



ROYAL CENTER FOR DISEASES CONTROL
QUARTERLY BULLETIN: First Quarter 2023
(Epi-week 01 - 13)

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Highlights on National Early Warning and Alerts Response Surveillance (NEWARS):

NEWARS:

Overall reporting rate for notifiable diseases had increased compared to the previous quarter

A majority of the immediately notifiable diseases/syndromes reported were suspected measles/rubella cases. Three tested positive for measles IgM and two tested positive for rubella IgM.

Four Dengue fever cases, two malaria, two bacterial meningitis, and were reported during the quarter

Nine diseases outbreak reported were reported during the quarter, of which two were Influenza-like illness, two outbreak of acute gastroenteritis, three outbreak of chickenpox and two outbreaks of Chilblain were reported.

1. National Early Warning Alert and Response Surveillance (NEWARS)

1.1 Reporting status of health centers under 20 Dzongkhags

In the fourth quarter, a total of 3710 weekly reports were expected from 265 health centers across the country. The overall reporting rate was inconsistent with the last quarter. Overall 87.0% of reports were received in the NEWARS of which 64.0% were reported on time, 13.0% were reported late and the rest were not reported (**Figure 1**).

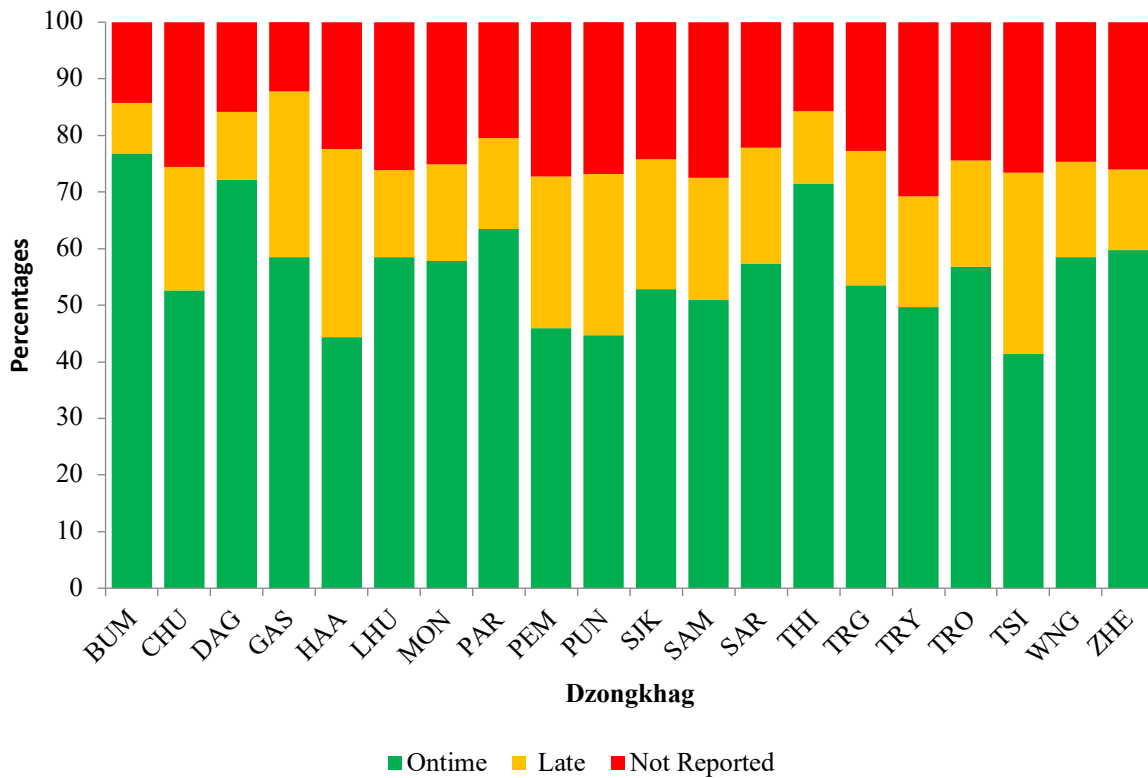


Figure 1: Dzongkhag-wise weekly reporting status for 4thquarter 2022

BUM (Bumthang), CHU (Chukha), DAG (Dagana), GAS(Gasa), LHU (Lhuntshe), MON (Mongar), Par (Paro), PEM (Pemagatshel), PUN (Punakha), SJK (Samdrupjongkhar), SAM (Samtse), SAR (Sarpang), THI (Thimphu), TRG (Trashigang), TRY (Trashiyangtshel), TRO (Trongsa), TSI (Tsirang), WANG (Wangduephodrang), ZHE (Zhemgang)

1.2 Status of Notifiable Diseases/Syndromes reported by health centers:

Among 11 weekly reportable diseases/syndromes, the highest number of cases were reported were ARI- 27454(78.0%) followed by AWD- 5192 (19.0%), (**Table 1**). The total number of cases reported was lower in this quarter compared to the fourthquarter 2022.

Table 1: Notifiable diseases/syndromes reported by Dzongkhags

DZO	ABD	AWD	AJS	ARI	MUM	FWR	FDP	TPF	SAR	RKS
BUM	3	247	3	936	0	02	0	0	4	0
CHU	26	389	0	2577	0	10	0	0	10	2
DAG	30	306	3	1252	0	0	0	0	3	0
GAS	0	34	0	68	0	0	0	0	0	0
HAA	3	178	0	393	0	0	0	0	5	0
LHU	15	146	0	690	0	0	0	0	1	0
MON	43	416	14	1464	0	0	0	0	97	4
PAR	24	149	8	2168	0	0	0	0	9	0
PEM	7	303	0	972	0	0	0	0	1	1
PUN	28	275	0	581	0	0	0	0	1	0
SJK	19	439	2	2448	0	3	0	0	13	0
SAM	24	873	1	2772	0	5	0	0	4	3
SAR	48	601	1	3529	0	40	0	0	11	1
THI	30	940	1	2408	0	22	2	1	2	0
TRG	57	427	2	1371	0	28	6	0	9	0

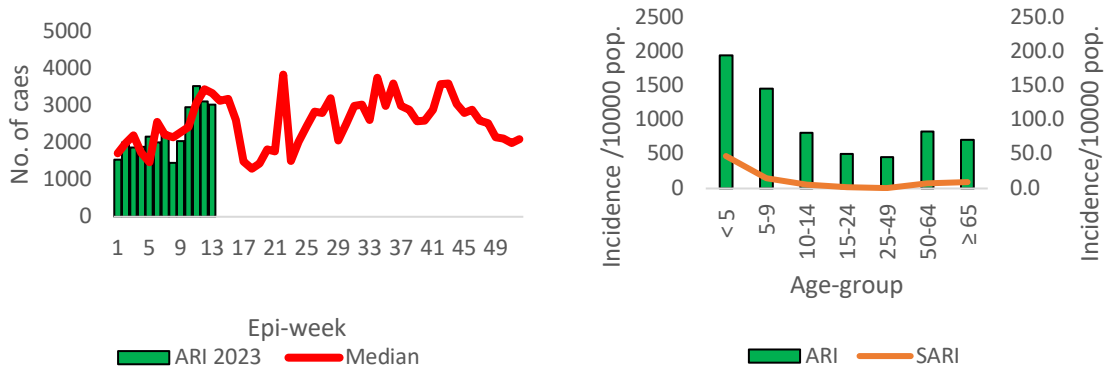
TRY	23	154	02	768	0	3	0	0	27	0
TRO	4	237	0	1218	0	9	3	0	12	0
TSI	27	210	0	1169	0	0	0	0	13	0
WNG	50	528	1	1640	0	01	0	0	9	0
ZHE	9	174	0	1298	0	2	0	0	1	0
Total	470	7026	38	27222	0	125	11	1	232	11

Abbreviations: ABD (Acute Bloody Diarrhea), AWD (Acute Watery Diarrhea), AJS (Acute Jaundice Syndrome), ARI, Acute Respiratory Infection), MUM (Mumps), FWR (Fever with Rash), FDP (Food borne Illness), TPF (Typhoid/Paratyphoid fever), SARI (Severe Acute Respiratory Infection), RKS (Rickettsioses).

1.3 Descriptive analysis of most common notifiable diseases:

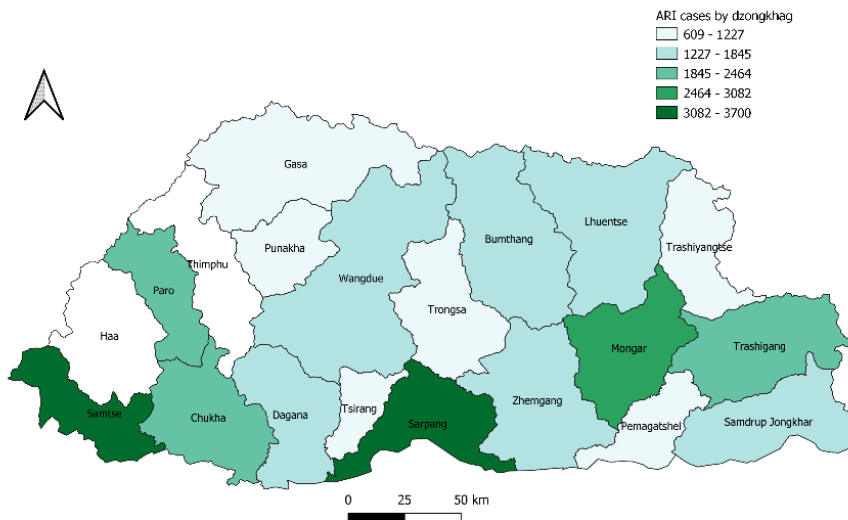
1.3.1 Respiratory Illness (ARI and SARI) syndrome

A total of 27454 cases of respiratory illness were reported, almost all cases were ARI (99.0%) and rest were SARI cases. The trend of ARI cases was found consistently lower compared with the median of the last three years of the same quarter (**Figure 2A**). The most commonly affected age group by respiratory illness was observed in the younger age-group (**Figure 2B**). By district, Sarpan reported the maximum number of ARI cases (**Figure 2C**).



