WATER BASED DISEASE INCIDENTS DUE TO INADEQUATE ACCESS TO SANITATION AND WATER SUPPLY IN FOUR PHI AREAS IN MAVANELLA, SRI LANKA

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ABSTRACT

Mawanella, an expanding city, belongs to Kegalle district of Sabaragamuwa Province, Sri Lanka. Water supply and sanitation facilities in and around many cities have not been improved in par with the population increase and might have influenced the spread of water related diseases. A study was conducted in four Public Health Inspector (PHI) areas (Aluthnuwara, Ambulugala, Higula and Mawanella) from Mawanella MOH area in the wet zone mid country. The objectives of the study were to assess water supply, health and sanitation situations prevailing and to investigate the temporal variability of the spread of water related diseases. Information on water supply, sanitation, and water related disease incidents were collected from the PHI officers for the period 1997 - 2007. A number of different tools such as secondary health data collection, one-to-one discussions and questionnaire surveys were used to assess the overall water supply and sanitation of the PHI areas.

Access to improved sanitation in urbanized Mawanella and semi-urbanized Aluthnuwara PHI areas show poor conditions compared to the national, provincial and district averages. Mawanella PHI area has 100% access to improved water sources while Hingula has coverage above the national average of 84.7%. The PHI division Ambuluwawa has only 21.8% of coverage with improved water supply. Mawanella PHI area has recorded the highest number of Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) cases which could be due to improper solid waste disposal and availability of mosquito breeding sites within the urban environment. The water related disease that is most prevalent after dengue is dysentery. Mawanella recorded the highest number of dysentery cases followed by Aluthnuwara. Hingula reported the least number of dysentery patients that is reflected by the better sanitation coverage. Mawanella has recorded the highest cases of hepatitis and dysentery that is reflected by poor sanitation coverage or poor wastewater management in the area. Contrary to this, Ambulugala, a rural area without a dense population, recorded the least number of infected patients which could be due to the least opportunity of water sources contamination. The water related diseases studied are mostly concentrated within the South-West monsoon; second inter monsoon and a part of the North-East monsoon due to heavy rainfall incidents. DF and DHF show very high incidents during the North-East monsoon.

1. INTRODUCTION

Urbanization is the driving force for modernization, economic growth, and development, but there are increasing concern about the effects of expanding cities, principally on human health, livelihoods and the environment. In general, populated cities and estate communities dispose wastewater including gray water from kitchens and/or bathrooms and black water from toilets and solid wastes directly into water bodies. Inappropriate fecal matter disposal, inappropriate toilets, toilet pits and improper installations of toilet pits in urban areas, low income communities, estates etc. have contaminated natural, surface and groundwater sources such as streams, wells, springs, etc. Water pollutions due to domestic and municipal discharges have affected potable sources of water posing serious health hazards (Ranasingha et al., 2008).

The implications of rapid urbanization on urban water supply and sanitation infrastructure are staggering. Water supply and waste disposal systems are unable to keep pace with development under resource poor environments, as is the case with LDCs. This results in much of the urban domestic (and industrial) wastewater being discharged untreated into urban waterways in spite of water quality guidelines and discharge standards being available in these countries. In cities with a predominance of urban and peri-urban agriculture (including agriculture on the outskirts of the city), the same watercourses serve irrigation and sometimes other household needs as well. Wastewater use in agriculture, in less developed country contexts, is clearly the result of poor urban sanitation (Jayakodi et al, 2006).

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Poorly managed wastewater has created many health problems such as high incidences of filariasis and dengue fever, skin defects, etc. None availability of adequate water supply and sanitary facilities for low income communities have created very poor sanitary conditions, further polluting the water resources enhancing disease spread. Lack of interest and support among the authority and the community on development of infrastructure and facilities is a major concern in wastewater management (Rajapakse et al., 2007).

Local cultural practices such as indiscriminate defecation in public places, washing clothes and cleaning utensils from water taps where the community collected its drinking water, and poor engineering design and maintenance of the water supply systems were risk factors contributed to acute diarrhoeal disease in a village in southern India (Sarkar et al., 2007). Kulabako et al. (2007) reported from Kampala peri-urban areas that widespread contamination of the groundwater with high organic thermotolerant coliforms and faecal streptococci originating from multiple sources. Palamuleni (2002) reported that groundwater and surface water sources in Malawi's urban poor areas are grossly polluted due to improper sanitation facilities, domestic solid waste disposal and hygiene practices. Pritchard et al. (2007) reported that the total coliform and faecal coliform values in the wet season were much higher than those in the dry season. They also reported that approximately 80% of the shallow wells tested in the dry season and 100% of the wells in the wet season did not meet the drinking water quality guidelines (Ranasingha et al., 2008).

