ROYAL CENTER FOR DISEASES CONTROL

QUARTERLY BULLETIN: Second Quarter 2022

(Epi-week 13-25)

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

a) NEWARS:

i) Overall reporting rate for notifiable diseases had decreased compared to previous quarter

ii) Of 46 suspected samples collected from suspected measles and rubella cases, one sample tested positive for measles IgM and for rubella IgM respectively

iii) Eight Dengue fever cases, two malaria and five acute encephalitis syndromes were reported during the quarter

iv) Six outbreaks (three outbreak of acute gastroenteritis, two food poisoning and one chicken pox was reported during the month. All outbreaks were investigated by the local health centers with the recommendation from RCDC

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

1.1 Reporting status of health centers under 20 Dzongkhags

In the 2nd quarter, a total of 3445 weekly reports were expected from 265 health centers across the country. The overall reporting rate was inconsistent with the last quarter. Overall 80.0% of reports were received in the NEWARS Information System of which 68.0% were reported on time, 12.0% were reported late and the rest were not reported (**Figure 1**).

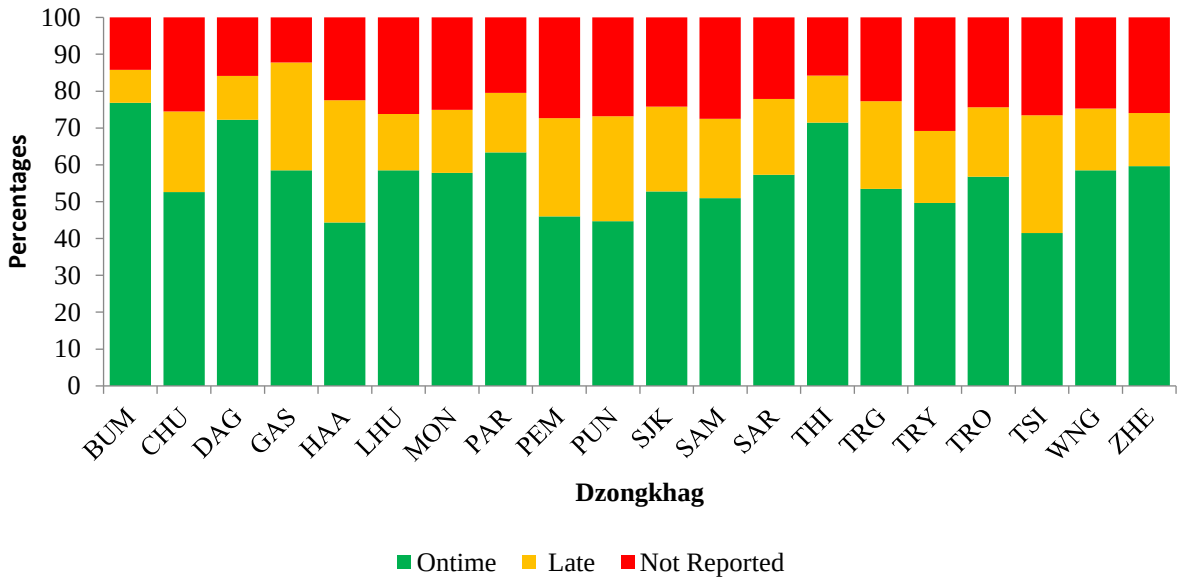


Figure 1: Dzongkhag-wise weekly reporting status for 3rd quarter 2021

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 (Trashiyangtshe), 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 for ARI- 28559 (76.0%) followed by AWD- 7311 (20.0%), **(Table 1)**. The total number of cases reported was higher in this quarter compared to the previous quarter.