A: Incidence by Epi-week

B: Incidence by age group



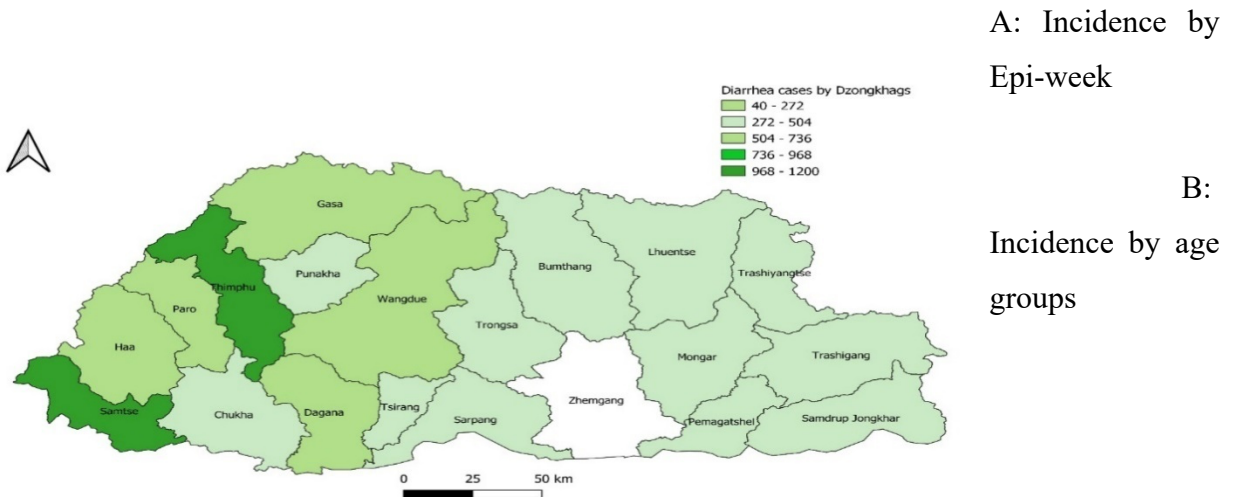
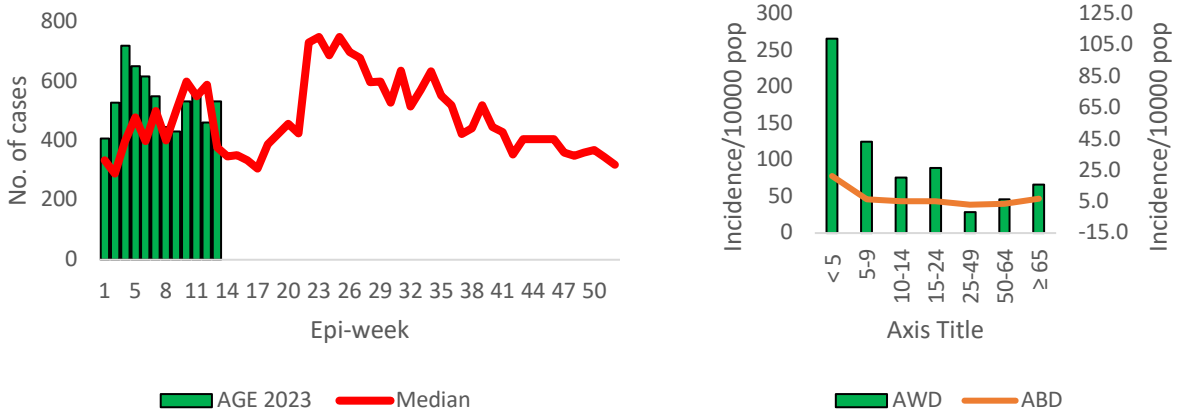
C: Incidence by district

Figure 2: Respiratory illness incidence by epidemiological weeks, age groups and place.

1.3.2 Diarrheal syndrome: (Acute Watery Diarrhea [AWD] and Acute Bloody Diarrhea [ABD])

A total of 7499 cases of diarrheal cases were reported (AWD: [7026] 93.0% and rest were ABD). The trend for diarrheal diseases was found at-par with the median for the last three years (**Figure 3A**). A high incidence of diarrheal diseases was observed in children 0-4 years (**Figure 3B**).

Diarrheal diseases were reported from all the dzongkhag while Thimphu and Samtser reported maximum AWD (Figure 3C).

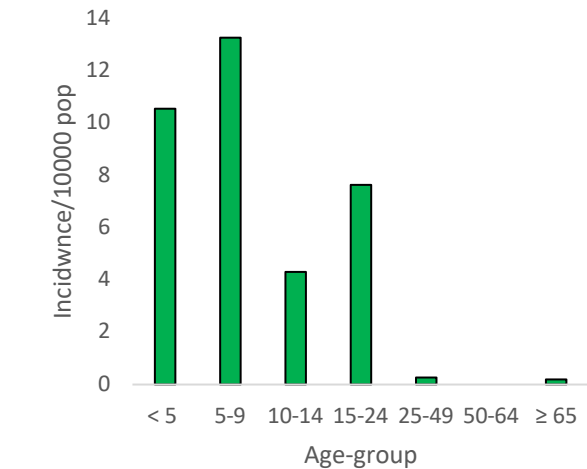
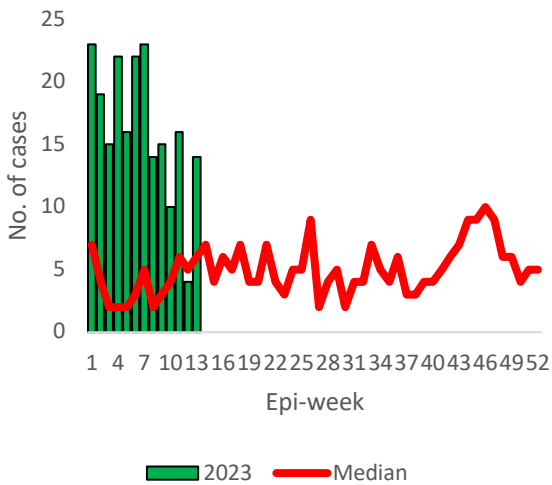


C: Incidence by district

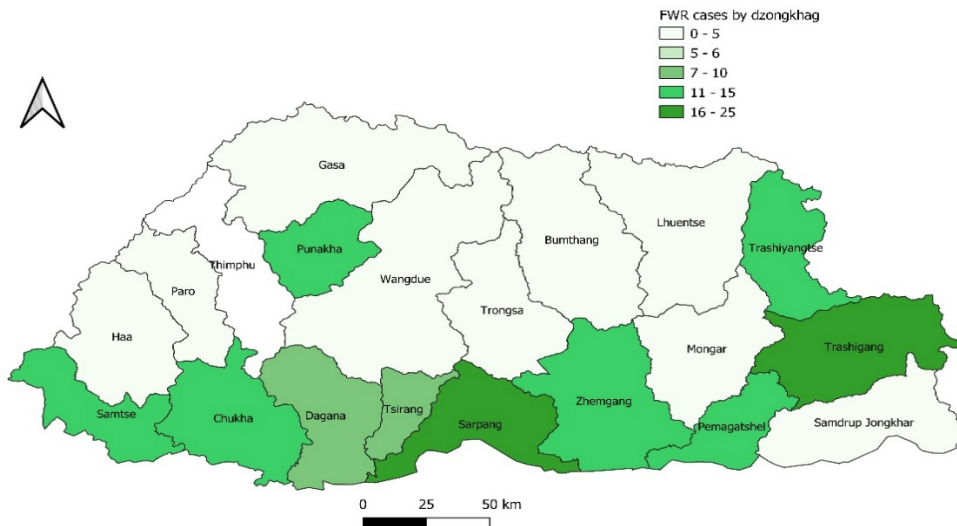
Figure 3: Diarrheal syndrome (AWD and ABD) incidence by Epi-week, age group and place

1.3.3 Fever with Rashes syndrome:

A total of 125 cases of fever with rash (FWR) syndrome were reported in the quarter (**Figure 4A**). The trend of FWR was found higher compared with the previous quarter. A majority of FWR were reported in the age group < 14 years (**Figure 4B**). Among the dzongkhag Sarpang and Trashigang reported maximum number of the cases (**Figure 4C**).



A: Incidence by Epi-week B: Incidence by age groups



C: Incidence by district

Figure 4: Fever with Rashes Syndrome (FWR) incidence by Epi-week, age group and place

1.4 Immediately Notifiable Diseases/syndromes:

A majority of the immediately notifiable diseases/syndromes reported were suspected measles/rubella cases of those three samples (two from Samdrupjongkhar, one from Sarpang) tested positive for measles IgM. While one sample from Sarpang tested positive for Rubella IgM. two pertussis, and two bacterial meningitis, were reported from different dzongkhag during the quarter (**Figure 5**).

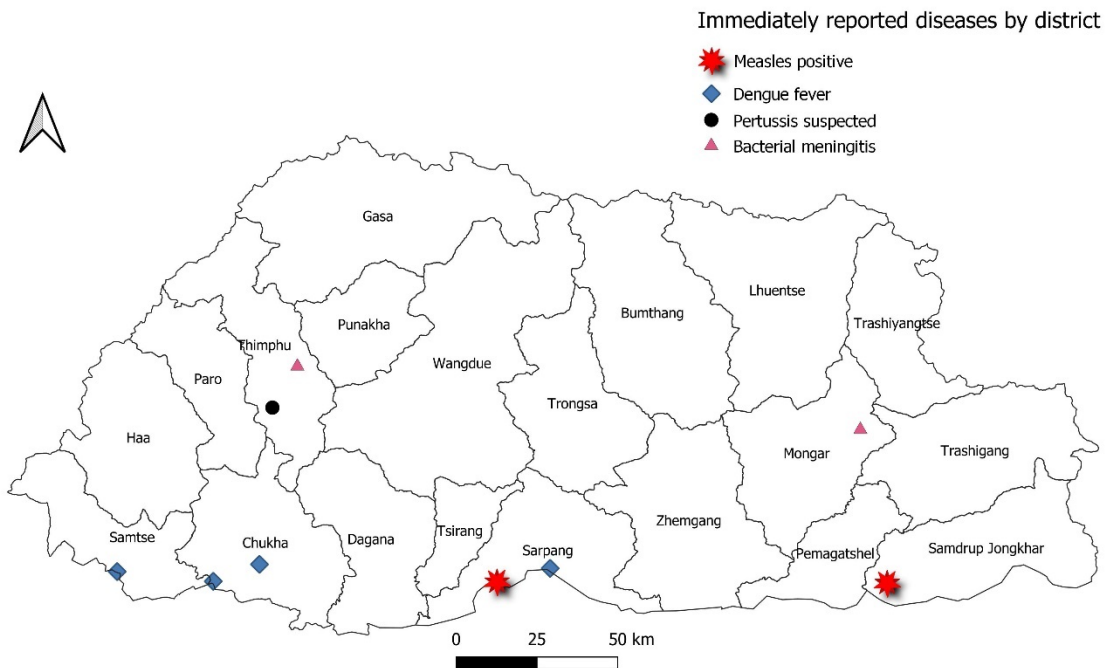


Figure 5: Distribution of immediately notifiable diseases/syndrome by dzongkhag

Nine diseases outbreak reported were reported during the quarter, of which two were Influenza-like illness, two outbreak of acute gastroenteritis, three outbreak of chickenpox and two outbreaks of Chilblain were reported(**Figure 6**). Specimens from ILI outbreak were tested, Influenza subtype FLU A/H3 was detected from the outbreak, that occurred at Zhemgang. All outbreaks were responded to by the respective health centers and the District Health Rapid

Response Team (DHRRT) upon the recommendations of RCDC. There was no mortality following the outbreak.

