CHAPTER FOUR
RESULTS

The previous chapter explained the procedures of activities and data analysis of this study. This chapter describes the results which are divided into three parts based on the data obtained from sample analysis and inspection of the sanitary conditions of the water supply in schools, comprising: (1) drinking water quality before and after intervention, (2) concentration of Coliform contamination in drinking water, and (3) sanitary conditions of the water supply in schools

4.1 DRINKING WATER QUALITY BEFORE AND AFTER INTERVENTION

4.1.1 Contamination of Bacteria in Drinking Water Samples

The pretest and posttest (before and after intervention) results of bacterial contamination in drinking water taken from targeted schools are displayed in Table 3.

Table 3. Pretest and Posttest Results of Bacterial Contamination in Drinking Water Samples

Type of school	Total Number of samples		Total number of samples contaminated with bacteria		Frequency									
					Coliforms Present		*E.coli* Present		*S.aureus* Present		Salmonellae Present		*C.perfringens* Present	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Governmental schools	14	19	1	3	1	3	0	0	0	0	1	0	0	1
%			7.1	15.8	7.1	15.8	0.0	0.0	0.0	0.0	7.1	0.0	0.0	5.3
Private schools	47	46	9	4	6	4	4	0	0	0	0	0	2	0
%			19.2	8.7	12.8	8.7	8.5	0.0	0.0	0.0	0.0	0.0	4.3	0.0
Total	61	65	10	7	7	7	4	0	0	0	1	0	2	1
%			16.4	10.8	11.5	10.8	6.6	0	0	0	1.6	0	3.3	1.5

I = Pretest (Before intervention by providing knowledge of sanitation). II = Posttest (After intervention by providing knowledge of sanitation).

As shown in Table 3, as a whole, the number of samples contaminated with bacteria decreased from 16.4% to 10.8% after the intervention. The waterborne bacterium, *S. aureus* was not found in all samples, but Coliforms, a sanitary indicator, were detected in both pretest and posttest samples. Salmonellae appeared in the pretest samples but not in later examination. In contrast to Salmonellae, *C. perfringens* was positive after intervention. When considering the samples collected from governmental schools, the posttest samples contained a higher percentage of contamination than those of the pretest at the percentage of 15.8% and 7.1%, respectively, whereas the samples from private schools shows the opposite result, of a reduction of contamination from 19.2%. to 8.7%. The statistical results showed significantly different contamination of bacteria in drinking water samples tested before and after the intervention ($\chi^2 = 0.45$, $p < 0.05$). Moreover, the bacterial contamination in water samples collected from governmental schools and private schools were different at a significant level of 95% ($\chi^2 = 0.09$, $p < 0.05$).

4.1.2 Contamination of Bacteria in Drinking Water Taken from the Targeted Schools

As indicated in Table 4, for governmental schools, one of two water samples taken after intervention from Wat Saima Community school contained Coliforms and *C. perfringens*. The pretest samples collected from Sainoi school and Kanaratbumrung Pathumthani schools were negative for Coliforms but were positive for the posttest. All governmental schools, except Wat Saima Community, indicated the absence of *E. coli, S. aureus*, Salmonellae and *C. perfringens* in both periods. Salmonellae was found in a pretest sample taken from Wat Saima Community but it was not detected in any posttest sample.

Table 4. Contamination of Bacteria in Drinking Water Collected from the Targeted Schools

Schools	Total number of samples		Total Number of samples contaminated with bacteria		Frequency									
					Coliforms Present		*E.coli* Present		*S.aureus* Present		Salmonellae Present		*C.perfringens* Present	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Governmental schools														
1. Wat Saima Community	2	2	1	1	1	1	0	0	0	0	1	0	0	1
2. Bodindecha (Sing Singhaseni)	2	4	0	0	0	0	0	0	0	0	0	0	0	0
3. Sainoi	1	2	0	1	0	1	0	0	0	0	0	0	0	0
4. Potinimitwittayakom	4	3	0	0	0	0	0	0	0	0	0	0	0	0
5. Thanyaburi	2	4	0	0	0	0	0	0	0	0	0	0	0	0
6. Kanaratbumrung Pathumthani	1	1	0	1	0	1	0	0	0	0	0	0	0	0
7. Chaiasitthawas	2	3	0	0	0	0	0	0	0	0	0	0	0	0
Total	**14**	**19**	**1**	**3**	**1**	**3**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**
Private schools														
8. Rajinibon	22	21	3	2	1	2	3	0	0	0	0	0	0	0
9. Saint John's	15	14	4	0	3	0	1	0	0	0	0	0	2	0
10. Srisangwal	10	11	2	2	2	2	0	0	0	0	0	0	0	0
Total	**47**	**46**	**9**	**4**	**6**	**4**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**0**

I = Pretest (Before intervention by providing knowledge of sanitation). II = Posttest (After intervention by providing knowledge of sanitation).