The population, in the urban centers and peri-urban areas are increasing. Water supply and sanitation facilities have not improved in par with the population increases. In addition to that, the pollution of the water sources by the increased population, urbanization and income generation activities has been taking place. This has led to increase in water related diseases spreading and at this moment, dengue and leptospirosis are widely spreading in Kegalle district. Therefore, a study was conducted in few selected PHI areas in Mawanella in Kegalle district with the objectives to assess the water supply in the study areas and to investigate health and sanitation situation prevailing in the study areas. The possibility of spreading different water related diseases in agricultural and urbanized areas was also assessed.

2. METHODOLOGY
2.1 Study Area
Mawanella is one of the major cities which belong to the Kegalle district in the Sabaragamuwa Province of Sri Lanka. Mawanella is located in the wet zone based on agro-meteorological classification of Sri Lanka. The area is getting an annual expected rainfall of more than 2400 mm. December to March is the distinct dry period. Four Public Health Inspector (PHI) areas, Aluthnuwara, Ambulugala, Higula and Mawanella were selected for this study. These PHI areas are mainly situated within the mid country wet zone and receives more than 2400 mm of 75% probable rainfall (NRMIC, 2008). Aluthnuwara and Higula areas are semi urbanized areas; Ambulugala is a village with poor facilities while Mawanella is a highly populated urbanized area. Aluthnuwara PHI area had a population of 22,440 (2007). Ambulugala was occupied by 20,870 (2007). Higula had a population of 23,745 (2007) while Mawanella PHI area had a population of 26,095 in 2007.

2.2 Public Health Data Collection
Information on the recorded cases of waterborne diseases, water washed or water scared diseases and water based vector borne diseases were collected from the epidemiological unit of Medical Office of Health (MOH), Mawanella and relevant PHI areas. Monthly epidemiological data were collected for eleven years (1997 to 2007). A number of different tools were used to assess the overall sanitation and hygienic behavior of the study areas. A guidance note was used to plan the field work with one-to-one discussions and collection of government health data.
3. RESULTS AND DISCUSSION

3.1 Sanitation Facilities

According to the department of census and statistics, national average having access to improved sanitation and improved water sources are 93.9% and 84.7%, respectively. (DCS, 2008). The access to improved sanitation and water supplies in Sabaragamuwa province is 95.3% and 72.9%, respectively while the same in Kegalle district is 96.8% and 73.2%, respectively (DCS, 2008). According to the data in Table 1, the access to improved sanitation in Aluthnuwara, Ambulugala, Mawanella and Hingula PHI areas are 74.8%, 95.9%, 70.4% and 93.5%, respectively. The access to improved sanitation in Mawanella, Aluthnuwara and Hingula are below the national and Sabaragamuwa provincial averages. Kegalle district average of access to improved sanitation is better than the averages reported from all the four PHI areas given in Table 1. According to these figures, the access to improved sanitation in Mawanella and Aluthnuwara PHI areas which are either urbanized or semi-urbanized areas show poor sanitation conditions compared to the national, provincial and district averages.

3.2 Water Supply Facilities

In Mawanella PHI area 97.6% households have mainline water supplies and 2.4 % have protected wells within their premises. Therefore, 100% of the population in Mawanella PHI area has access to improved water sources. The percentage of households in Mawanella and Aluthnuwara PHI divisions has access to protected water sources that are higher than the district (73.2%), provincial (72.9%) and national (84.7%) averages. The study PHI division Hingula has 77.4 % coverage of water supply and 13.7% of protected wells which in total is above the national average. The PHI division Ambulawuwa has only 21.8% of coverage with improved water supply.

<table>
<thead>
<tr>
<th>Table 1 – Sanitation and Water Supply Data in the Study Areas</th>
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<tr>
<td>Aluthnuwara</td>
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<tr>
<td>Total number of houses</td>
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<td>Houses without toilets (%)</td>
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<td>Toilets without sufficient sanitation (%)</td>
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<td>Households without access to improved sanitation (%)</td>
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<td>Households with access to improved sanitation (%)</td>
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<td>Houses covered by water supply (%)</td>
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<td>Houses covered by protected wells (%)</td>
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<td>Households with access to improved water supply (%)</td>
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3.3 Disease Spreading

An overview of the most prevalent water related diseases in the study PHI areas were assessed using the government health statistics. It is important to note that some of the cases of the diseases are not reported at the provincial ministry of health due to the mild infections and sorting the treatments at private hospitals.