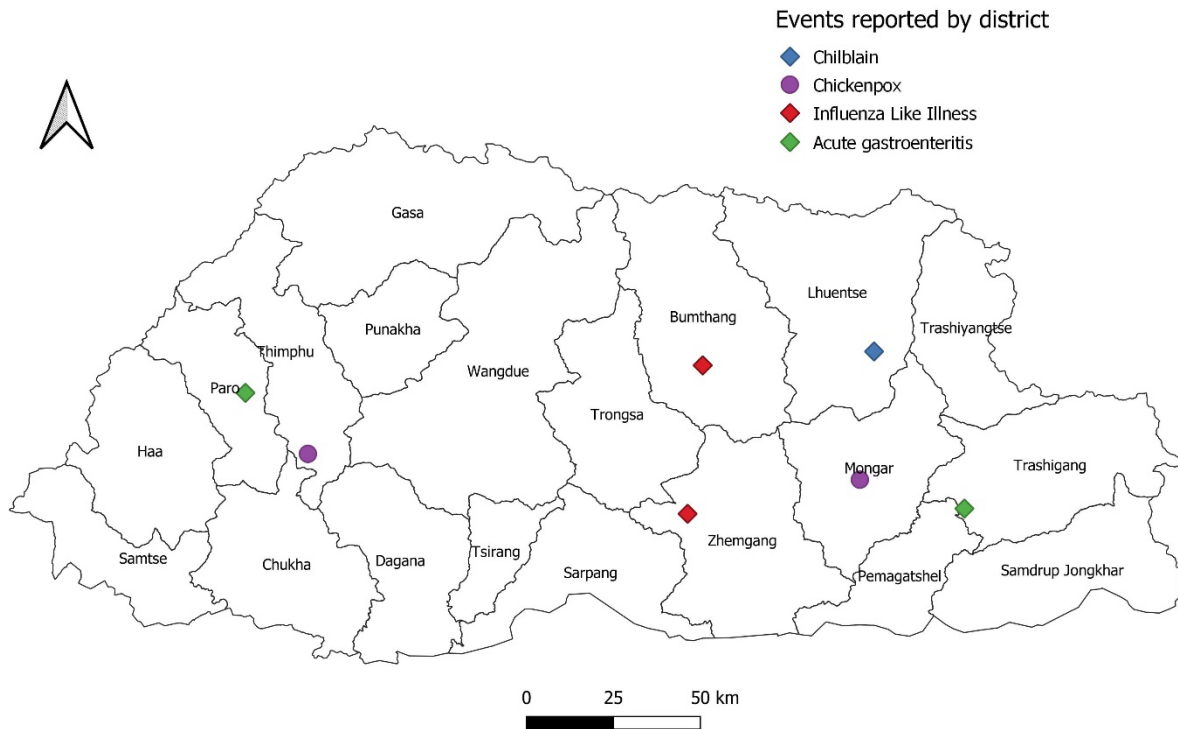


Figure 6: Distribution of events by dzongkhag

Laboratory Based Surveillance

2.1.1 Drug Resistant Surveillance for Tuberculosis

A total of 610 samples were received at National Tuberculosis Reference Laboratory (NTRL) for culture and drug susceptibility testing (DST) for anti-tuberculosis drugs. Of the total, 335 (54.9%) were pulmonary samples, 22(3.6%) were extra-pulmonary samples and 128(20.0%) were pulmonary samples received for TB screening for VISA. In addition, 125(20.5%) follow-up samples were received for culture from MDR-TB patients under treatment.

Among the pulmonary samples, 63.3% (n=212) were received for new smear negative samples and 27.8 % (n=93) were that of new smear positive samples (**Figure 7**).

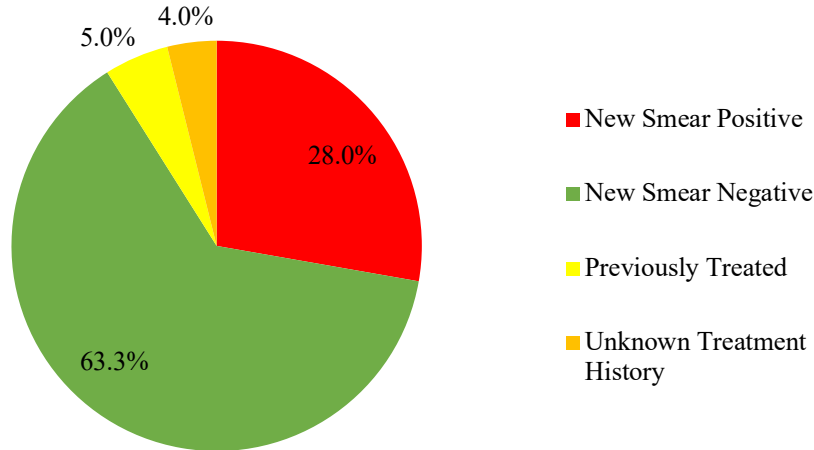


Figure 7: Classification of Pulmonary TB samples

2.1.2 Drug Sensitivity Test

Drug sensitivity test report was available for 94 samples using Line Probe Assay and 54 samples had reports for Liquid DST for first line drugs. A total of 13 multi-drug resistant tuberculosis (MDR-TB) cases were detected among patients with complete DST report. Of the 13 samples, 11 of the MDR-TB cases were from new smear positive pulmonary samples, one MDR-TB case was detected from EPTB sample and one from sample screened for VISA. MDR-TB cases were highest in the age group of 20-29years (61.5%) (**Figure 8**). Of the 13 MDR-TB samples, 12 samples were sensitive to both Fluoroquinolones and aminoglycoside by second line DST. One sample was resistant to fluroquinolone.

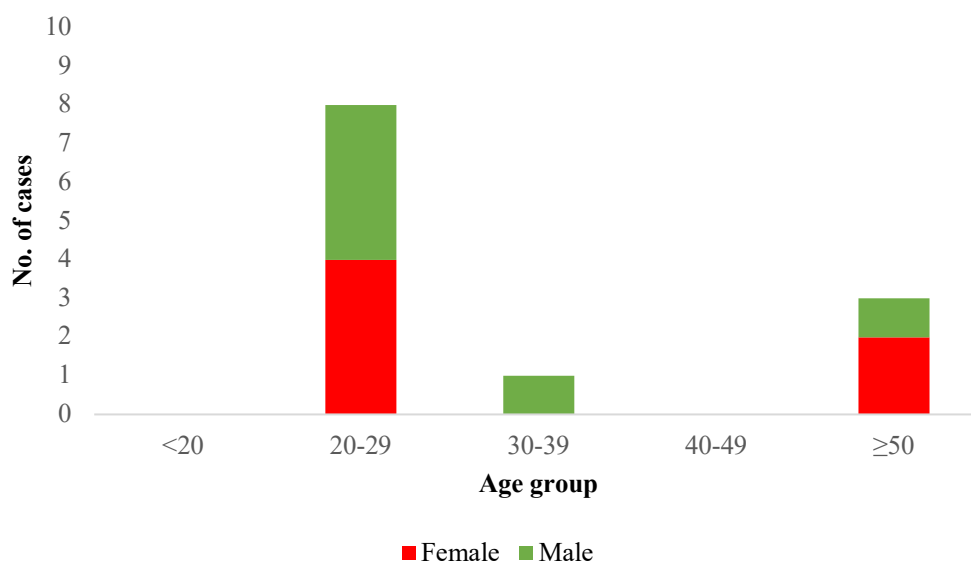


Figure 8: Distribution of MDR-TB cases by age group and gender

2.2 COVID-19 & Influenza Surveillance

2.2.1 COVID-19 Integrated Influenza surveillance

A total of 121 (2.8 %) new cases of COVID-19 (20 from Flu samples) were detected during first quarter of 2023 (week 1 – 13) through enhanced surveillance of COVID-19 and COVID-19 Integrated Influenza Surveillance. A total of 4,360 samples were tested for COVID-19 of which 807 were tested by Rapid Antigen test, and 3,553 by RT-PCR assay. The highest cases were detected in epi-week 2 (25), followed by week 3(20) (**Figure 9**). All cases were detected from community and in-coming travelers (imported cases). Paro (42) reported the highest cases followed by Thimphu (30) and Zhemgang (9) (**Figure 10**).

The mean age was 41.6 years (Range: 1 – 84 years). The mostly affected age group for COVID-19 was 50 – 59 years (22.8 %), followed by 30 – 39years (21.8 %) and 40 – 49 years (21.8 %). Males (53.5 %) were affected more compared to females (46.5 %) (**Figure 11**).

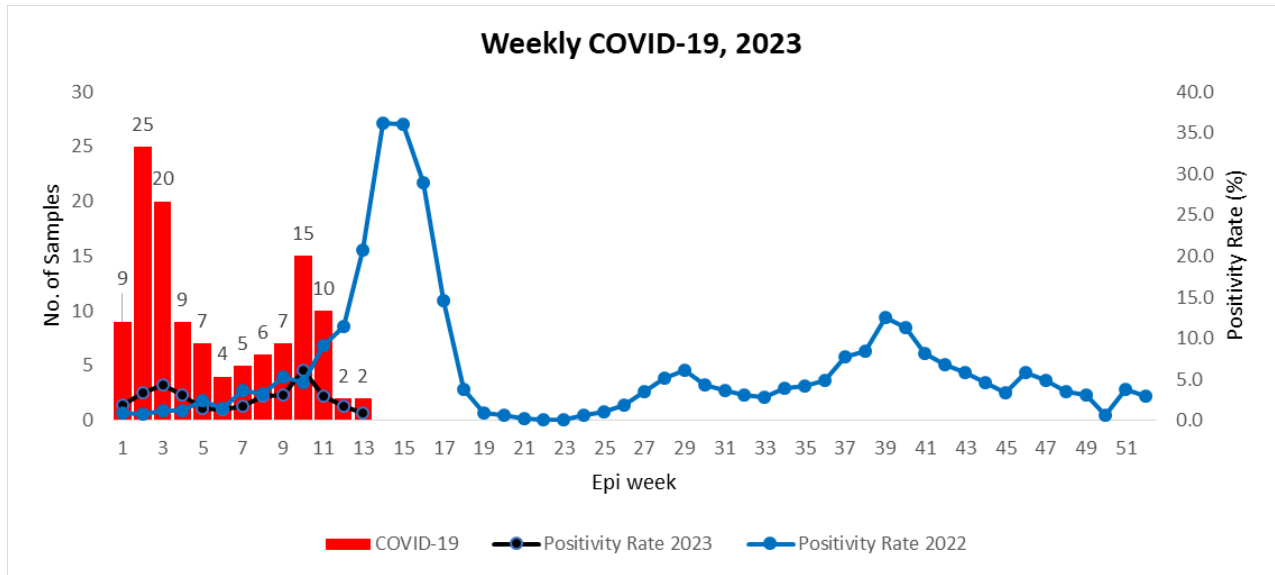


Figure 9: COVID-19 and positivity rate in Jan – Mar 2023 (week 1 – 13); (Source: HFS & RCDC)