As shown in Table 4, for private schools, after the intervention, two of the posttest samples collected from Rajinibon and Srisangwal displayed positive results for Coliforms but showed negative for waterborne pathogens. Even though the pretest samples taken from Saint John's school were positive for Coliforms, *E.coli* and *C. perfringens*, all posttest samples showed negative results of bacterial contamination.

4.2 CONCENTRATION OF COLIFORM CONTAMINATION OF DRINKING WATER

The average concentration of Coliforms count (MPN per 100 ml) in drinking water samples displayed as a Mean value ($\overline{X}$) is indicated in Table 5 below.

Table 5: Concentration of Coliforms Count (MPN per 100 ml) in Drinking Water Tested Before and After Intervention

Number	Schools	Total Number of Tested Samples		Mean ($\overline{X}$) of Coliforms count (MPN/100 ml)	
		Before intervention	After intervention	Before intervention	After intervention
	Govermental schools				
1	Wat Saima Community	2	2	0	1.1
2	Bodindecha (Sing Singhaseni)	2	4	0	0
3	Sainoi	1	2	0	1.8
4	Potinimitwittayakom	4	3	0	0
5	Thanyaburi	2	4	0	0
6	Kanaratbamrung Pathumthani	1	1	0	5.1
7	Chaiyasitthawas	2	3	0	0
	Private schools				
8	Rajinibon	22	21	0.2	1.9
9	Saint John's	15	14	1.5	0
10	Srisangwal	10	11	0.6	1

According to Table 5, before the intervention, the samples taken from governmental schools showed a mean value of zero whereas three private schools, i.e. Rajinibon, Saint John's and Srisangwal, showed values of 0.2, 1.5 and 0.6, respectively. After the intervention, the mean values of Coliform counts in drinking

water taken from Wat Saima Community, Sainoi, Kanaratbamrung Pathumthani, Rajinibon and Srisangwal were higher than those obtained before the intervention in contrast to Saint John's school that showed lower values. However, the mean values of Coliform contamination in dinking water taken from all schools except Kanaratbamrung Pathumthani were lower than the standard limit of the Ministry of Public Health as defined as Coliforms in drinking water less than 2.2 (shown in Table 2).

4.3 SANITARY CONDITIONS OF WATER SUPPLY IN SCHOOLS

Based on Table 4, there were five schools displaying low quality water samples after the intervention; three of these were governmental schools, i.e. Wat saima Community, Sainoi, and Kanaratbamrung Pathumthani, and two were private schools, i.e. Rajinibon and Srisangwal. Here, the sanitary conditions of the water supply providing poor quality water samples (as indicated in Table 4) that were obtained from inspection using the checklist are as follows:

4.3.1 Wat Saima Community School

After the intervention, one sample in Wat Saima Community school showed contamination of Coliforms and *C. perfringens* (Table 4). The sanitary conditions of the drinking water supply providing the poor quality samples are shown in Table 6 below.

Table 6. Sanitary Conditions of Drinking Water Supply Providing Low Quality Samples in Wat Saima Community School

Inspection	Results
1. Type of water source	Tap water
2. Type of drinking water dispenser	Water cooler tank
3. Surrounding area of water dispenser	Dirty
4. Water filter is used.	Yes
5. Appearance of the water filter	Old but not rusty
6. Duration of filter used	Less than 1 year
7. If water cooler tank is used, how often is it cleaned?	Once a year
8. Drinking water quality has previously been examined.	Yes
9. There is/are person(s) responsible for cleaning the water cooler tanks.	Yes

As shown in Table 6, the drinking water source came from tap water flowing through a water filter and was stored in a water cooler tank. The surrounding area looked dirty (indicated by trash, rubbish and an unclean floor) and the water filter that had been used less than one year looked old but not rusty. The water cooler tank was cleaned once a year by a staff member.

4.3.2 Sainoi School

After the intervention, one sample of drinking water taken from Sainoi school showing positive results for Coliforms (Table 4). The sanitary conditions of the drinking water supply providing poor quality samples are shown in Table 7 below.

