

Disease Prevention Practices in Adolescent Females: A Microscopic Analysis of Water Quality, Sanitation Methods, and Perception of Vector-Borne Illnesses in a Rural Region of the Dominican Republic

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Abstract

Though water quality and sanitation have improved over the past years, there is room for improvement, especially in third-world countries like the Dominican Republic and Haiti. Many people lack the knowledge and supplies to provide basic care for themselves and their families in these countries. The objective of this study was to assess the perceptions of water quality, effective female sanitation practices, and the spread of vector-borne diseases in rural neighborhoods in the Dominican Republic, by surveying a sample of 16 girls between the ages of 8 to 12. Another goal of this study was to analyze how deficiencies in proper care practices could affect the psychosocial development of girls growing in such an environment. Various mediums were used to procure data from the sample, including interviews with the girls, a 14-question survey, and interviews with child psychologists and coordinators at the local Health Care Clinic, all of which were used to establish a baseline for the amount of health education the girls received. Brochures handed out in the city regarding the importance of water quality, daily body care, and sanitation were also examined. This study showed that only 12.50% of the participants had access to purified water by filtration systems or boiling processes while 68.75% of the participants reported exposure to water-borne illnesses. The major diseases that affected the children's lives were small pox, Chikungunya, and malaria. Based on these findings, the efficiency of day-to-day care practices taught to female children to protect against vector-borne illnesses should be reconfigured, since the lack of understanding in rural environments would be classified as public health concern in the world of global medicine. This research study draws attention to potential improvements in healthcare education in developing countries so that immunity levels in young children may be increased through better prevention methods.

Keywords: Sanitation, Water Quality, Dominican Republic

1. Introduction

Around 2.6 billion people in the world lack access to clean water and proper health education, two factors that contribute to approximately a 10 percent increase in disease spread around the world.¹ Specifically, poor sanitation, a side effect of such circumstances, has been associated with the increasing prevalence of diarrheal diseases.² Before 2015, Caribbean and South American countries had attempted to build an infrastructure centered around sanitation and health regulations passed by their governments. But, after the projected deadline for the achievement of the Millennium Developmental Goals passed, the same countries used a new approach to quicken progress, one where community building played a huge role. The new goal, based on the recently created model, is to improve the level of sanitation in rural areas by teaching people how to change their habits, while motivating them to set small goals for their neighborhood to accomplish. That way, both community investment in the future and community investments in

women and children increase. To help further Caribbean and Latin American development, the World Health Organization and United Nations Children's Fund are focusing their efforts on communities that are lagging extremely behind, helping with outreach in such regions.³

1.1 Availability Of Clean Water

Access to clean water is a basic necessity in life. Unfortunately, many people do not have access to water that can be used for basic sanitation purposes or for drinking, which sometimes leads to practices such as open defecation and the pollution of water through human excreta.⁴ As population increases, demand also increases, stretching a fixed supply to its limits.⁵ Many countries are surrounded by water, but much of that water is contaminated, either by other bacteria or pollution from industrial as well as other types of waste. Since many people do end up drinking this contaminated water due to incredible thirst, they contract bacterial infections in their digestive tracts and their lungs. Though there has been a notable improvement in water quality, hygienic sanitation techniques still need to be put into practice.⁷

1.2 Spread Of Vector-Borne Illnesses

The Dominican Republic's tropical climate increases the incidence of vector borne diseases. Vector borne diseases are defined to be infectious diseases that are transmitted through other organisms like mosquitoes, insects that are the main vectors of transmission for dangerous viruses such as Dengue and Chikungunya, both of which are rampant in the Dominican Republic.¹ Dengue fever and Chikungunya are characterized by high fevers, severe joint pains, swelling, and rashes, and if all the symptoms are not treated within fourteen days, a fatality is likely to occur.³ Since both diseases use the same vector, they can be contracted through wet soil, stagnant and impure water, and incorrect sanitation techniques.⁸ Clean water and sanitation play an important role in preventing such illnesses. Tap water, river water, and unfiltered water are home to many microbes and bacteria, and because many people do not have purification systems, much of the population of the Dominican Republic is left vulnerable to many deadly diseases.

One area of sanitation that has not been extensively studied is how children perceive insufficient access to sanitation, poor water quality, and water-borne illnesses. During this research study, the knowledge of children on the topics above is analyzed and validated.

2. Aims of the Study

The main goals of this project were to ascertain the knowledge of the participants regarding (1) sanitation and access to sanitation, (2) water quality and methods of purification, and (3) diseases that directly affect their population. Based on the responses received, a holistic assessment of how the spread of disease alters child development in impoverished communities was to be made. This analysis would then provide foundational information to create better-structured outreach programs in countries like the Dominican Republic.

3. Methods

Overall, this was a mixed methods study. We interviewed participants using survey questions and also allowed them to respond in an open-ended fashion. In addition to this, a tour of the community, an examination of health brochures in the area, and interviews with the clinic director all aided in providing context for the participants' living conditions.