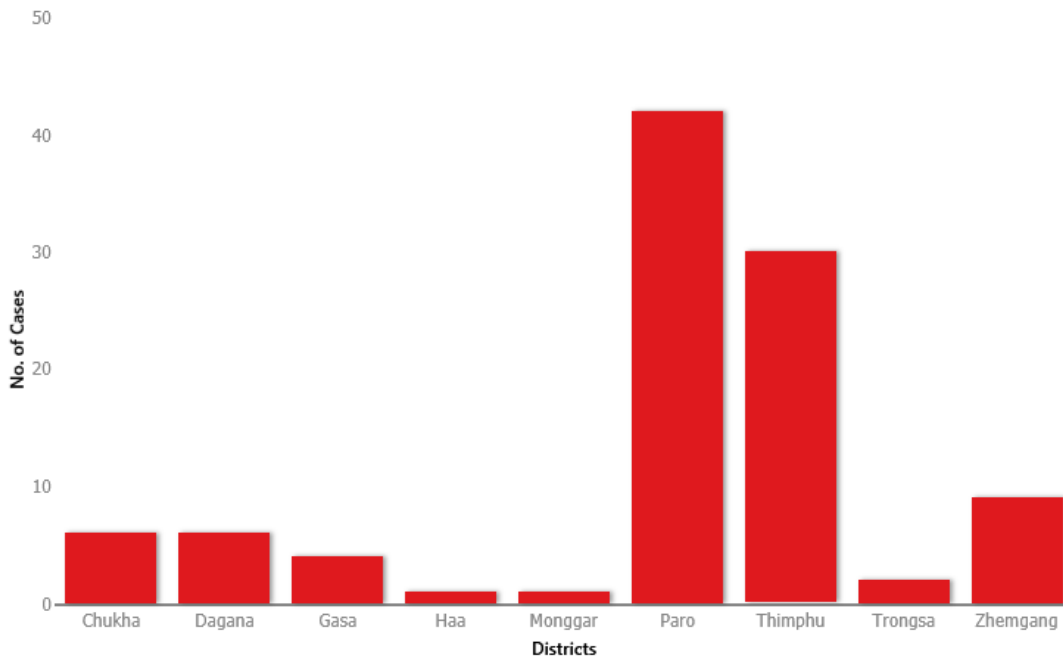


Figure 10: COVID-19 positives by districts during 1st quarter 2023 (Source: HFS & RCDC)

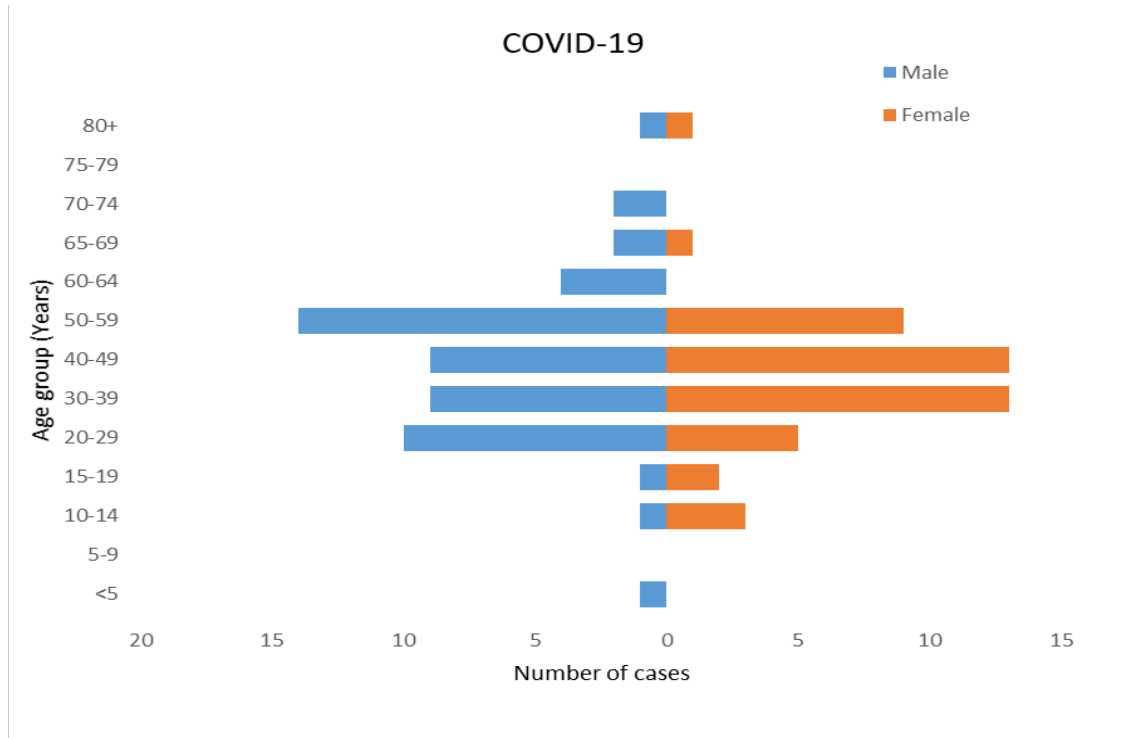


Figure 11: COVID-19 by age and Gender distribution

2.2.2 Influenza

Influenza activity has increased during the first quarter of 2023. Influenza positivity rate has increased particularly from epi-week 7 – 10 compared to the previous years. A total of 512 flu specimens including ARI outbreak samples (ILI- 385, SARI- 115, Outbreak- 12) were received and tested for Influenza and SARS-CoV-2 through multiplex RT-PCR (Flu SC2) and detected 19.9% (102/512) Influenza positives, 3.9% (20/512) SARS-CoV-2 and 0.2% (1/512) Co-infection (**Figure 12**). Influenza lineage FLU B/Victoria (76.5%, 78/102) was most predominating strain, followed by FLU A/H3 (16.7%, 17/123). A total of 20 (16.3%) SARS-CoV-2 positives were detected from flu Samples (**Figure 13**).

The mean age was 23.6 years (Range: 6 months – 90 years). The most affected age group for Influenza was 30 – 39 years (25.5 %), followed by <5 years (14.7 %). Males (61.8 %) were affected more than the females (38.2 %) (**Figure 14**). Almost all the cases had cough (94.1 %) and fever (84.3 %), followed by sore throat (68.6 %) and headache (54.9 %).

Samtse Hospital (143) and Trongsa Hospital (114) has sent more samples compared to rest of the sentinel hospitals (Figure 15, 16 & Table 2).

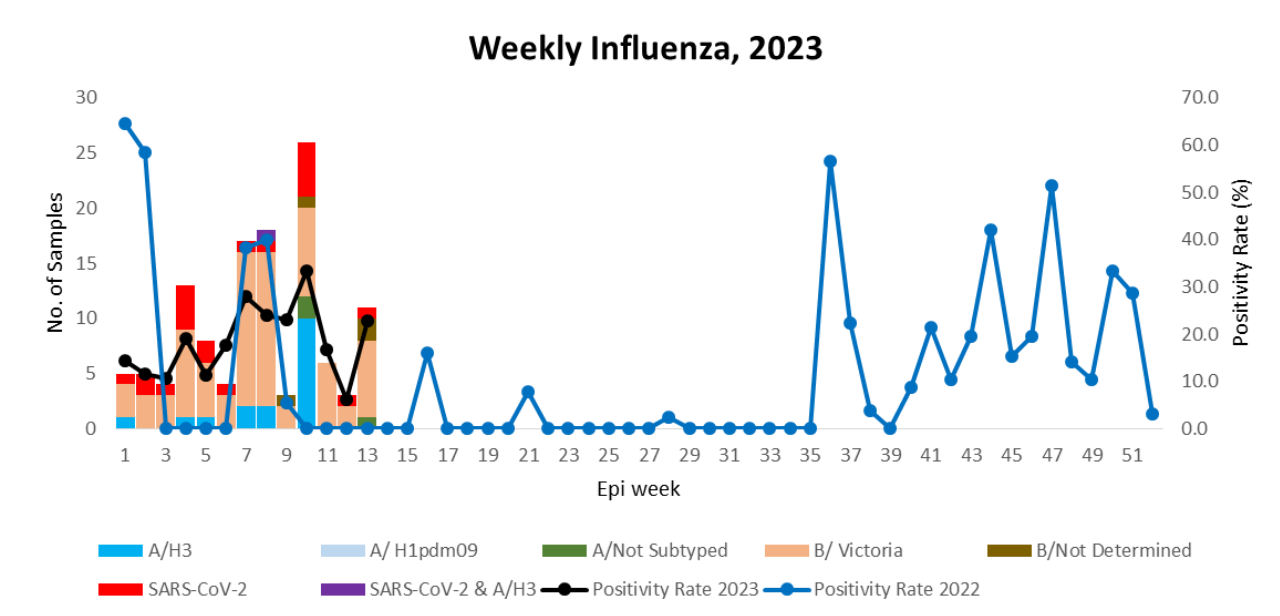


Figure 12 : Weekly Influenza subtypes and SARS-CoV-2 (Source: RCDC)

