

## Abstract

Diarrhea is a significant cause of morbidity and mortality, yet incidence data in Monterrico, Guatemala, are limited. This project seeks to estimate its prevalence in Monterrico and to develop an evidence-based “Water Sanitation and Hygiene” (WASH) strategy to reduce diarrhea disease. A systemic review was done, from which 20 peer review articles were selected for the design of the data collection tool for this project. This was used to assess diarrhea disease prevalence and to develop an evidence-based WASH strategy. 229 participants with a mean age of 41.4 years. The prevalence of diarrhea diseases was 63%, and most cases did not treat their drinking water (46%). The highest odds ratio was observed in “unidentified water” sources (OR=2.39). Chi-square test of independence revealed no statistically significant association between the type of water source and cases of diarrheal disease ( $p=0.23$ ). Hence, the prevalence of diarrhea disease could be linked to poor hygiene and sewage disposal. Future research could consider diarrhea prevalence in children due to higher morbidity and mortality in them.

## Introduction and Research Question

Diarrheal disease is a longstanding public health problem in developing countries, although simple and inexpensive interventions are available to prevent and treat diarrhea. The lack of clean water and many sanitation problems makes diarrheal diseases a significant cause of mortality and morbidity.<sup>1</sup> Globally, diarrheal disease is one of the leading causes of morbidity and mortality.<sup>2</sup> Annually, it is estimated that the number of diarrheal cases could be about 2 billion.<sup>3</sup> In 2019, diarrhea was the 5th leading cause of disability-adjusted life years (DALYs) and the 8th leading cause of death. In Guatemala, diarrheal was the 10th leading cause of death in 2019. Most studies focus on children <5 years because this age group is at high risk. However, the new trend shows that cases between 20-24 years old and 60-64 years old are rising.<sup>4</sup> Therefore, this research aims to evaluate the prevalence of diarrheal disease and its predictors among people aged 18 and older living in Monterrico, Guatemala, using specific data collection instruments and implementing evidence-based WASH interventions to reduce the spread of diarrheal diseases.

## Methods

The prevalence of diarrheal disease in Monterrico was assessed using a ten open and close-ended question data collection instrument. This collection instrument was developed from the systematic review of peer-review articles that estimated diarrheal disease. The collection instrument was attached to a health screening that was carried out. It captured socio-demographic data, water source, and water treatment information, and if people had 3+ episodes of diarrhea within the past 14 days or not. Data were analyzed in Microsoft Excel.

Development of WASH strategy based on obtained results, and peer-reviewed articles.

Database	Keyword(s)	Hits	Title Appropriate to Study	Discarded after Abstract Review	Designated for Full-Text Review	Selected for Literature Review
Liberty University database	Diarrheal Diseases and WASH Interventions	3,305	856	127	20	20

Fig. 1. Extensive search for articles relevant to diarrhea disease prevalence and WASH interventions

**WASH Questionnaire**

- Within the past 14 days, has there been one day where you had stomach pain and loose, watery poop three or more times?
  - Yes
  - No
- At home, where do you get your water? (Circle all that apply)
  - River water
  - Municipal water
  - Bagged water
  - Other (Please identify): \_\_\_\_\_
- What do you do to your water? (Circle all that apply)
  - Boil it
  - Cloth filter
  - Chlorine
  - Clay filter
  - Other (Please identify): \_\_\_\_\_
  - I do not do anything to my water
- Do you use this water to wash your fruits and vegetables?
  - Yes
  - No
- Do you store any water at home?
  - Yes
  - No