Table 1: Notifiable diseases/syndromes reported by Dzongkhags

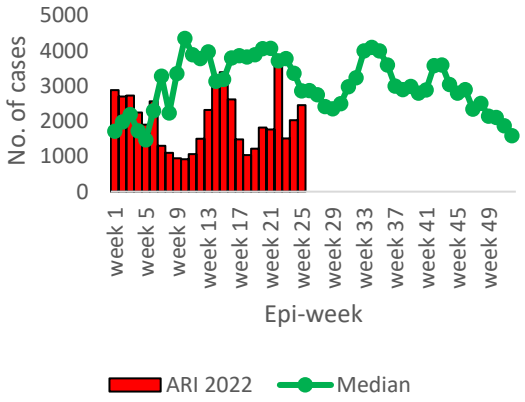
DZO	ABD	AWD	AJS	ARI	MUM	FWR	FDP	TPF	SAR	RKS
BUM	14	194	33	1313	0	0	1	0	11	0
CHU	120	163	0	2260	0	0	0	0	17	5
DAG	1	123	0	1431	0	2	1	0	2	0
GAS	0	74	0	150	0	0	1	0	0	0
HAA	0	95	0	490	0	0	0	0	0	0
LHU	18	60	10	1551	1	0	0	0	0	0
MON	87	319	5	3446	1	1	0	0	13	0
PAR	85	724	2	2636	10	2	0	0	10	3
PEM	3	141	5	864	0	0	2	1	3	1
PUN	6	78	0	1333	0	0	0	0	1	0
SJK	13	241	52	1353	0	0	87	0	18	2
SAM	36	464	0	2991	1	0	0	0	137	1
SAR	21	176	0	1766	0	0	0	0	4	0
THI	56	830	5	2547	5	2	0	1	17	0
TRG	21	2672	67	1742	0	11	7	19	21	4
TRY	29	251	1	781	0	9	1	0	3	1
TRO	39	202	16	1199	0	0	1	3	8	0
TSI	21	159	0	719	0	1	0	0	40	2
WNG	37	310	0	792	14	6	0	0	2	0
ZHE	1	35	0	395	0	9	0	0	1	0
Total	**608**	**7311**	**196**	**28559**	**32**	**43**	**101**	**24**	**308**	**19**

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).

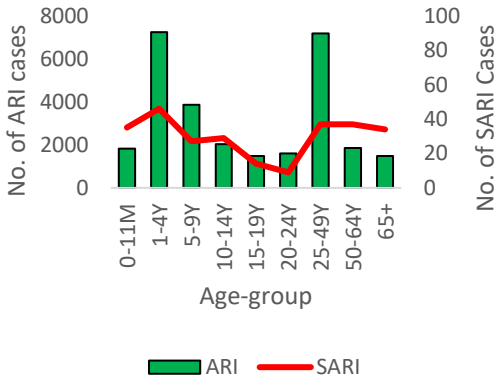
1.3 Descriptive analysis of most common notifiable diseases:

1.3.1 Respiratory Illness (ARI and SARI) syndrome

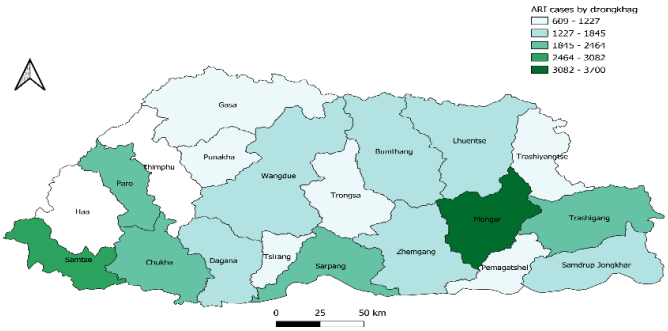
A total of 28867 cases of respiratory illness were reported, almost all cases were ARI (99.0%) while only 1.0% were SARI cases. The trend of ARI was found consistently lower compared with the median of the last three years of the same quarter (**Figure 2A**). The most commonly affected age group by respiratory illness was observed in the younger age group (**Figure 2B**). By district, Samtse and Mongar reported the maximum number of ARI cases (**Figure 2C**).