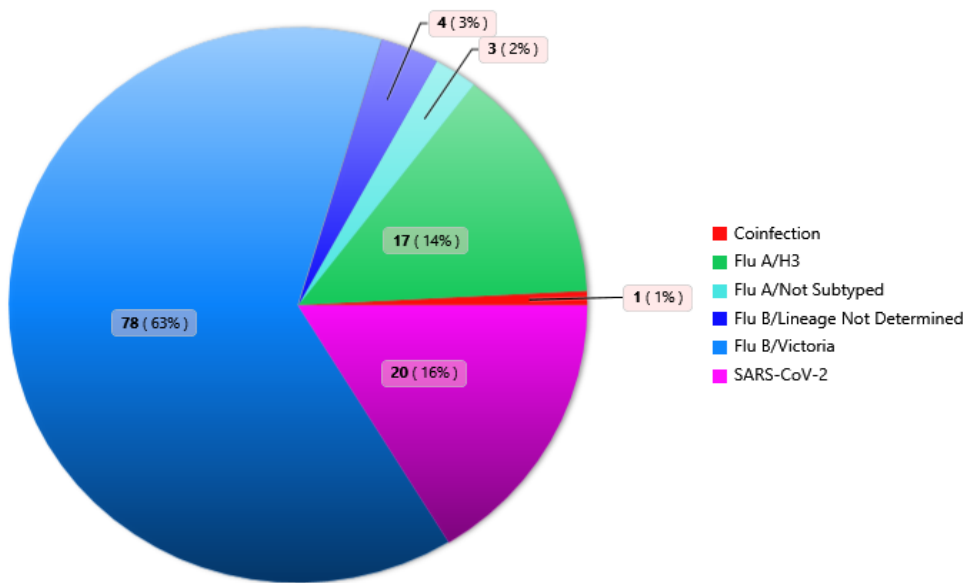


Figure13: Positivity rate of Influenza subtypes and SARS-CoV-2

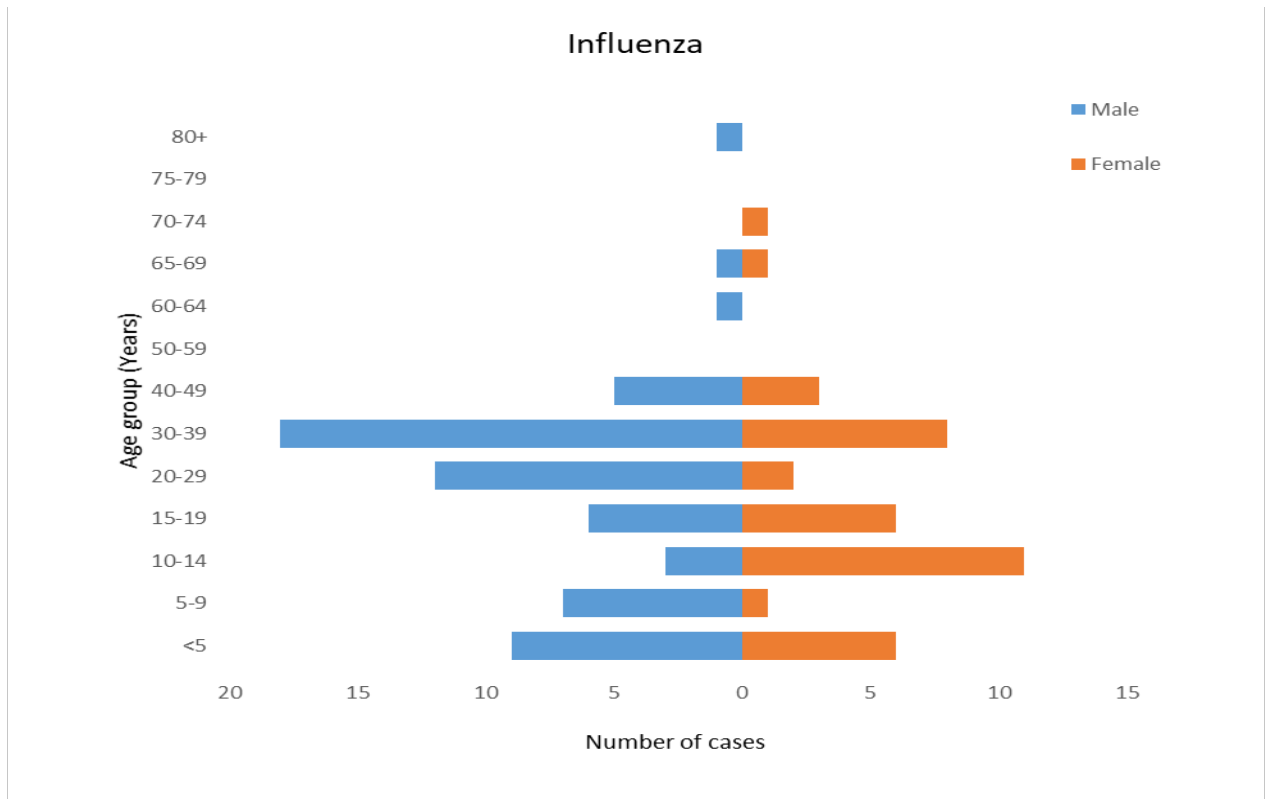


Figure 14: Influenza by age group and gender for first quarter, 2023

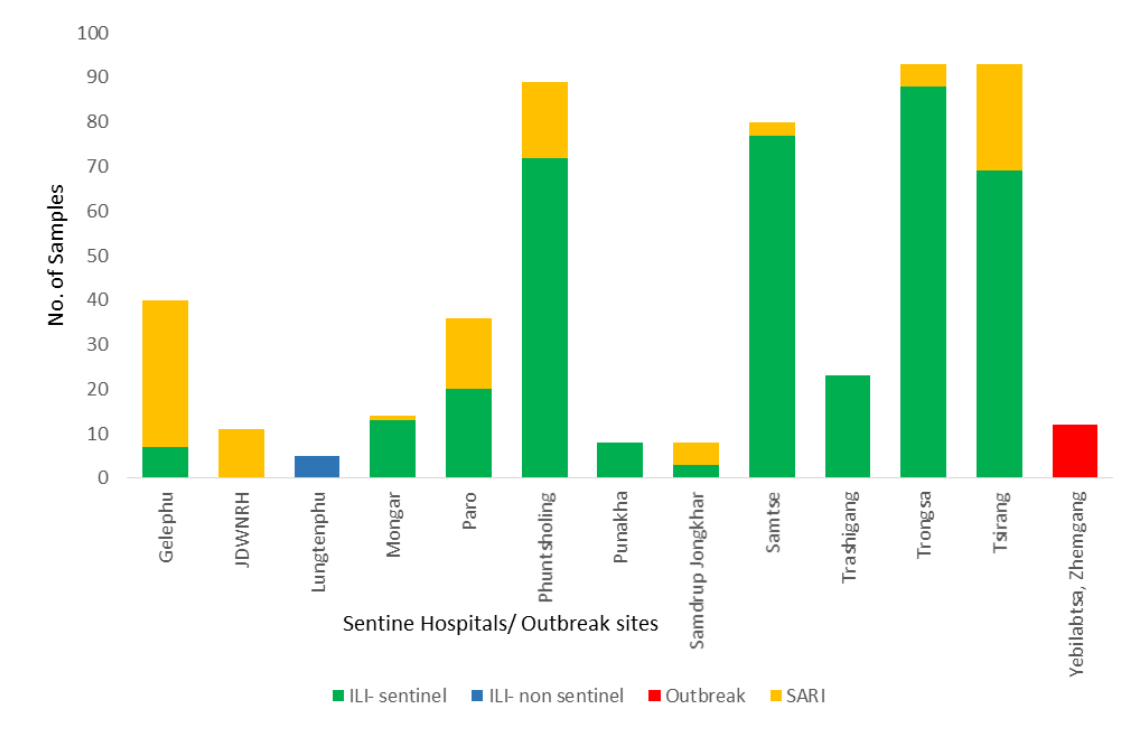


Figure 15: Number of ILI, SARI and Flu Outbreak Specimens received in 1st quarter 2023

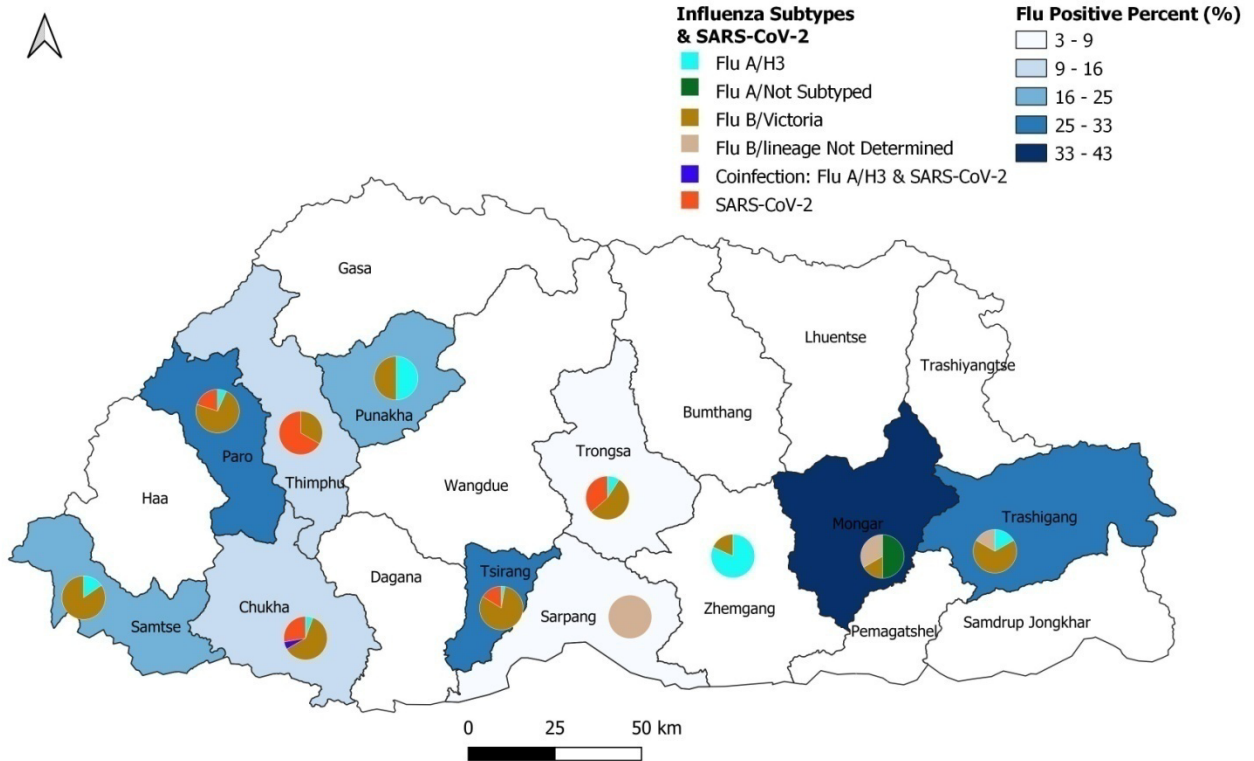


Figure 16: Influenza subtypes and SARS-CoV-2 with Flu positivity distribution by Sentinel Hospitals

Table 2: Summary table for Influenza subtypes and sample tested in first quarter, 2023

Sentinel Hospitals	ILI						Outbreak			SARI				SARI Total	Grand Total	
	FLU A/ Not Suptyped	FLU A/H3	FLU A/H3 & SARS-CoV-2	FLU B/ ND*	FLU B/ Vic	FLU B/ SARS-CoV-2	ILI Total	FLU A/H3	FLU B/ Vic	Outbreak Total	FLU A/H3	FLU B/ ND*	FLU B/ Vic			SARS-CoV-2
Gelephu							7								33	40
JDWNRH															11	11
Lungtenphu							5									5
Mongar	3				1	1	13							1	1	14
Paro		1				10	20							1	16	36
Phuntsholing		1	1			11	72							1	17	89
Punakha		1				1	8									8
Samdrup Jongkhar							3								5	8
Samtse		2				10	77						1		3	80
Trashigang		1			1	4	23									23
Trongsa		1				6	88								5	93
Tsirang						29	69									24
Yebilabtsa, Zhemgang								9	2	12						12
Grand Total	3	7	1	2	72	16	385	9	2	12	1	2	4	4	115	512

*ND: Flu B Lineage Not determined

2.2.3 Epidemiological Surveillance of ILI & SARI

The weekly aggregate report for Influenza-like illness (ILI) and severe acute respiratory infection (SARI) cases are being reported weekly from respective sentinel sites (**Figure 17**). A total of 1,266 ILI cases and 167 SARI cases were reported from respective sentinel hospitals during 1st quarter of the year 2023. More cases were observed particularly for ILI cases from week 10 – 13 (**Figure 18**).

The most affected age group was 30 – 64 years (26.1%) followed by 15 – 29 years (22.7%) age group, while for SARI the most affected age group was from 0 – 1 years (25.7%) followed by > 65 years age group (24.6%) (**Figure 19**).

The cases were reported from all the respective sentinel sites, though few sites has not reported and few sites has reported as zero reporting. Samdrup Jongkhar Hospital (454) has reported highest ILI cases and Paro (38) has reported highest SARI cases during the first quarter of 2023(**Table 3& 5**).