Fig. 2. Wash questionnaire adapted from the peer-review articles

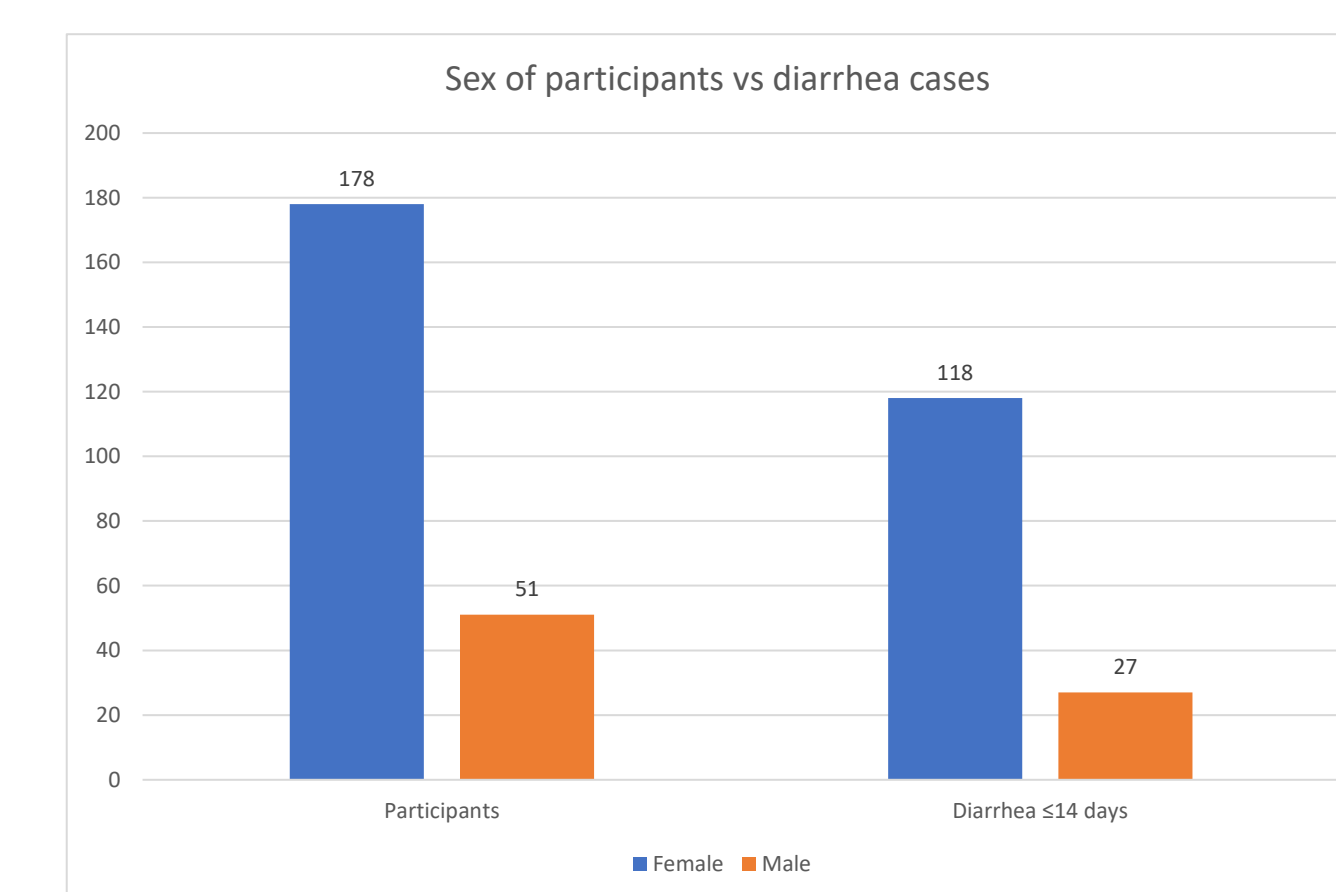


Fig. 3. Diarrhea case distribution by sex

Water Source	Cases	Controls	Odds Ratio
River	1	0	1.17
Municipal	2	1	1.18
Bag	56	48	0.49
Well	84	35	1.93
Other	2	0	2.39

