's Fund/World Health Organization.

Method	Yes	No
Flushing in the toilet		
Pit latrine		
Digging shallow pits		
Nearby bushes		
Nearby streams		

Irena HA, Mulenga V and Mwambazi M (2011). Diarrhoea is a major killer of children with severe acute malnutrition admitted to in-patient set in Lusaka, Zambia. Nutrition Journal, 10, 110.

☐ Less than 5 people ☐ 5–10 ☐ 11–16

☐ More than 16 people ☐ Other (specify):

Hamuganyu I (2014). Correlates of diarrhoea among the under-fives in Namwala District, Zambia. Dissertation. Lusaka: University of Zambia.

☐ Pit latrine ☐ Flushable toilet ☐ Simple traditional latrine

☐ Ventilated improved pit latrine ☐ Others (specify): _____

Lusaka City Council (2010). Waste management by-laws. Lusaka: Government Printing Department.

Behaviour	Yes	No	I don't know
Poor disposal of diapers			
Sanitation			
Water			

Rokkappanavar K, Nigudgi SR and Ghooli SA (2016). Study on knowledge and practice of mothers of under-five children regarding management of diarrhoea in urban field practice area of MRMC, Kalburgi, Karnataka, India. International Journal of Community Medicine and Public Health, 3, p.705.

Statement	Agree	Neutral	Disagree
a. There is nothing wrong with not washing hands after changing a child's nappies.			
b. There is nothing wrong with not washing hands after using the toilet.			
c. There is nothing wrong with not washing hands before preparing food.			
d. There is nothing wrong with drinking water from a well.			
e. There is nothing wrong with drinking tap water directly without chlorination.			
f. There is nothing wrong with seeking traditional healers/traditional medicines before taking a child with diarrhoea to hospital.			
g. Making ORS and giving it to a child with diarrhoea reduces dehydration.			
h. Having a proper meal/diet improves the child's nutritional status and prevents malnutrition.			