

Assessment and Treatment of Arsenic Contaminated Tube well water from selected areas in Kyaunggon Township, Ayeyarwady Region, Myanmar

Khin Phyu Phyu¹, Phyo Wai Zin¹, Kyi Kyi Nyein Win¹, Mya Marlar¹, Khine Khine Mar¹, Tin Tin Han¹, Arisa Konish², Min Kyaw Htin³, Myo Nanda Aung¹, Aye Naing⁴, Zaw Than Htun¹

¹ Department of Medical Research, Myanmar
³ Irrigation and Water Utilization Management Department

² University of Miyazaki, Japan
⁴ Department of Public health & Department of Medical Services

5th NIES International Forum on 21st to 22nd January 2020

1. Background

- Arsenic, naturally present in the environment, is a highly toxic metalloid element that cause systemic lesions including skin lesions, cardiovascular disease, various cancers and cognitive development of children.
- In the Ayeyarwady delta region of Myanmar, high arsenic contamination of groundwater had been revealed since 2000.¹
- In 2013, Kyaunggon township was the most seriously contaminated area among 17 townships, that had 21.56% of water sources containing arsenic concentration above National Drinking Water Quality Standard, Myanmar (NDWQS) value of 50 µg/L.²
- Since ground water is an essential water source in rural Myanmar, mitigation options need to be introduced to reduce arsenic exposure to the people who live in this area.



About Kyaunggon township

- Population: 163,035
- Unit water consumption: 2-3 L/day/Capita
- Major water source: tube well water as well as for drinking
- Other source: River water, Rain water
- limited sources: bottle water

2. Objective and Methodology

- Research about current status of arsenic contamination in selective area of Kyaunggon township by cross-sectional analytic study and development of the low cost arsenic reducing Gravel Sand Filter system
- Because of the previous findings, arsenic information were mainly received from health staffs and being interested by most of the students³, the drinking water samples were collected from 69 schools (1/3 of total schools) and 27 health centers under 10 Rural Health Centers
- Measurement of Arsenic: Wagtech Digital Arsenator

3. Results

3-1 Concentration of As (µg/L) in tube wells (n=96)

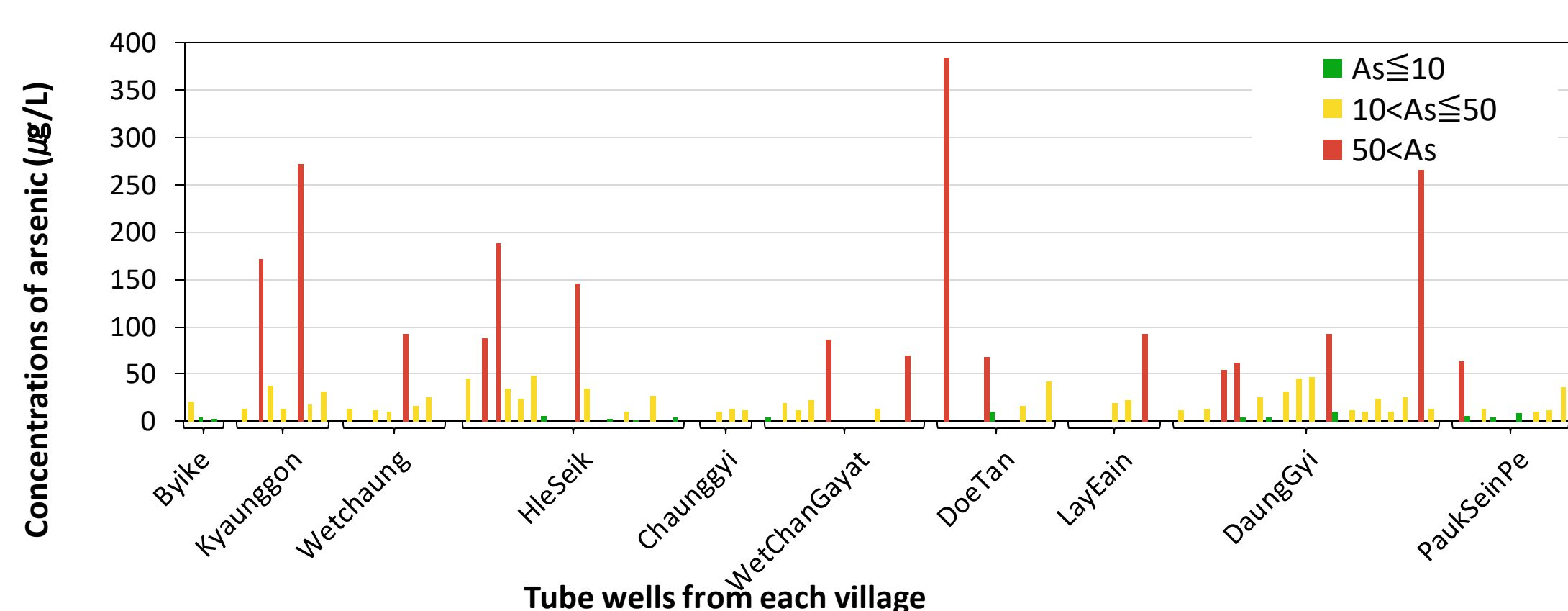


Fig.1 Concentration of arsenic in water from each tube well in Kyaunggon township