Table 7. Sanitary Conditions of Drinking Water Supply Providing Low Quality Samples in Sainoi School

Inspection	Results
1. Type of water source	Tap water
2. Type of drinking water dispenser	Water cooler tank
3. Surrounding area of water dispenser	Dirty
4. Water filter is used.	Yes
5. Appearance of the water filter	Old but not rusty
6. Duration of filter used	1-3 years
7. If water cooler tank is used, how often is it cleaned?	Monthly
8. Drinking water quality has previously been examined.	Yes
9. There is/are person(s) responsible for cleaning the water cooler tanks.	Yes

As shown in Table 7, the drinking water was obtained from tap water flowing through a water filter and was stored in a water cooler tank. The water cooler tank location looked dirty (indicated by trash, rubbish and an unclean floor). The water filter that had been used for 1-3 years looked old but not rusty. The water cooler tank had been cleaned monthly by staff in the school.

4.3.3 Kanaratbamrung Pathumthani School

After the intervention, one sample in Kanaratbamrung Pathumthani school tested positive Coliforms (Table 4). The sanitary conditions of the drinking water supply of the poor quality samples are shown in Table 8 below.

Table 8. Sanitary Conditions of Drinking Water Supply Providing Low Quality Samples in Kanaratbamrung Pathumthani School

Inspection	Results
1. Type of water source	Tap water
2. Type of drinking water dispenser	Water cooler tank
3. Surrounding area of water dispenser	Dirty
4. Water filter is used.	Yes
5. Appearance of the water filter	Old but not rusty
6. Duration of filter used	More than 5 year
7. If water cooler tank is used, how often is it cleaned?	Once a year
8. Drinking water quality has previously been examined.	Yes
9. There is/are person(s) responsible for cleaning the water cooler tanks.	Yes

As shown in Table 8, the drinking water was obtained from tap water flowing through a water filter and stored in a water cooler tank. The appearance of the water supply location was dirty (indicated by trash, rubbish and an unclean floor) and the water filter that had been used more than 5 years looked old but not rusty. A staff member cleaned the water cooler tank once a year.

4.3.4 Rajinibon School

After the intervention, two drinking water samples taken from Rajinibon school displayed Coliforms contamination (Table 4). The sanitary conditions of the drinking water supply for the poor quality samples are shown in Table 9 below.

Table 9. Sanitary Conditions of Drinking Water Supply Providing Low Quality Samples in Rajinibon School

Inspection	Results	Results
	Sample 1	Sample 2
1. Type of water source	Tap water	Tap water
2. Type of drinking water dispenser	Water cooler tank	Water cooler tank
3. Surrounding area of water dispenser	Dirty	Dirty
4. Water filter is used.	Yes	Yes
5. Appearance of the water filter	Old but not rusty	Old but not rusty
6. Duration of filter used	1-3 years	1-3 years
7. If water cooler tank is used, how often is it cleaned?	Monthly	Monthly
8. Drinking water quality has previously been examined.	Yes	Yes
9. There is/are person(s) responsible for cleaning the water dispensers.	Yes	Yes

As shown in Table 9, the drinking water came from tap water flowing through water filters and was stored in water cooler tanks. Both water supply sites looked dirty (indicated by trash, rubbish and an unclean floor) and the water filters that had been used for 1-3 years were old but not rusty. The water cooler tanks had been cleaned every month by a staff member.

4.3.5 Srisangwal School

After the intervention, two drinking water samples taken from Srisangwal school indicated positive Coliforms contamination (Table 4). The sanitary conditions of the drinking water supply for the poor quality samples are shown in Table 10 below.

Table 10. Sanitary Conditions of Drinking Water Supply Providing Low Quality Samples in Srisangwal School

Inspection	Results	Results
	Sample 1	Sample 2
1. Type of water source	Tap water	Tap water
2. Type of drinking water dispenser	Water cooler tank	Water cooler tank connected to multiple-faucet basin
3. Surrounding area of water dispenser	Dirty	Dirty
4. Water filter is used.	Yes	Yes
5. Appearance of the water filter	Old and rusty	Old but not rusty
6. Duration of filter used	More than 5 years	More than 5 years
7. If water cooler tank is used, how often is it cleaned?	Once a year	Once a year
8. Drinking water quality has previously been examined.	Yes	Yes
9. There is/are person(s) responsible for cleaning the water dispensers.	Yes	Yes

As shown in Table 10, one sample was taken from the water cooler tank which was attached to an old and rusty filter. The other sample was taken from a multiple-faucet basin connected to an old (but not rusty) filter. The filters used for supplying both water samples had been used for over 5 years. Both water supply locations were dirty (indicated by trash, rubbish and an unclean floor). In addition, there were persons responsible for managing the cleaning of the water cooler tanks once a year.

This chapter presents the results of bacterial contamination in drinking water provided for students before and after the intervention and of inspecting sanitary conditions of the water supply in schools. The findings of this study will be summarized and discussed in the next chapter.