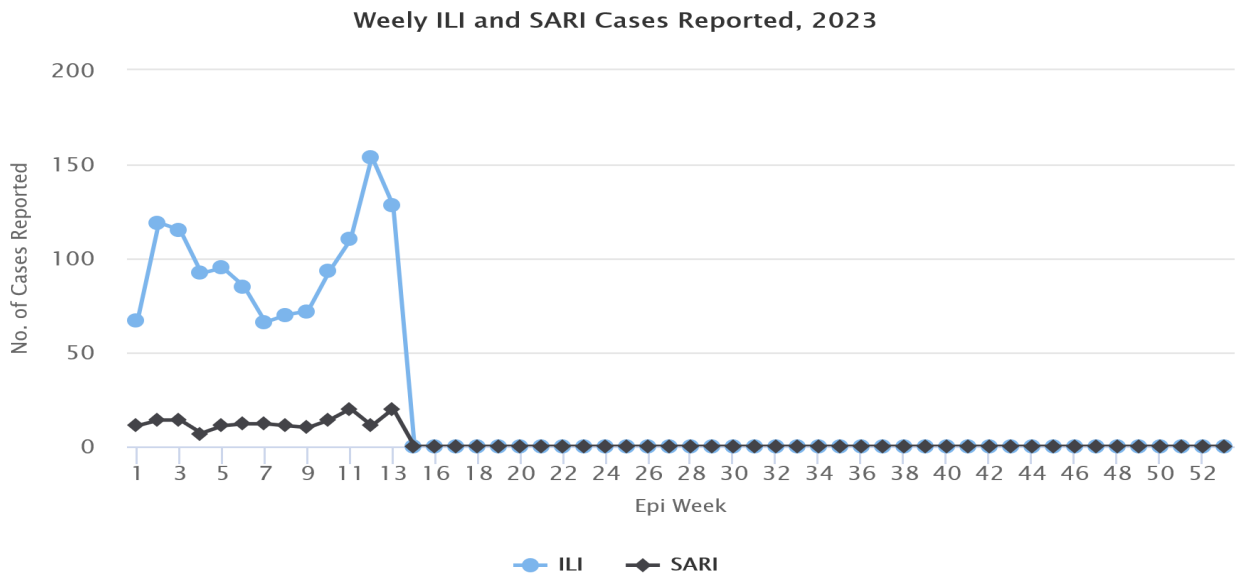


Figure 17: Weekly ILI and SARI cases reported from Sentinel sites

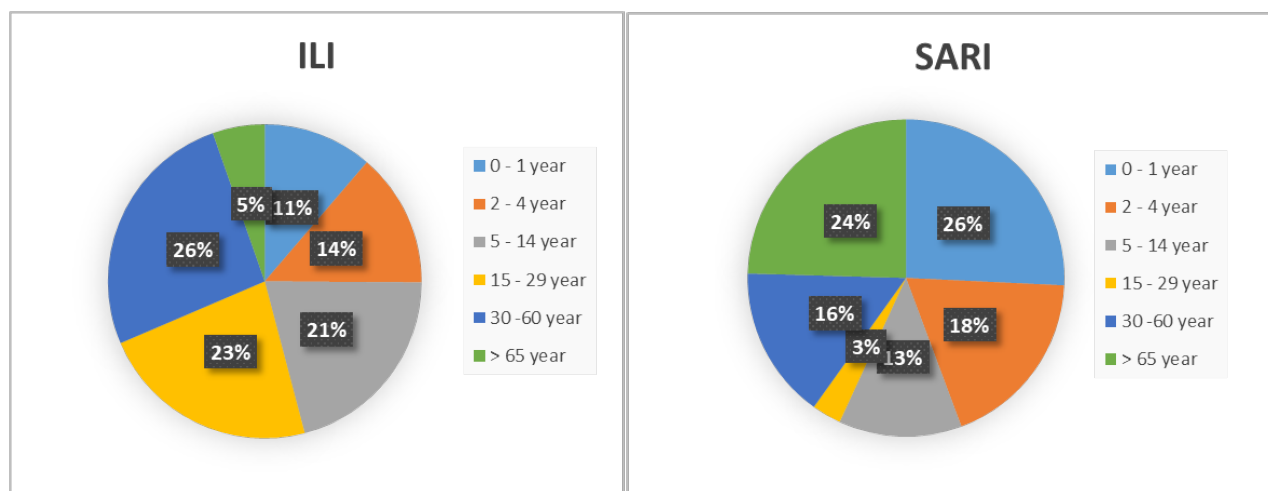


Figure 18: ILI and SARI cases by age group

Table 3: Weekly ILI cases reporting Status from week 1 – 13, 2023 (Source RCDC)

ILI Sentinel Sites	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Grand Total
Paro Hospital	0	0	0	1	0	0	0	0	4	4	28	40	21	98
Punakha Hospital	4	5	3	4	4	4	3	3	0	10	4	0	10	54
Samdrup Jongkhar Hospital	7	32	41	28	47	40	39	43	36	36	35	37	33	454
Samtse Hospital	11	15	15	13	14	7	3	0	2	1	9	19	13	122
Trashigang Hospital	18	15	17	16	3	6	6	8	10	8	6	12	10	135
Trongsa Hospital	15	27	22	8	14	15	12	12	14	9	8	10	24	190
Tsirang Hospital	12	25	17	22	13	13	3	4	6	25	20	36	17	213
Grand Total	67	119	115	92	95	85	66	70	72	93	110	154	128	1266

Table 4: Weekly SARI cases reporting Status from week 1 – 13, 2023 (Source RCDC)

Sentinel Hospitals	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Grand Total
Gelephu CRRH	0	2	2	2	2	0	4	5	3	1	8	2	3	34
JDWNRH	6	5	4	2	0	4	0	0	0	0	0	1	9	31
Monggar ERRH	0	0	0	0	0	0	0	0	0	0	1	4	0	5
Paro Hospital	2	3	0	1	3	3	2	5	0	4	5	3	7	38
Phuentsholing Hospital	2	0	1	1	1	0	2	1	4	2	3	1	0	18
Punakha Hospital	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Samdrup Jongkhar Hospital	0	1	1	0	1	0	2	0	0	2	0	0	1	8
Samtse Hospital	0	0	0	1	2	0	0	0	0	0	0	0	0	3
Trashigang Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trongsa Hospital	1	1	1	0	0	1	0	0	0	1	0	0	0	5
Tsirang Hospital	0	2	5	0	2	4	2	0	3	4	2	0	0	24
Grand Total	11	14	14	7	11	12	12	11	10	14	20	11	20	167

2.3.1 Laboratory-based surveillance for vaccine-preventable diseases

Infectious Disease Serology Laboratory (IDSL) carries out a nation-wide laboratory-based surveillance for Acute Encephalitic Syndrome (AES), Measles and rubella (MR) and Pertussis. During the first quarter of the year, 61 samples were received for MR testing and 6 for AES (Table 6). IgM ELISA performed on these samples resulted in four measles & three rubella positive cases. Two measles positive cases were from Sarpang and two cases were from Samdrup Jongkhar. Of the three rubella positive cases, two were from Samdrup Jongkhar and one was from Sarpang. Detection by PCR where all negative and samples were sent to NIH reference laboratory for further genotyping of. IgM ELISA for *Japanese encephalitis* (JE) virus performed on samples received for AES were all negative. No samples were tested for pertussis.

Table 5: Number of samples received from health centres for MR and AES surveillance

Surveillance	Site/ Hospital	Number of samples received
Measles & Rubella	Gidakom	02
	Paro	06
	Gedu	01
	Sarpang	12
	Bumthang	01
	JDWNRH	10
	Pemagatshel	02
	Trashigang	01
	Samdrupjongkhar	20
	Wangduephodrang	01
	Phuntsholing	05
AES (JE)	JDWNRH	06

2.3.2 Dengue, Acute Undifferentiated Febrile Illness (AUFI) and other confirmatory tests

IDSL received four samples from sentinel sites for dengue confirmation and one sample for scrub typhus confirmation. Out of total received two were detected positive for dengue. All samples tested for scrub typhus confirmation were negative.

Total of nine Acute Undifferentiated Febrile Illness (AUFIs) surveillance samples received from AUFIs sentinel sites. One sample received from JDWNRH was tested positive for scrub typhus. Leptospirosis test was positive for all samples.

IDSL also receives additional samples for serological confirmation. Samples received for the purpose independent tests are reflected in **Table 6**.

Table 6: Samples received and tested for dengue and scrub typhus surveillances

Test	Hospital	Sample received	Positive test result						
			DENV NS1	DENV IgM	Scrub typhus IgM	Lepto IgM	JE IgM	CHIKV IgM	Brucella IgM
AUFIs	JDWNRH	03	00	00	01	03	00	00	NA
	Tsirang	02	00	00	00	02	00	00	NA
	Punakha	02	00	00	00	02	00	00	NA
	Trongsa	01	00	00	00	01	00	00	NA
	Samtse	01	00	00	00	01	00	00	NA
Dengue	Tashicholing	01	00	01	NA	NA	NA	NA	NA
	Nganglam	01	00	00	NA	NA	NA	NA	NA
	CRRH	02	00	01	NA	NA	NA	NA	NA
Scrub typhus	Samtse	01	NA	NA	00	NA	NA	NA	NA

DENV: Dengue virus, CHIKV: Chikungunya virus, NA: Not applicable

2.4. Sentinel Surveillance for Diarrheal Etiologic Agents

This quarter, 96 samples were received from eight sentinel sites (**Figure 19**). Most of the samples received were from the Phuntsholing and Thimphu. Of these, 58 (60.0%) were male and 38 (40.0%) were females.

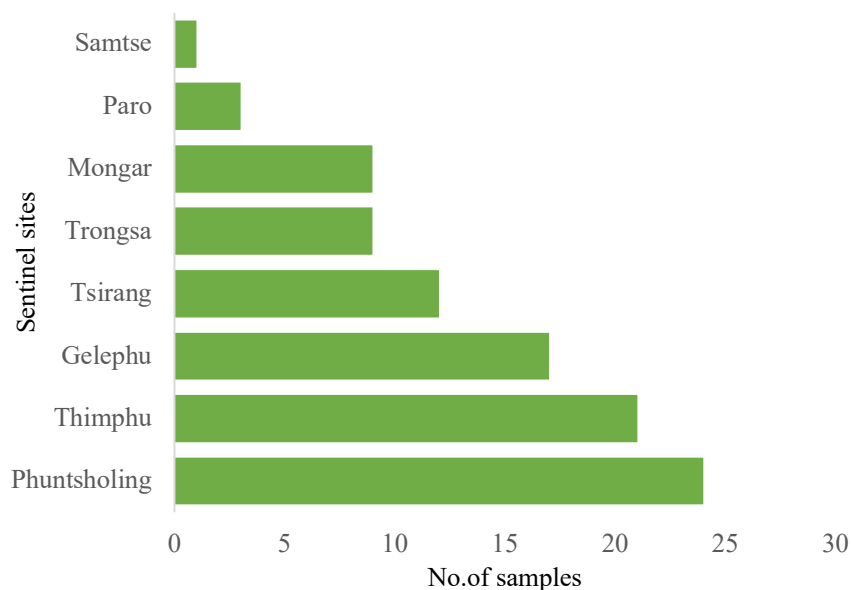


Figure 19: Frequency of fecal specimens received from different sites

Of the total sample, 69.0% constitute loose and 31.0% watery stool with mucus positive only for 6.0% and 2.0% samples present for blood. The mean age of the patients enrolled was 17 years and mean duration of illness was 63 hours. Of all, 68.0% attended OPD and rest was treated in IPD. Seven diarrhea cases were found linked to having consumed a suspected food. Rotavirus was detected in 29.0% (5/17) of the tested samples. Bacterial pathogens include *Aeromonas* species, *Shigella* species and diarrheagenic E.Coli (EAEC & EIEC) with detection rate of 7.0% (7/96). The antimicrobial-resistant pattern for the isolated bacterial pathogens is provided in (Table 7).