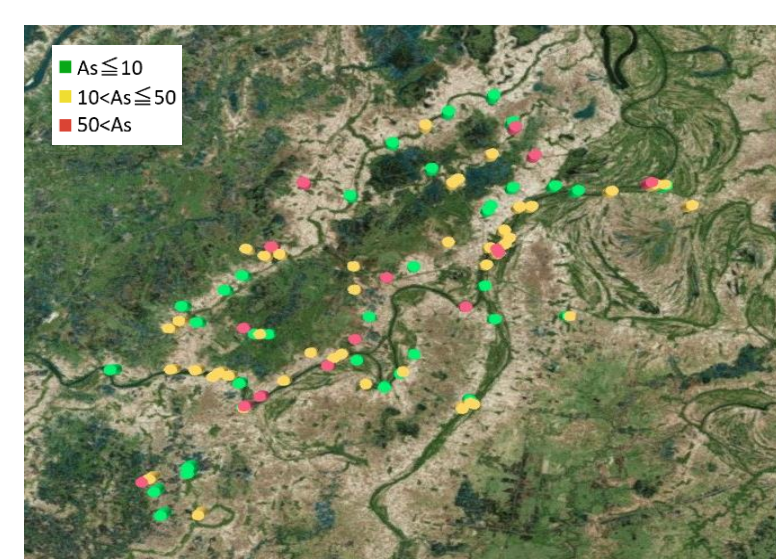


Fig.2 Risk map showing concentration of arsenic color-coded by concentration at this study area

Table1 Tallied data about concentration of arsenic in each village

	As level (µg/L)		Number of tube well				Ratio				
	min	Max	total	As ≤ 10	10 < As ≤ 50	50 < As	0%	25%	50%	75%	100%
Byike	3	21	3	2	1	0	67	33	0	0	0
Kyaunggon	13	272	7	0	5	2	71	29	0	0	0
Wetchaung	0	93	8	2	5	1	25	63	13	0	0
HleSeik	0	188	17	7	7	3	41	41	18	0	0
Chaunggyi	0	13	4	1	3	0	25	75	0	0	0
WetChanGayat	0	87	12	6	4	2	50	33	17	0	0
DoeTan	0	384	9	5	2	2	56	22	22	0	0
LayEain	0	92	7	4	2	1	57	29	14	0	0
Daunggyi	0	268	20	4	12	4	20	60	20	0	0
PaukSeinPe	0	63	9	4	4	1	44	44	11	0	0
total			96	35	45	16	36	47	17	0	0

- High concentrations of arsenic exceeding NDWQS value were detected in water from **17%** of the tube wells.
- The highest As level was **more than 7 times** as high as NDWQS.
- No regularity about distribution of arsenic was found.
- In all villages, **more than 70%** of the tube wells provided water satisfying NDWQS.

3-2 Distribution of Arsenic in (µg/L) (Depth and location)