Among the vector borne diseases, dengue fever (DF) / dengue hemorrhagic fever (DHF) and malaria are of concern. Other water and food borne diseases dysentery and viral hepatitis were the most prevalent health problems recorded in these areas while few typhoid cases are also reported. Leptospirosis, which has become an epidemic disease in Sri Lanka, is recorded from all the studied PHI areas.

Out of the four PHI areas, Mawanella PHI area has recorded maximum number of the DF and DHF cases (Figure 1). Mawanella Pradeshiya Sabha or the local government authority area is identified as one of the high
risk areas for DF and DHF infections. The number of patients reported from Mawanella PHI area infected and treated for DF / DHF was 178, a very high figure when compared with the other three PHI areas, followed by Hingula. High incidents of DF / DHF reported from Mawanella and Hingula could be due to improper solid waste disposal and/or availability of breeding sites such as construction sites in the densely populated city and peri-urban areas. Ambulugala and Aluthnuwara are comparatively rural and population density is milder than the Mawanella and Hingula PHI areas. However, it is important to note that malaria is not recorded from Aluthnuwara PHI area for the period from 1997 to 2007 (Figure 1).

![Graph showing disease incidents](image)

**Figure 1 – Number of Water Related Diseases Reported at Different PHI areas from 1997–2007**

The water related disease that is most prevalent after dengue is dysentery. Mawanella is the area that recorded most of the dysentery cases followed by Aluthnuwara. Hingula is the area reported with least number of dysentery incidences. In Mawanella, there are 14.7% of households who do not have toilets and there are another 14.9% households who has toilets but without sufficient sanitation. Hingula is the area among the four study PHI areas that has least percentage of the people who do not have toilets (2.3%) or toilets without sufficient sanitation (4.0%). The access to improved sanitation is reflected by the least number of water related diseases in Hingula. This is also an indication that the water sources used in this area are less prone to fecal pollution.

Mawanella recorded the highest incidents of hepatitis, dysentery and dengue from the study areas. This is reflected by the poor sanitation coverage or poor wastewater management in the area. Contrary to this, Ambulugala, a rural area without a dense population, recorded the least number of infected patients. This could be due to the least opportunity of water sources contamination – sufficient spacing between sanitation installations and water wells.

Figure 2 shows the total number of disease incidents recorded at all the four PHI areas considered in this study. The diseases are more concentrated in the periods from April to October (South-West monsoon, Second Inter Monsoon and a part of North East Monsoon). Months from February to March (First inter-monsoon) and November recorded the least number of incidents. The findings of Ranasingha et al. (2008) showed that in Kurunegala, most of the diseases are concentrated within the seasons just after the peak rainy seasons and during the inter-monsoonal seasons. This study is conducted in the wet zone mid country where the rainfall pattern is different and shows a different disease distribution patterns.
Dengue shows the highest incidents from May to August (South-West monsoon) and from November to January (North-East monsoon). The lowest dengue incidents are reported from February to April and from September to October, first and second inter-monsoons, respectively. Dengue fever shows a very clear relationship to the rainfall distribution in the area. North-East monsoon reported sharp increases in DH & DHF cases in all the PHI areas studied that could be attributed to the heavy rainfall received throughout the North-East monsoon.

CONCLUSION
Access to improved sanitation in Mawanella and Aluthnuwara PHI areas which are either urbanized or semi-urbanized areas show poor sanitation conditions compared to the national, provincial and district averages. Mawanella PHI area (100%) has access to improved water sources, while Hingula has coverage above the national average. The PHI division Ambuluwawa has only 21.8% of coverage with improved water supply. Mawanella PHI area has recorded maximum number of the DF and DHF cases which could be due to improper solid waste disposal and availability of mosquito breeding sites. The water related disease that is most prevalent after dengue is dysentery. Mawanella recorded the most of the dysentery cases followed by Aluthnuwara. Hingula reported the least number of dysentery incidences that reflects the better sanitation coverage and are less prone to fecal pollution. Mawanella recorded the highest incidents of hepatitis and dysentery that is reflected by the poor sanitation coverage or poor wastewater management. Contrary to this, Ambulgala, a rural area without a dense population, recorded the least number of infected patients which could be due to the least opportunity of water sources contamination.

REFERENCES