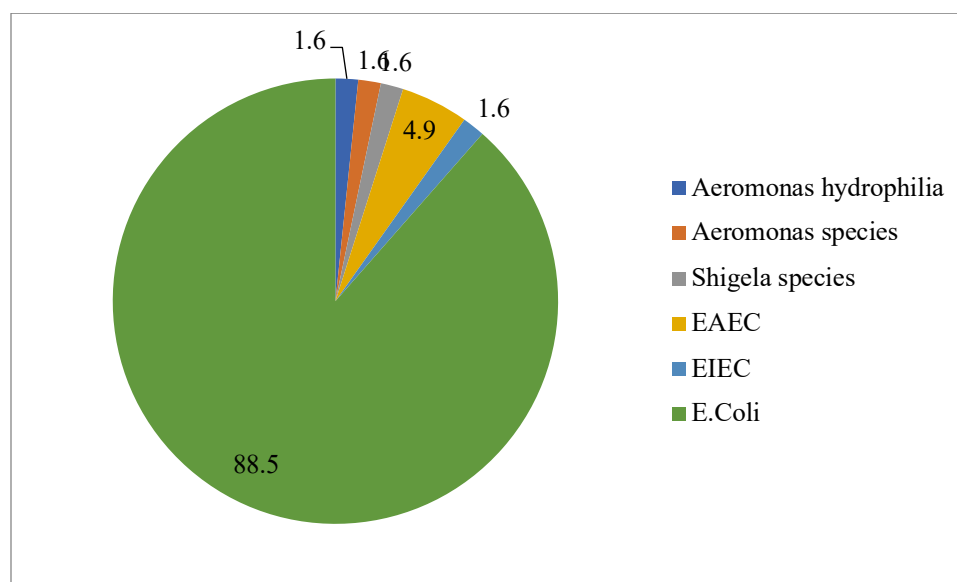


Figure 20: Proportion of enteric pathogens isolated

Table 7: Anti-bio gram (Resistant pattern) for bacterial pathogens

Pathogen	AMP	CZO	CRO	LEX	CHL	CIP	GEN	NAL	TCY	SXT
EAEC (n=3)	2	2	1	2	0	1	0	2	1	1
EIEC(n=1)	1	1	0	1	0	0	0	0	1	1
<i>Aeromonas hydrophilia</i> (n=1)	1	1	0	0	0	0	0	1	0	0
<i>Aeromonas species</i> (n=1)	1	1	0	1	0	0	0	0	0	1
<i>Shigella species</i> (n=1)	0	1	0	1	0	0	0	0	0	0

AMX (Amoxicillin), CZO (Cephazolin), CRO (Ceftriaxone), LEX (Cephalaxin), CHL (Chloramphenical), CIP (Ciprofloxacin), GEN (Gentamycin), NAL Nalidic Acid, TCY (Tetracycline), SXT (Trimethoprim and sulfamethaxazole), EAEC (Enteraggregative *E-coli*) EPEC (Enteropathogenic *E-coli*)

2.5 Food safety surveillance

Total of 92 ready to eat food samples from January to March 2023 from five dzongkhags were shipped for food safety surveillance sites. Of the total, 25 samples were sent from Gelephu, 22 samples from Thimphu, 20 samples from Mongar and 5 samples from Paro (**Tablev 8**)

Table 8: Number of Food safety surveillance samples received from sites (Q1 2023)

	Jan	Feb	March
Paro	5	5	10
Phuentsholing	5	0	0
Gelephu	10	10	5
Mongar	10	0	10
Thimphu	12	0	10

The food samples were tested for physical parameters, indicator organisms and pathogenic organisms. The total plate count and *E.coli* counts are the two commonly used as indicator test for the foods accessing food safety and surrogacy for hygiene practice. During the current period 4.4 % of food samples had been contaminated with pathogenic organism and 3.3 % with indicator organism. The common pathogens isolated are *Staphylococcus aureus* accounting to 2.1 % and *Bacillus cereus* 1.0 %, respectively. The common indicator organism were total aerobic count and total *Enterobacteriaceae* of 2.1 % each (TPC: $>\log 10^5$ CFU/g and Total *Enterobacteriaceae* $>\log 10^2$ CFU/g).

The common ready to food items contaminated with indicator included aluchop, momo and vegetable curry. Similarly, the common foods with pathogenic organism included, such as chowmein, chillichop and channa.

During the same period (Jan-Feb 2023) one event of foodborne disease was reported through NEWARS. However, detailed laboratory investigation could not be conducted due to unavailability of samples, as all the leftover samples were discarded by the patients.

2.6. Urban Drinking Water Quality Monitoring (UDWQM)

2.6.1 Bacteriology test Report

Total of 528 samples were tested in the first quarter (January, February, March) of 2023 by 34 Health Centers. Out of which, 32.8% was found unsafe and more than 50% of the sample tested was found to be fit for consumption. **(Figure 21)**

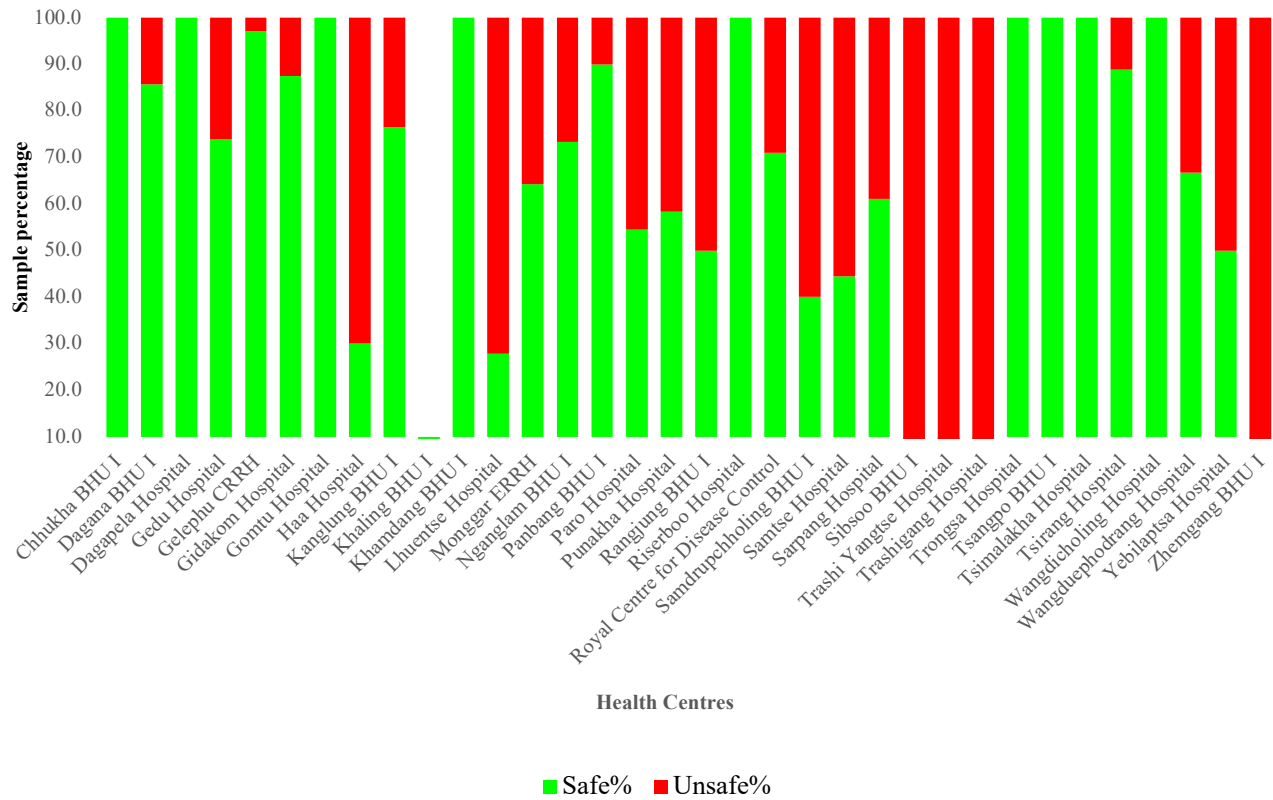


Figure 21: Bacteriology test report of 34 Hospitals/BHU-1 in urban area

2.6.2 Chlorination Report

Out of eight health centers monitoring free residual chlorine in drinking water sample Tsirang, Gomtu and Phuentsholing Hospital has not reported for this quarter. Out of 60 samples tested for the free residual chlorine, 90.0% (n=54) were found to be inadequately chlorinated. Permissible limit of free residual chlorine is 0.2 to 0.5mg/L for safe water (**Figure 22**).

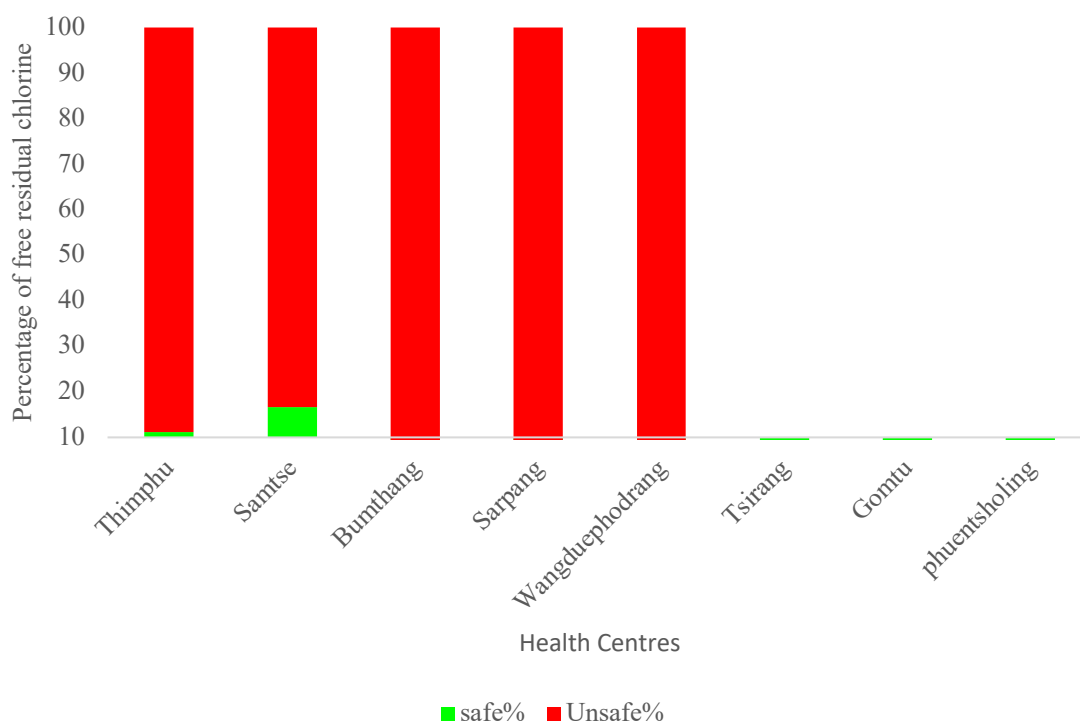


Figure 22: Free Residual Chlorine test report for 8 health centers in urban area

2.7.1 Drug Quality Monitoring

A total of 181 samples were tested at National Drug Testing Laboratory in the 1st quarter of 2023. The samples were tested as per their pharmacopeial claim. The samples were tested for different parameters from 12 sites. Of the 181 samples tested, 12 samples were found to be non-compliant (**Table 10 & Figure 23**). Accordingly, the test reports were communicated to BFDA for their necessary regulatory action.