3.1 Study Participants

The study sample consisted of a group of Dominican girls ranging from the ages of eight to twelve who have lived in the Dominican Republic ever since they were born. There were 16 girls who partook in this study and they were all from different households with similar demographics. All of them lived with large extended families, were between the ages of 6 to 14, and had grown up in the same community. They were asked questions in pairs and each girl gave a response to each question. Most live in the neighborhoods around the Callejón District.

3.2 Survey Questions

The same 14 questions were asked to each pair of girls and were based on the three topics of disease, water quality, and sanitation. There were five questions based on knowledge of water quality, another five were based on diseases and their effect on other aspects of a child's life, and six were directly related to sanitation methods. The girls' answers were both recorded by a digital voice recorder and a video camera.

Table 1: Survey questions presented to participants

Question Number	Theme	Question
1	Sanitation	What does being clean mean to you? Do you like feeling clean?
2	Sanitation	How do keep yourself clean? Brushing teeth, hair? Washing your body, face, and hair?
3	Sanitation	Do you wash your hands and brush your teeth at least 3-4 times a day?
4	Sanitation	Do you use the restroom more than once a day?
5	Sanitation	Do you shower regularly?
6	Water	Does your mom boil water for you?
7	Water	Where can you find water in the community? For example what kind of water do you use for cooking and bathing? How is your water purified?
8	Water	Do you have a water filtration or purification system?
9	Water	Do you receive bottled water or is it simply tap water?
10	Water	What happens when the purification system doesn't work or there is no water?
11	Disease	Have you been sick in the past?
12	Disease	What illnesses have you had?
13	Disease	What do you learn in the health class at the Mariposa Center?
14	All Themes	<i>Please share any experience that you would like to share.</i>

4. Results

Table 2: Survey responses to questions about sanitation and access to water

Characteristic:	N (Proportion)
Reported Hand-washing and Teeth-brushing	15 girls (93.75%)
Restroom Use > Once per Day	13 girls (81.25%)
Daily Shower	11 girls (68.75%)
Reported Illness	16 girls (100%)
Have a Primary Physician	9 girls (56.25%)
Receive Boiled Water	2 girls (12.5%)
Own a Water Purification/Filtration System	2 girls (12.5%)
Are you Exposed to the Untreated Tap Water	16 girls (100%)

Table 3: Qualitative responses to open-ended questions

<u>Theme</u>	<u>Qualitative Responses</u>
<u>Access to Water</u>	Participant 1: “You can find water in the river, ocean, shops, and aqueducts, but you can also catch rainwater. For drinking water, they purify water through a pump that boils all water to reduce the damage regular water can cause to your throat and lungs. Few people can afford this.”
	Participant 5: “We get water from a hole in the ground, similar to a deposit or reservoir. It is called a ‘poso’.”
	Participant 3: “Water used to come to my house very rapidly, but now, since there is a lower amount of water in the country, there isn’t enough for bathing or washing. There are times when there is no water and it only comes back hours later. When this happens, we need to climb up to get rainwater. It is really difficult to climb up and down with a huge tub of water on your head.”
<u>Sanitation Techniques</u>	Participant 9: “When we wake up in the morning, we need to clean up by brushing our teeth, combing our hair, and washing our faces and bodies with the water we have.”
<u>Formal Education</u>	Participant 10: “In the class, we learn that it is important to take a towel whenever we go swimming, about diseases in the country, and the risk of HIV, especially since girls are in danger in the city.” ⁷
	Participant 14: “Staying clean means that you stay advanced or in front of the general population. We don’t harm anyone by getting them sick.”
<u>Diseases</u>	Participant 12: “I have suffered from the influenza virus, my friends have suffered from smallpox, we have all suffered from pain throughout the body; but the worst of all was Chikungunya which killed us slowly.”
	Participant 2: “When I had Chikungunya, my mom used to wake me up in the morning and put a wet cloth on my forehead just to reduce the fever. They bought some special juice instead of actual medicine and prepared it for me.”
	Participant 9: “My friend had smallpox and her brother contracted it from her. After that, every single person in her family got infected with smallpox, and in the end, they became very, very sick.”

	Participant 13: “If you get sick, it is scary not only for you, but also your family. To get you the medicine, they need to take a loan or somehow get enough money to pay for it. This may cause problems.”
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The final results of this study showed that only 12.5% of the girls make use of boiled water for the purpose of drinking, 12.5% of the girls have a home water treatment system point of use within their home, and 100% of the girls have reported an serious illness in the past three years.

This evidence from the study validates various arguments from other literary sources, which highlight how ignorance with respect to hygiene and disease prevention proves to be a detrimental force on young females. While the girls do understand the difference between improper and proper sanitation, they do not seem to have the proper supplies or resources to execute the techniques they learn at home and at school. This means that they are unable to put into practice the knowledge they gain through community programs, leaving them in the same unsanitary conditions that they started off in. Their lack of water and materials may correlate to their high susceptibility to illnesses, as can be seen in the results of the study. The girls demonstrate an adequate knowledge of not only their grim circumstances, and this research shows the need for improvement within the field of care and sanitation.