A: Incidence by Epi-week



B: Incidence by age group

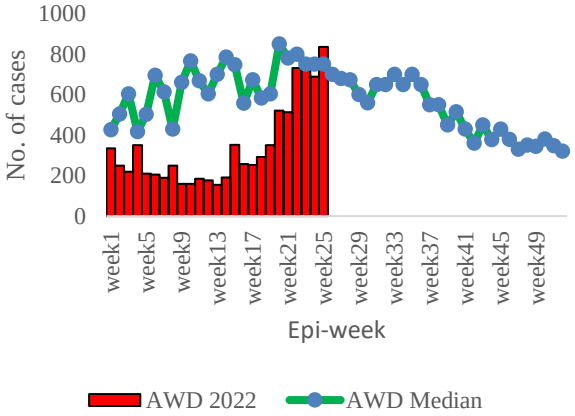


C: Incidence by district

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

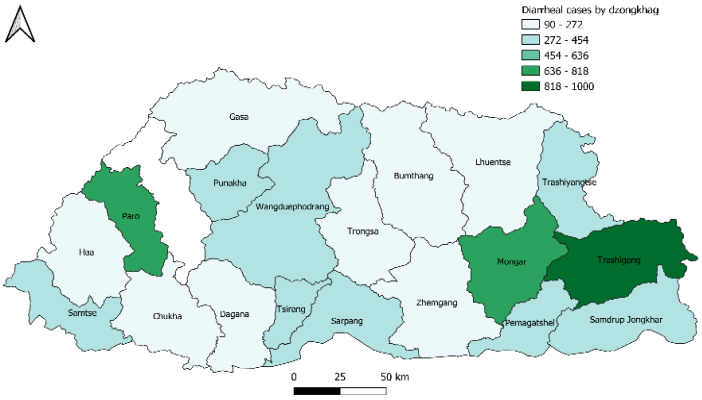
1.3.2 Diarrheal syndrome: (Acute Watery Diarrhea [AWD] and Acute Bloody Diarrhea [ABD])

A total of 2756 cases of diarrheal syndromes were reported (AWD: 92.0% and ABD: 8.0%). The trend for diarrheal diseases was found increasing, it could be attributed to the summer season however the trend is at-par with the median for the last three years (**Figure 3A**). A high incidence of diarrheal syndromes was observed in children 0-4 years (**Figure 3B**). Diarrheal diseases were reported from all the dzongkhag while Trashigang reported maximum AWD (**Figure 3C**).



A: Incidence by Epi-week

B: Incidence by age groups

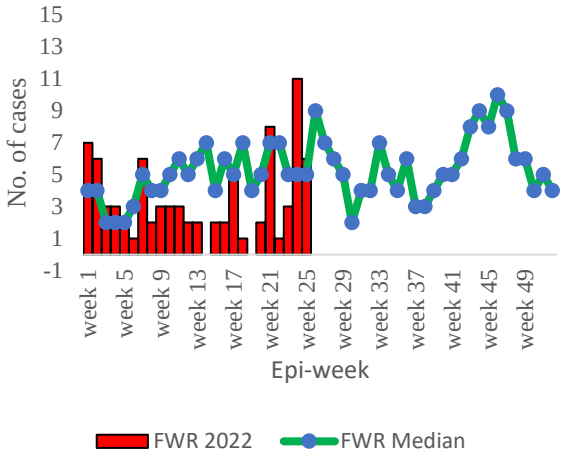


C: Incidence by district

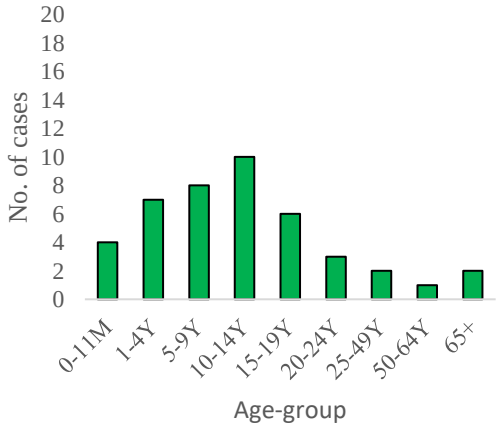
Figure 3: Diarrheal syndrome (AWD and ABD) incidence by Epi-week, age group and place

