



# Development of a Cost-effective Water Dispenser for hand washing at a rural/resource limited setting – A concept note

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**Abstract:** Lack of clean water coupled with access to contaminated water has only resulted in increase in spread of infectious diseases, especially among the rural children. Further the national sample survey in 2018 showed only 35.8% of Indians wash their hands with soap before eating and 74.1% washed their hands after defecation. In spite of the continued efforts by the governmental and private agencies to encourage the habit of adequate hand washing, especially before and after eating and defecation, lack of basic facilities including absence or malfunction of water storage tanks and taps hinder this process. The lack of tap facilities force the users to use a mug to draw water from the storage tank which lead to contamination of the water, ruling out the advantages of washing hands. These basic facilities are not only absent in public places but also in many households in rural India where running taps are a rare accessory.

In view of these barriers faced, the authors propose a new design of Water Dispenser which can be constructed using locally available resources and hence reduces the cost involved in the construction of tanks and the necessary tap facilities. This not only reduces the initial financial burden at a rural/resource limited setting, but also reduces the recurring cost of maintenance over a period of time.

Further this design can be constructed using minimal labour and expertise and can be ideally done at rural/resource limited school setting by the assistance of the students and staff of that particular place/institution.

Key words: rural population, water borne diseases, hand washing, cost-effective

### **Introduction:**

Hand washing has been emphasized as preventive health behaviour, as clean hands are one of the most important step in avoiding the spread of germs and diseases.<sup>1</sup> The recent surge of COVID-19 pandemic on a global front has reemphasized this fact and all major health organizations of the world have advocated the importance of hand hygiene as one of the foremost prerequisite for prevention of COVID-19 infections.<sup>2</sup> On a population front, various studies have shown that proper and adequate hand washing can result in:

- Reduction in the number of people who get sick with diarrhea by 23-40%
- Reduction in diarrheal illnesses in people with weakened immune systems by 58%
- Reduction in respiratory illnesses, like colds, in the general population by 16-21%
- Reduction in absenteeism due to gastrointestinal illness in schoolchildren by 29-57%<sup>3</sup>

Further according to data from UNICEF, one in every four children under the age of 5 years result from diarrhea and pneumonia and just hand washing with soap can reduce the death rates of these diseases by 65%.<sup>4</sup> The CDC has estimated that about 1.8 million under the age of 5 die each year from these diseases, the top two killers of young children all over the world.<sup>5</sup>

### **Indian scenario**

Being the second most populous country of this world, India houses around 1.4 billion people, with major of its population in rural setting, who have limited access to health and infrastructural facilities. According to the census of 2011, 72.18% of the Indian population are in rural setting and are plagued with a variety of burdens on a day to day basis. One such commodity which is sparse among the Indian population is access to safe and potable water. With its diverse geographic distribution, lack of water and other basic services in India has proved to be the cause of several infectious diseases especially in the rural communities.

A report in 2019 by Nithi Aayog points out that about 800 million people in India face high to severe water scarcity<sup>6</sup>. Though governmental efforts have reduced this imbalance and basic sanitation facilities have been improved by programs like Swachh Bharat, depleting ground water levels and contamination of water bodies have added to this burden of improper water distribution among the Indian population.

Lack of clean water coupled with access to contaminated water has only resulted in increase in spread of infectious diseases, especially among the rural children. In addition, there still exists the problem of open defecation, especially in rural India which acts as a nidus in spread of infection. The governmental agencies have always concentrated on building toilets to discourage open defecation practice and also improve access to

safe and portable water to improve the health status of our population, in lines with the Sustainable Development Goals.

In addition government agencies have also taken efforts to advocate safe and effective hand washing, especially among the rural school children to control the spread of infectious diseases. However A national sample survey in 2018 showed only 35.8% of Indians wash their hands with soap before eating and 74.1% washed their hands after defecation<sup>7</sup>.

In spite of the continued efforts by the governmental and private agencies to encourage the habit of adequate hand washing, especially before and after eating and defecation, lack of basic facilities including absence or malfunction of water storage tanks and taps hinder this process. The lack of tap facilities force the users to use a mug to draw water from the storage tank which lead to contamination of the water, ruling out the advantages of washing hands. These basic facilities are not only absent in public places but also in many households in rural India where running taps are a rare accessory.

This lack of water resources and its effective usage is significant in the rural areas more than the urban areas. This shortage is one of the reasons for public defecation as there is no running water available in the toilets. Further since substantial running water is needed for a single hand wash with soap, many times this hygienic necessity is forgotten..

### **The proposed New Design for Water dispensing for the purpose of hand washing at Rural/resource limited setting**

The proposed new design of Water Dispenser is envisioned to be constructed using locally available resources and hence reduces the cost involved in the construction of tanks and the necessary tap facilities. This not only reduces the initial financial burden at a rural/resource limited setting, but also reduces the recurring cost of maintenance over a period of time.

Further this design can be constructed using minimal labour and expertise and can be ideally done at rural/resource limited school setting by the assistance of the students and staff of that particular place/institution.