Figure 1: Tenaco, an apparatus constructed to collect rainwater after a storm

Water remains the key problem that links both disease and sanitation. As seen by the study, the children do not make use of boiled water and simply drink water that their parents have access to. Most of the families lack a home water treatment system and are therefore unable to provide clean water constantly for their children. Children must resort to rain catchment to receive enough water for daily use as seen in Figure 1. Rain catchment is a technique utilized in developing nations where rain is collected in a large tank on the roof and then purified so that it is clean enough to drink. Still, the simple apparatus does not filter out much of the disease-causing bacteria in the water, making it a Band-Aid solution for a much deeper issue. The Tenaco (Figure 1) is the name of such a device and is seen in some of the lower middle class homes in the community.

Disease and illness in families and communities often affect the lives of the children. These children contract a variety of diseases from their surroundings. They perceive disease as physically draining, destructive, and costly. Only 9 out of 16 girls have access to primary care or a local physician, so medical care and other health advice is not readily available. One girl specifically states that one disease can spread through the community within weeks, forcing many families to suffer with fevers and other symptoms for days at a time. Moreover, medicine is rather expensive within the Dominican Republic, and contracting a disease will cause a struggling family to exceed their spending limit, exacerbating their state of poverty.

Sanitation, water, and disease are all intricately linked in the Callejón District. That being said, the argument, which states that the improvement of water quality and hygiene will reduce the recurrence of illness, has been strengthened by the results of this study.

4. Discussion

To summarize once more, the main results of this study were that only 12.5% of the participants had access to purified water by filtration systems or boiling while 100% of the participants reported exposure to water-borne illnesses.

The girls came from a life of poverty, which restricted them from having the proper facilities in which to boil water or receive purified water as well as receive an education on simple water filtering methods.¹⁰ Having a constant electrical supply or gas supply is considered a luxury in the Dominican Republic, and a family's financial situation within the community determines the course of their life as well as future.¹¹ One out of the sixteen interviewees said that she had constant running water and two said that they had purification systems.¹² Many girls were confused when asked about boiling water to reduce the bacteria levels since they had not been taught this before. Their families still do not know all the information that they should be aware of in order to protect the children from disease, and in serious cases, death.



Figure 2: Piles of trash collected around the community ready for weekly burning

All the participants mainly suffered from the same illnesses and this could be due to the fact that all of the girls came from the same area, same communities, and same water distribution district. The neighborhoods have many infrastructural weaknesses that contribute to the spread of disease, specifically trash removal, sanitation, and cooking practices.⁸ Contamination to water sources occurs even more because of the burning of trash, and unfortunately, trash burning is a regular practice in the Dominican Republic. Most of the chemicals from the decomposing trash leak into the irrigation systems and aqueducts, contaminating water sources (Figure 2).



Figure 3: Open water sources accumulating water from trickling pipes

Furthermore, many families within a community share a latrine, or a hole-in-the-ground toilet. As each latrine fills up, families move the outhouse to another spot slowly poisoning the ground water the community relies on when there is a lack of water. In addition to the latrine usage, families, by government regulation, must keep their sanitary napkins and toilet paper with them as trash due to the inefficient plumbing system of the Dominican Republic. This allows bacteria to feed off of the feces and multiply using this excreta.¹³ Since low-income Dominican families also store water in metal containers similar to Tenacos, vector and water borne diseases are allowed to replicate. Mosquitos contaminate stagnant and open water sources, which can increase the in-home risk of contracting Dengue and Chikungunya (Figure 3). This only contributes to the amount of risk factors within a girl or boy's childhood. The girls also ingest and cook with the same water; therefore, this is another avenue for the spread of disease.¹⁵

In order to improve the quality of the drinking water, some kind of government intervention is needed, especially because of the inadequate living conditions of many Dominican families. The government should attempt to install an efficient purification system in a region of the country and monitor its effect on the surrounding population. Based on the project's success and the developmental budget, the program can be expanded so that all residents have a chance to receive purified water.¹⁴ If this is not an option, awareness on the topic of alternatives to purify drinking water must be increased. This would give the public other options and not pressure them to purchase the five-gallon containers of "purified" water sold in stores. It is important not only for the country's government to be involved, but also for the world government to pool in resources.¹⁴ The World Health Organization, World Bank, and UNICEF can all work to provide filtration packets, LifeStraws, and water tubs for the families in the Dominican Republic. Improvement could be made in the long-term and it may be possible through a global partnership.

The study presented above was unique in the way that it discussed issues presented from the perspective of a child. Though the strengths detailed above prove to yield much information, a few limitations of the study include the sample size, which was made up of only 16 girls, and the geographic region, since the study only assess one district within the Dominican Republic.

Future studies that can be conducted include studies that involve the impact of contaminated water on brain function in children, using MRI imaging, to document developmental problems. Another study that can be conducted is a study on how the parents' education on the topic of sanitation as well as education level overall affects the knowledge of children about local diseases. Finally, a study that can document interesting results is one that measures how sickness can affect academic aptitude in children through swings in elementary and secondary school attendance.

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