Fig. 6. Distribution of diarrhea cases according to water source utilized

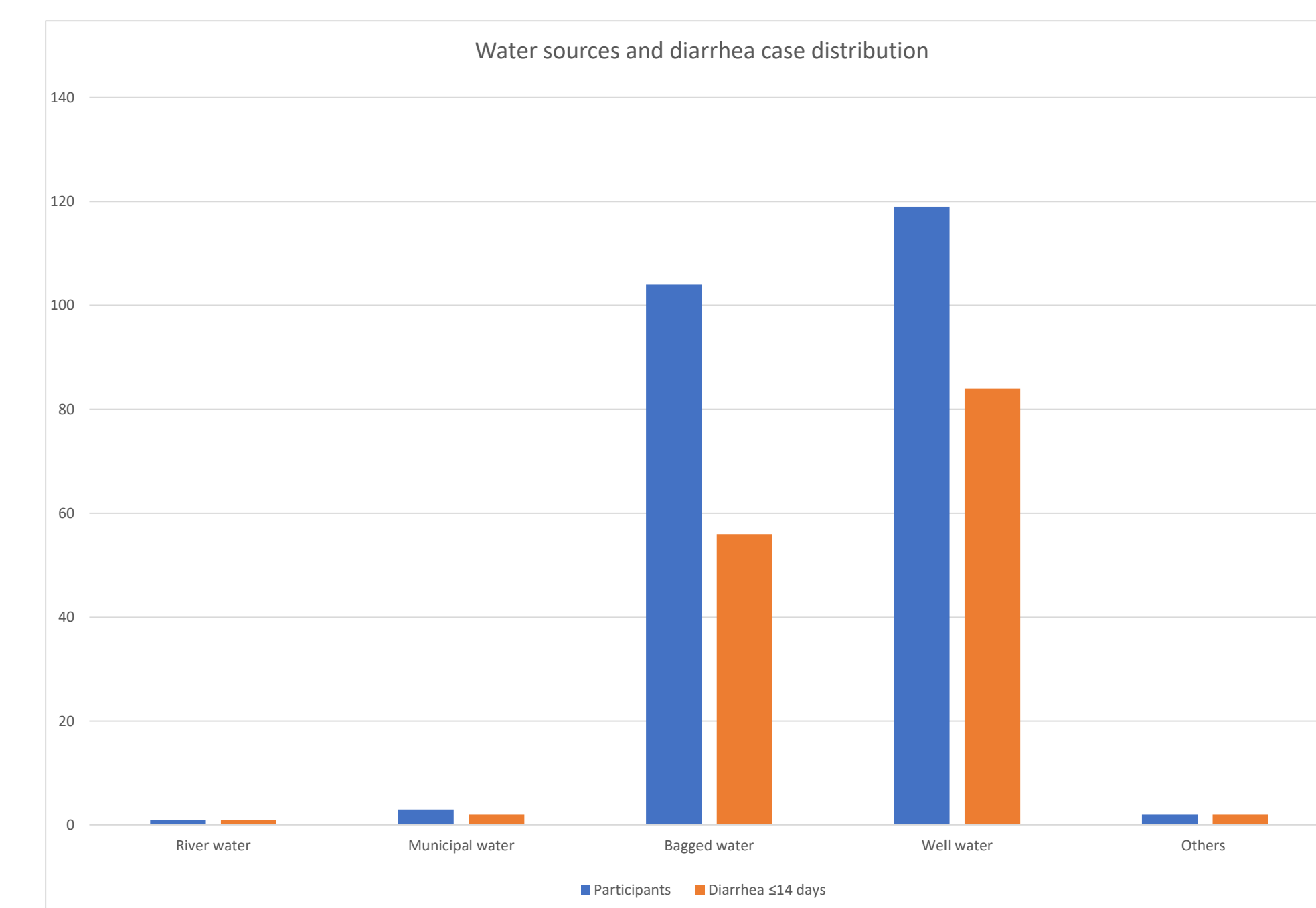


Fig. 4. Distribution of diarrhea cases according to water source utilized

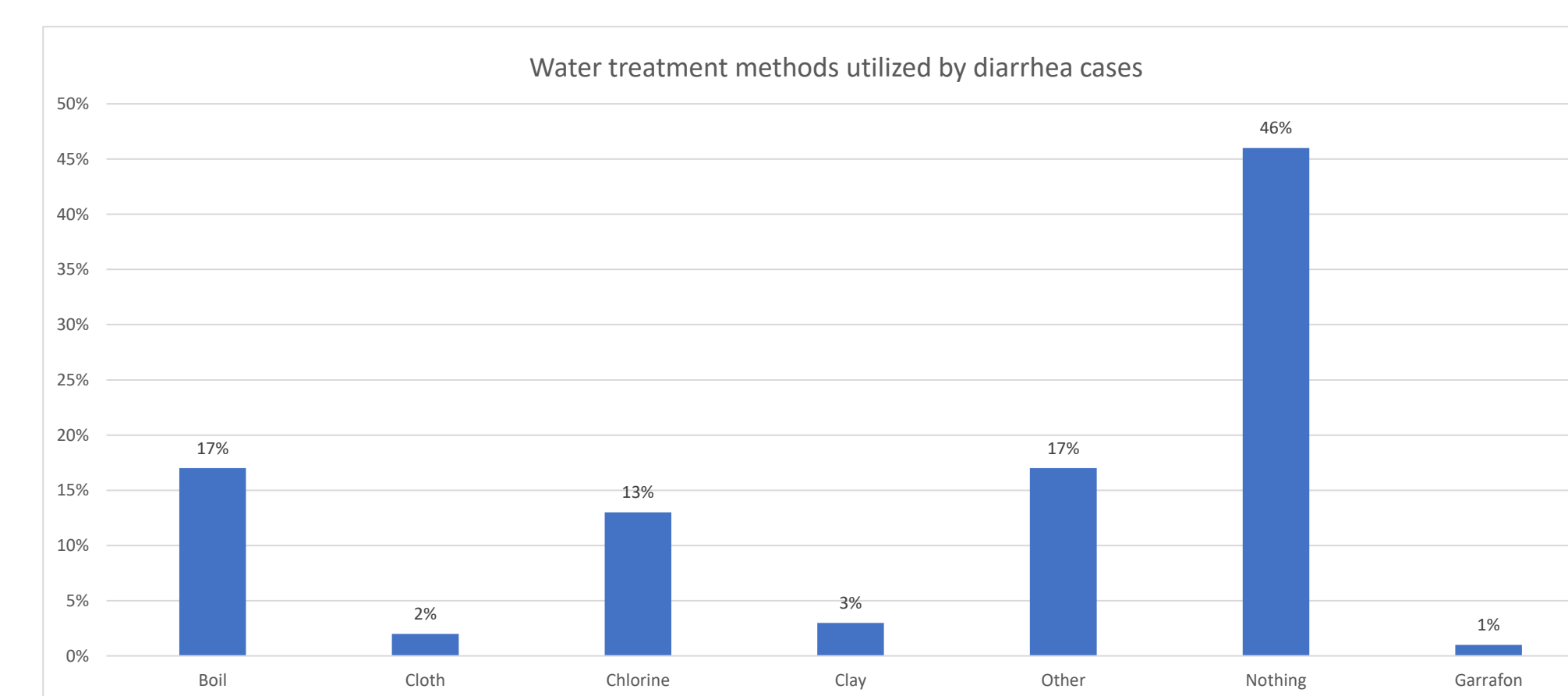


Fig. 5. Various water treatment methods utilized by people with diarrhea

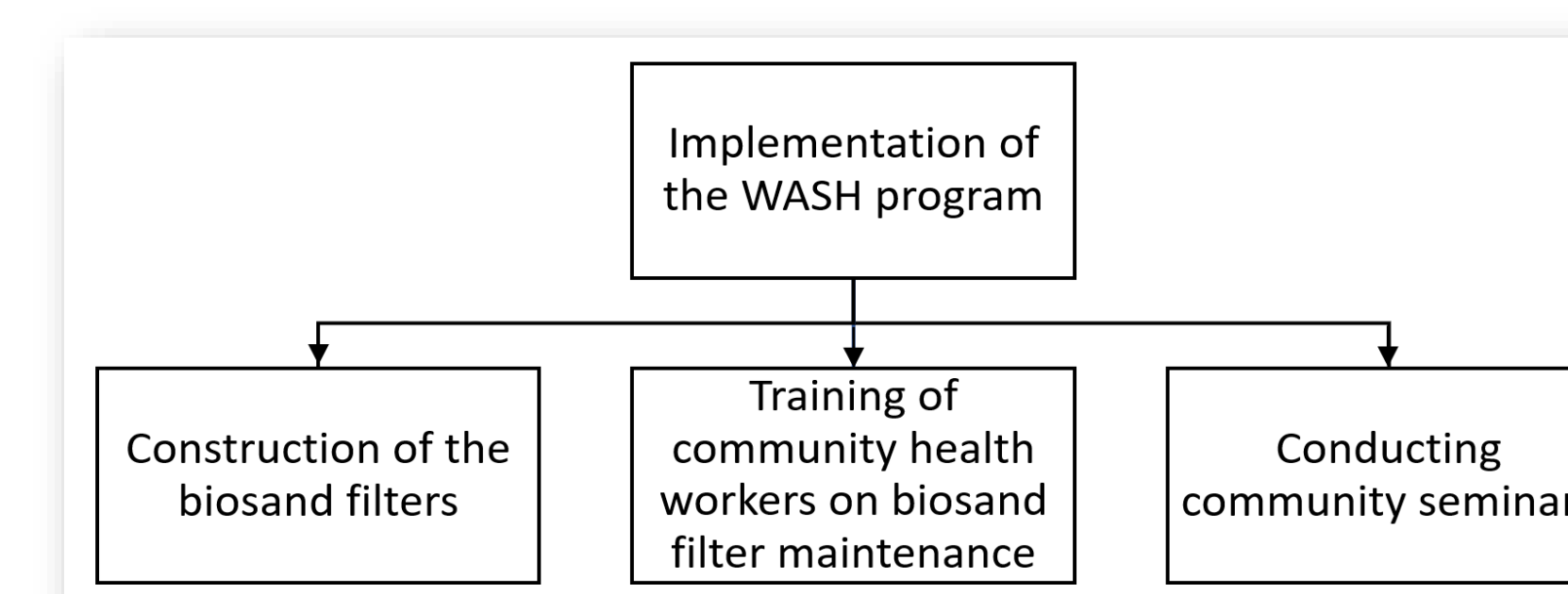


Fig. 7. Proposed intervention plan to reduce diarrhea disease prevalence in Monterrico

## Results and Conclusion

### Results

3,305 articles were identified after an extensive search for articles relevant to diarrhea disease prevalence, and WASH interventions. Further selection with respect to predefined eligibility criteria scaled them down to 856 articles. However, only 127 articles were relevant for this study after a detailed abstract review. A full-text