Table 10: Distribution of sample collection sites

Site	Complies	Does not comply	Total
Bhutan Food and Drug Authority	9	5	14
Deothang Hospital	2	0	2
Gelephu CRRH	0	1	1
GonpaSingma BHU	2	0	2
JDWNRH	2	0	2
Jomotsangkha BHU I	2	0	2
Medical Supply & Distribution Division	135	6	141
Nganglam BHU I	9	0	9
Pemagatshel Hospital	3	0	3
Punakha Hospital	1	0	1
Royal Centre for Disease Control	1	0	1
SamdrupJongkhar Hospital	3	0	3
Total	169	12	181

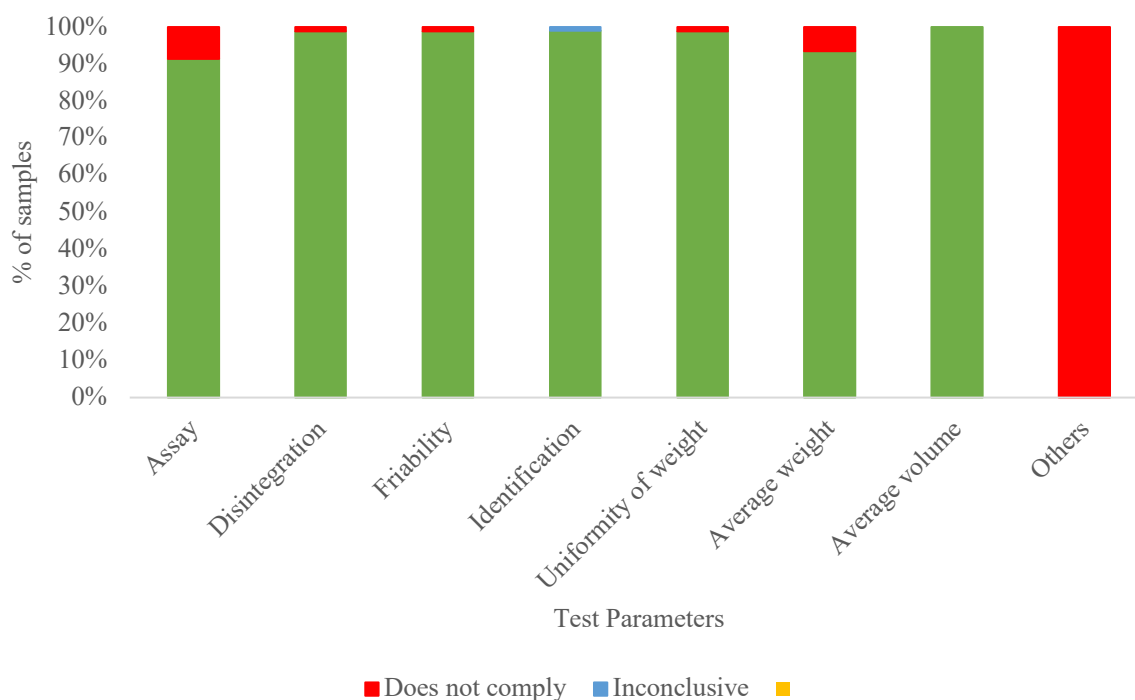


Figure 23: List of test parameters analysed

2.8. Blinded rechecking of malaria slides

2.8.1 Reporting status of health centres

In the 1st quarter, a total of 115 health centres have participated in malaria blinded rechecking conducted by National Malaria Reference Laboratory (NMRL). Of the total, 25.3% were reported on time, 21.0% submitted zero report, 9.7% were reported late and rest were not reported (**Figure 24**)

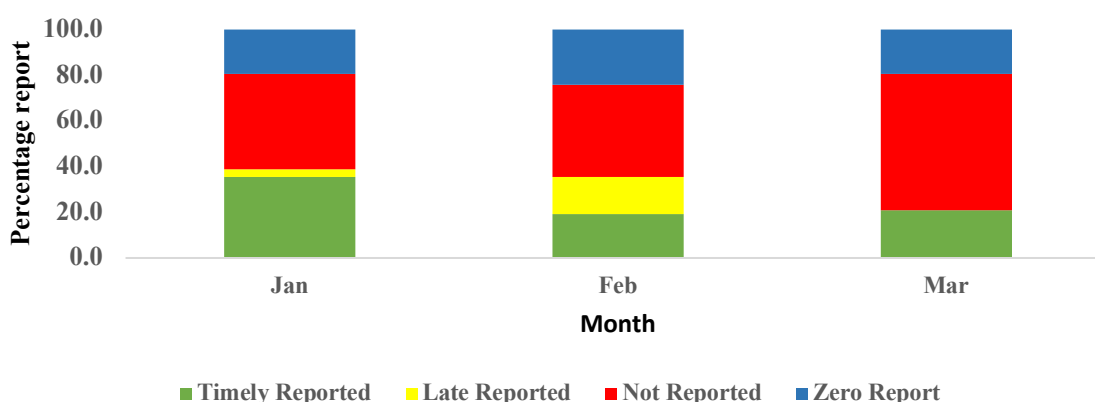


Figure 24: Monthly reporting status for 1st quarter 2023

2.8.2 Blinded rechecking status

Total of 539 malaria slides were received at NMRL for blinded rechecking. From the total slides examined, all the slides were confirmed as negative slides. All the slide received were evaluated on the following parameters and their performance score on specificity was 100.0%, malaria detection was 100.0%, quality of blood film was 72.35% and quality of stain was 82.48% (**Table 11 & 12**)

Table 11: Report on Malaria Blinded rechecking for 1st quarter 2023

Third Quarterly report on Malaria Blinded Rechecking 2022

Month	Jan	Feb	Mar	Total
Health center participated in blinded rechecking	38	40	37	115
Total slides received for blinded rechecking	223	192	124	539
Total positive detected	0	0	0	0
Total Nmps detected	223	192	124	539
Total slide Examine				539

Table 12: Report on performance score for Blinded rechecking

Performance score on blinded rechecking				
Month	Oct	Nov	Dec	Quarterly Score
Sensitivity (True positive detection)				
Specificity (True negative detection)	100	100	100	100
Malaria parasite detection	100	100	100	100
Mp Species Identification				
Mp Stages Identification				
Mp Parasite density				
Stain Quality	63.02	91.95	92.48	82.48
Blood film Quality	87.7	69.68	59.66	72.35

2.9. National Toxicology Center

2.9.1 Aflatoxins B₁

Aflatoxin B₁ is an aflatoxin produced by *Aspergillus flavus* and *parasiticus* which is a very potent genotoxic carcinogen inducing tumours in humans. A total of 144 food samples were tested for the presence of aflatoxins B₁, out of which 112 samples were detected with a range of 18.1 to 116.4 µg/kg. The mean contamination level was 18.06±24.4 µg/kg with the minimum concentration of 2.1 µg/kg and a maximum of 116.4 µg/kg in the samples respectively.

Different international organization has different maximum residue levels with the lowest that is of European union of less than 4 µg/kg. More than half of the samples exceeded the MRLs set by

the EU regulation (EC) No. 1881/2006. Whereas for CODEX and US FDA standards, more than quarter of all the samples were beyond their standards.

Sl. no	Regulatory organization	Maximum residue level (MRL) µg/Kg	Samples above MRL	
			Number (n)	Frequency (%)
1	CODEX	15	38	26.3
2	EU	4	82	56.9
3	US FDA	20	23	15.9

2.9.2 Confirmation of drugs of abuse

The gold standard technique for identification and confirmation of drug of abuse is by gas chromatography-mass spectrometry (GC-MS). Out of many reasons is being most sensitive and specific methods for use globally. Drug identification in various biological sample matrix like urine and blood is accomplished by comparison of chromatographic retention times and mass spectra to certified reference standards analyzed under the same condition. Moreover, it is also compared with the mass spectral from commercialized and pre-established validated in-house library of drug standards.

A total of 10 samples were received in this quarter for confirmation of Tramadol, Ketamine, benzo-diazepam and its derivatives and delta 9 tetrahydrocannabinol in urine samples. Of the 10 samples, 10.0% (n=1) was positive for Tramadol (**Figure 25**). The samples were prepared using the liquid-liquid extraction method. The analysis method was developed for each type of drugs, validated using the certified reference standards, compared with the NIST 17.0 library and use of internal standards/spiking method.

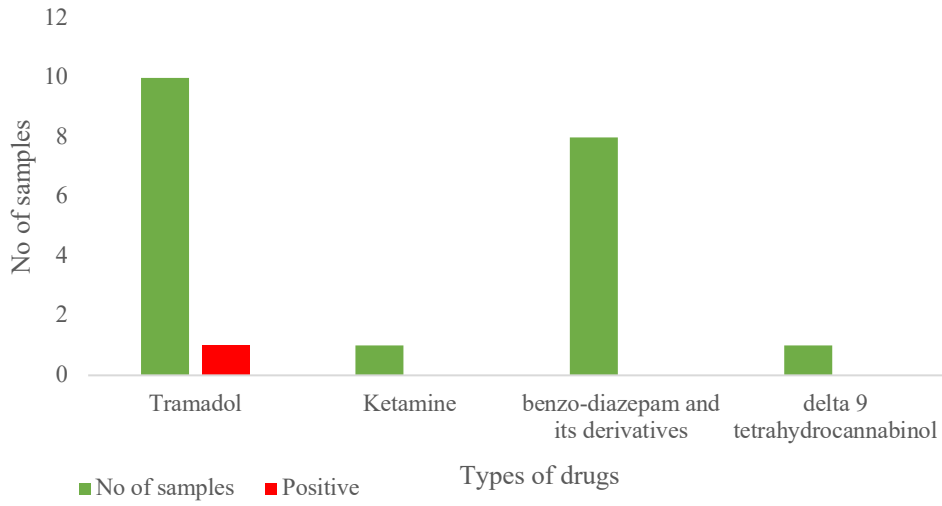


Figure 25: Type of drugs of abuse sample received and tested at the laboratory