1.3.3 Fever with Rashes syndrome:

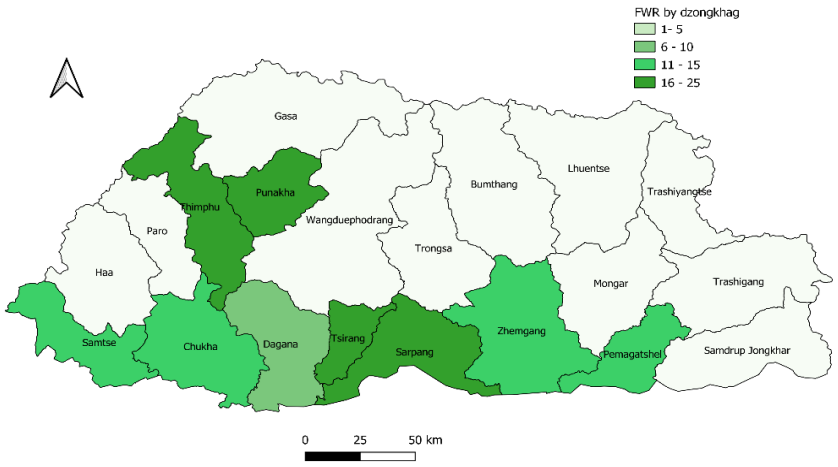
A total of 45 cases of fever with rash (FWR) syndrome were reported (**Figure 4A**). The trend was found lower compared with the previous quarter: the overall weekly records showed that the number of cases declined consistently. A majority of FWR were reported in the age group < 14 years (**Figure 4B**). A majority of FWR cases were reported from the southern region (**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 Dengue fever cases, two confirmed rubella two malaria, and one measles confirmed cases reported during the quarter (**Figure 5**).

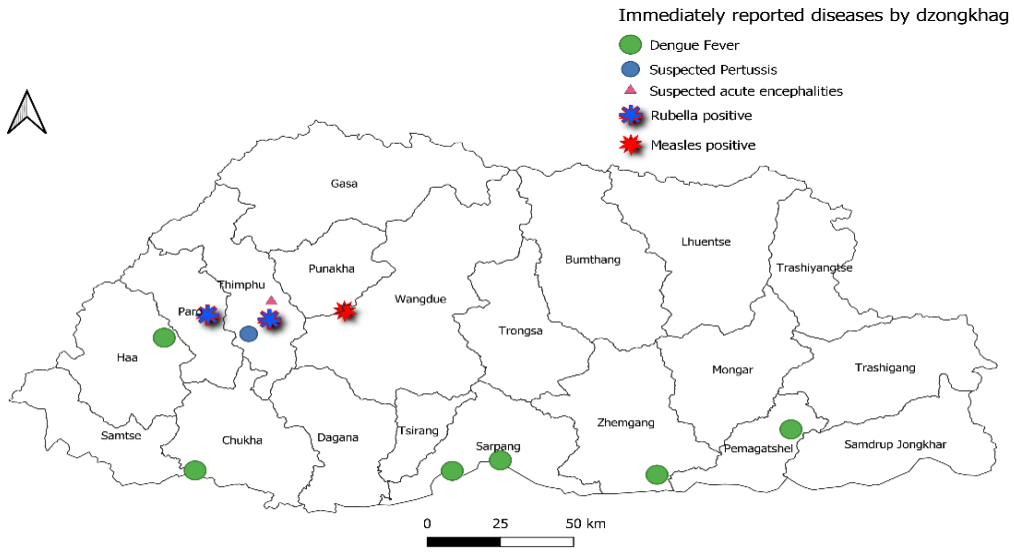


Figure 5: Distribution of immediately notifiable diseases/syndrome by dzongkhag

1.5 Events/Outbreaks Reported

Six outbreaks were reported in this quarter; of those (three outbreaks of acute gastroenteritis (AGE), two food poisoning, and one chicken pox were reported during the quarter (**Figure 6 and Table 2**). 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.