review selected 20 articles, used to develop variables for the data collection instrument. The data collection instrument was administered to 229 participants, aged ≥18 in Monterrico, Guatemala, where their mean participant age was 41.4 years, with the majority being females (78%). Diarrhea disease prevalence in Monterrico was 63% (n=145). Participants whose primary source of water was “well water” had the highest diarrhea disease occurrence (57.93% of all cases). The highest odds ratio was observed in “unidentified water sources” (OR=2.39), followed by “well” water (OR=1.93), “municipal water” (OR=1.18), “river water” (OR=1.17), and lastly, “bagged” water (OR=0.49). Chi-square test of independence revealed no statistically significant association between water sources and diarrhea disease cases ( $\chi^2=5.60$ ,  $p=0.23$ ). Most diarrhea disease cases were found not to treat their water before drinking (46%). A WASH program intended to reduce diarrhea disease prevalence in Monterrico was proposed (integration of biosand water filters).

### Conclusion

The high prevalence of diarrhea diseases could be linked to poor hygiene and sewage disposal. Even though diarrhea diseases threaten humans, there are not enough systems to curb the spread in Monterrico. Future research should include children due to their high morbidity and mortality.

## Future Work

1. Implementation of the WASH program
2. Extend the project to cover all age groups
3. Extend the research to characterize the pathogens responsible for diarrhea diseases in Monterrico, Guatemala.

## References

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