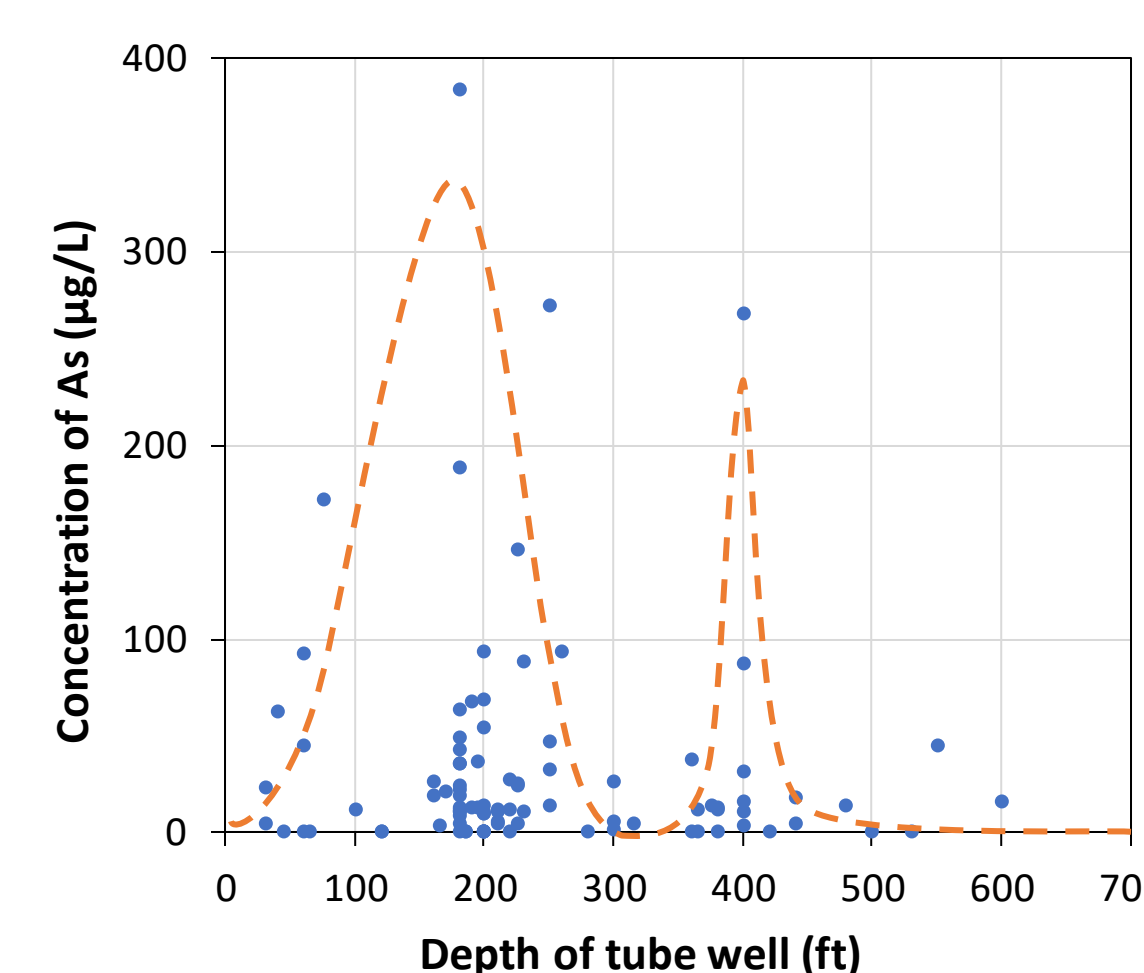


Fig.3 Relationship between concentration of arsenic and depth of tube well

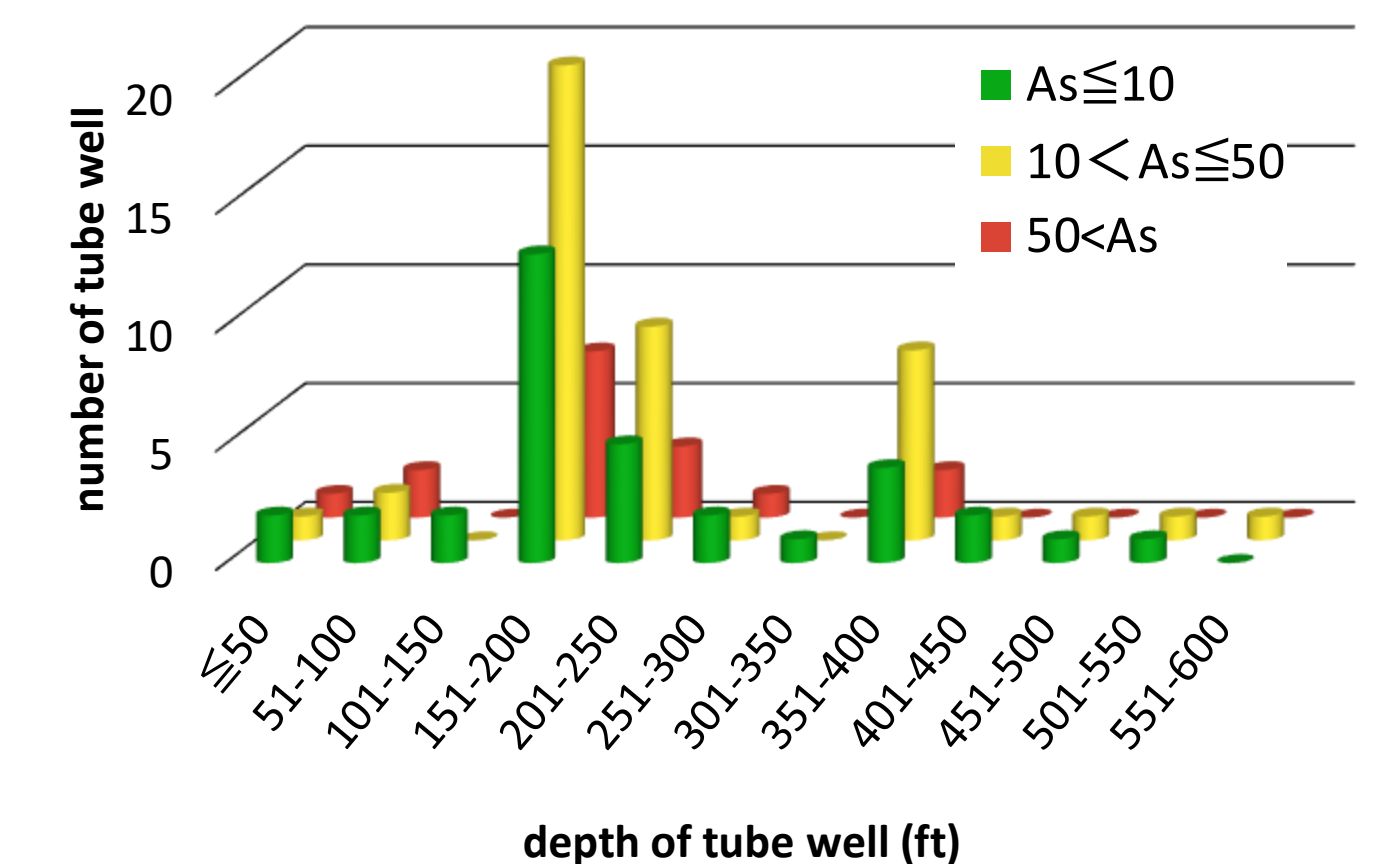


Fig.4 Relationship between concentration of arsenic, tube well number and depth of tube well

- Tube wells which is **150-250 ft**, and **400 ft** depth tend to contain high level of arsenic.
- Arsenic with a concentration exceeding NDWQS (>50 ppb) was not detected from wells **deeper than 400 ft**.

3-3 Gravel Sand Filter (GSF) (31st October 2019)

Table 2. Results of raw and filtered water

	Arsenic (µg/L)	Fe (mg/L)
NDWQS value	50	0.3
Raw water	173	11.3
Immediate	73	-
After 2 weeks	13	0.07

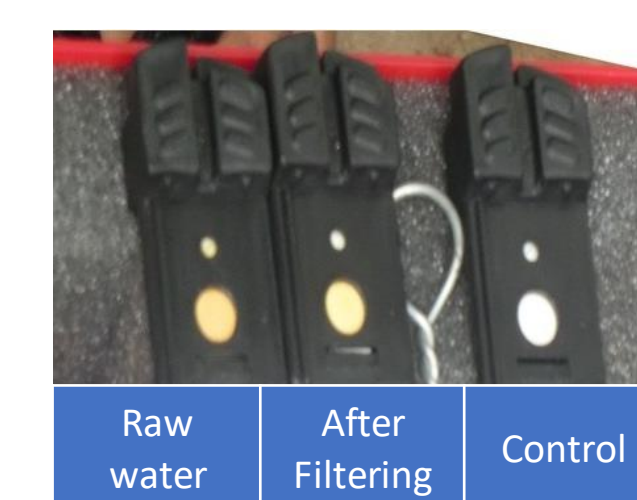


Fig.5 Results of raw water and filtered water by field Arsenic test kit



Fig.6 Model of Gravel Sand Filter at Kyaunggon hospital

- Arsenic and iron levels were reduced from high concentration to **within permissible level of NDWQS**.

4. Discussion

This study demonstrated the current situation of arsenic contamination of tube well water in selected areas of Kyaunggon township. These results suggested the possibility of introducing the following measures:

- People should use safe water from nearby uncontaminated tube wells and GSF to reduce arsenic exposure to the people who live in this area.
- For making new tube well, the risk map should be used by selecting low risk location or depth of tube well more than 400 feet.

5. Further Research

- To maintain GSF system
 - By monitoring conducting performance for long-term use
 - By evaluating effects of composition of water on GSF system

6. References

- Tet Nay Tun, Arsenic contamination of water sources in rural Myanmar, 29th WEDC International Conference, towards the millennium development goals, 2003, p.291-221
- UNICEF, An Analysis of Arsenic Content in Drinking Water Sources of Ayeyarwady region, 2013, p.6
- Final report of PEH project 2018