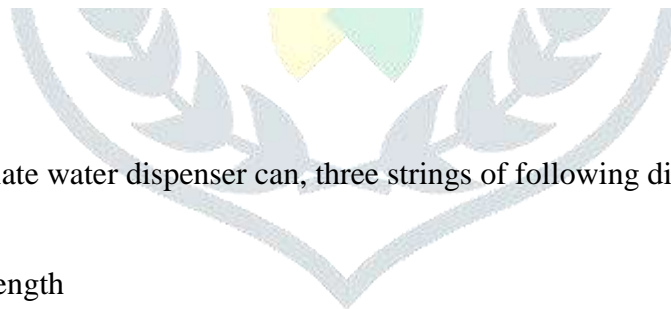
#### **Method of construction of the water dispenser:**

##### **1. Preparation of water dispenser can:**

For the purpose of the water dispenser, any clean plastic or metal can which has a capacity to hold 20 liters of water can be utilized. Used cooking oil cans can be used for this purpose. Figure 1 shows the proposed shape and size of the water dispenser cans which can be advocated for this purpose.



Figure 1 representing a model water dispenser



After selection of an appropriate water dispenser can, three strings of following dimensions should be taken:

1. String A of 4 feet in length
2. String B of 4 feet in length
3. String C of 9 feet in length

String A is used to secure the container to the groove created on the horizontal log panel which is in turn used to secure the container in place, as shown in Figure 2. It is proposed to secure the upper end of the handle of the dispenser to the log panel so that the same is secured in place



Figure 2: String A used to secure the container

String B is used to secure the nozzle of the water dispenser can as shown in Figure 3. This string has to be secured so that the same can be used to lower the nozzle of the dispenser and hence the water in the container can be poured during washing the hands



Figure 3: String B used to secure the nozzle of the container

String C is secured to the handle of the dispenser and the other end of the string goes around the log panel, and the free end of the string C shall be used to lower the dispenser further along with String B, as per the requirement of the user. This has been shown in Figure 4



Figure 4: String C used to secure the handle of the dispenser

## 2. Preparation of Log panel

The log panel consists of a round wooden log, preferably of bamboo or any log of wood which is durable and native to that particular region. The log panel structure consists of two supporting pillars, along with a horizontal wooden platform to support the water dispenser with the strings, as shown in Figure 5. It is preferred to have the supporting pillars of around 5 to 6 feet high (depending on the type of users, whether adults or children) and the horizontal platform of around 5 feet in length so that around two water dispensers can be secured on this structure, as shown in figure 6. Two grooves, preferably 1 feet from the either ends and three feet apart should be placed in the vertical wooden panel to secure string A and also place string C for a single dispenser. This groove secures the string C in place and also services to assist in pulling the string C when required to draw water from the dispenser.



Figure 5: Horizontal wooden platform to support the water



Figure 6: Water dispenser held by strings and supported by wooden panel



### 3. Preparation of gravel bed to collect the used water:

It is preferred to develop a gravel/sand bed on the floor to collect the used water, so that the same can percolate underwater. The collected water can also be used to water the plants nearby, if such an environment is available.

### 4. Method of using the water dispenser for hand washing

The users are encouraged to wash their hands, after sensitizing them about the health benefits, along with the handwashing technique and the duration of the same. The user can pull the string B initially to pour the water from the dispenser for washing his/her hands and feet. However when the water levels are reduced in the dispenser, string C, along with string B can be pulled so that the water in the lower half of the dispenser can be used for washing purpose.

### Advantages of the Proposed Model

1. The current proposed model can be constructed using indigenously available materials and hence reduces both the initial and recurrent cost for installation and maintenance.
2. This model can be constructed using locally available, unskilled manpower and reduces the requirement for expertise manpower
3. This model does not require any mechanical components or electricity for operation and hence can be more user friendly
4. This model reduces the probability of the user using a mug or container to draw water from the water source and hence contaminating the source of water or the container.

### Limitations of the Proposed Model

1. This model proposes a metal or plastic dispenser to store the water for subsequent use for hand washing. There exists a possibility of leakage or contamination of the water dispenser over a time of use. Hence the same has to be replaced as and when it is required.
2. It is advocated to use strong strings for securing the water dispenser and for those required to draw the water. However, over the period of time and repeated use, the strings could break due to exposure to environmental conditions or excessive force of the users. Hence the same may also require replacement after a period of time.
3. Constant refilling of the water dispensers are required in case of multiple users, as in the case of school or community settings.

In spite of the constraints and limitations, the proposer feels that this model could be a viable alternative for water dispensing for hand washing purposes in rural or resource limited settings. Considering that India is the seventh largest country in this world in terms of size, and the second largest in terms of population, it is understandable that variation does exist among Indian population in terms of access to care and infrastructural facilities. With more than seventy percent of the Indian population in rural settings, access of major infrastructural facilities has been either limited or reduced. In spite of various efforts by governmental agencies to reduce this difference in access to care and infrastructure, there exist many regions in our country with limited or no access of basic infrastructural facilities. Access to health care and wellbeing is one such facility with limited access in rural settings. It is an irony that though majority of the Indian population dwell in rural settings, the health facilities seem to concentrate more in urban regions, forcing many rural people to migrate to an urban setting for access to care. This phenomenon is more pronounced in the current scenario with the spread of COVID-19 infection, which has affected substantial amount of Indian population. With more than 3.5 lakh cases per day in India, as on 12th May 2021, Indian governmental authorities have stressed the importance of preventive health habits among the population, including wearing of mask and frequency hand washing and hygiene among the population.

Though proper hand washing has been advocated as preventive health behaviour, the current health burden of India has made the governmental agencies to overemphasize the importance of hand hygiene. The proposer is of the view that this novel method of water dispensing would advocate safe hand washing habits among the rural masses of India, even in the absence of basic requirements like water tanks and taps.

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