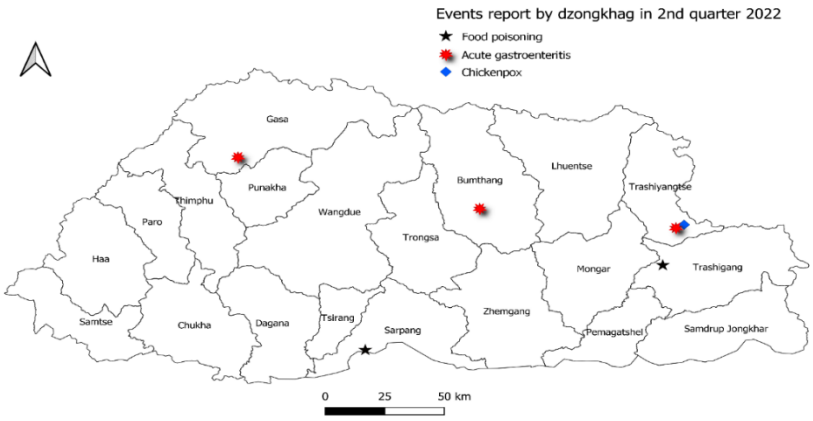


Figure 6: Distribution of events by dzongkhag

Table 2: Report of events (outbreak) by date of reported

SL. No	Name of outbreak	Dzongkhag	Location	No of cases	Date of notification	Investigated by	Lab Investigation
1	Food poisoning	Sarpang	Gelephu	07	12/05/2022	Local team	Done
2	Chicken-pox	T/yangtse	Dungzam	10	05/06/2022	Local team	Not Done
3	Mushroom Poisoning	Trashigang	Reserboo	05	05/06/2022	Local team	Not Done
4	AGE*	Gasa	Damji	10	06/06/2022	Local team	Not Done
5	AGE*	T/yangtse	Khamdang	24	12/06/2022	Local team	Not Done
6	AGE*	Bumthang	Bumthang	20	13/06/2022	Local team	Not Done

*AGE=Acute gastroenteritis

2 Sentinel surveillance

2.1.1 Drug-Resistant Surveillance for Tuberculosis

A total of 297 suspected tuberculosis patient samples were received at National Tuberculosis Reference Laboratory (NTRL) for culture and drug susceptibility testing for anti-tuberculosis drugs. Of the 297 samples, 232 (78.1%) were pulmonary tuberculosis (PTB) cases, 32 (11.0%) were extra-pulmonary tuberculosis cases and 33 (11.1%) were pulmonary samples received for TB screening for VISA. In addition, 83 follow- up samples were received for culture from MDR-TB patients under treatment.

Among the PTB cases, new smear positive (NSP) constituted 53.45% (n=124) of the cases, followed by 29.0% (n=67) of new smear negative cases, 15.5% (n=36) did not have record of case type and 2.1% (n=5) were previously treated cases (**Figure 7**).

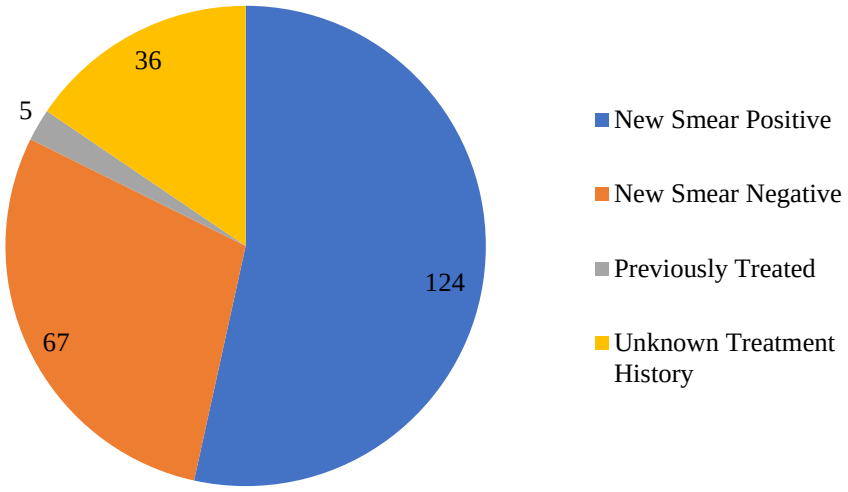


Figure 7: Classification of Pulmonary TB samples

2.1.2. Drug Sensitivity Test

Out of 297 samples, 143 samples had culture growth. All 143 samples with culture growth (100.0%) patients had complete drug susceptibility reports using a rapid molecular line probe assay. A total of 19 multi-drug resistant tuberculosis (MDR-TB) cases were detected among patients with complete drug susceptibility reports. Sixteen of the MDR-TB cases were from new

smear-positive pulmonary samples, one was a previously treated case, one MDR-TB case was detected from EPTB sample and 1 was from VISA screening. MDR-TB cases were highest in the age group of 20-29 years (10/19) and among females (12/19) (**Figure 8**). Eighteen MDR-TB cases were sensitive to both Fluoroquinolones and aminoglycoside while one sample was resistant to fluoroquinolone(Pre-XDR TB)

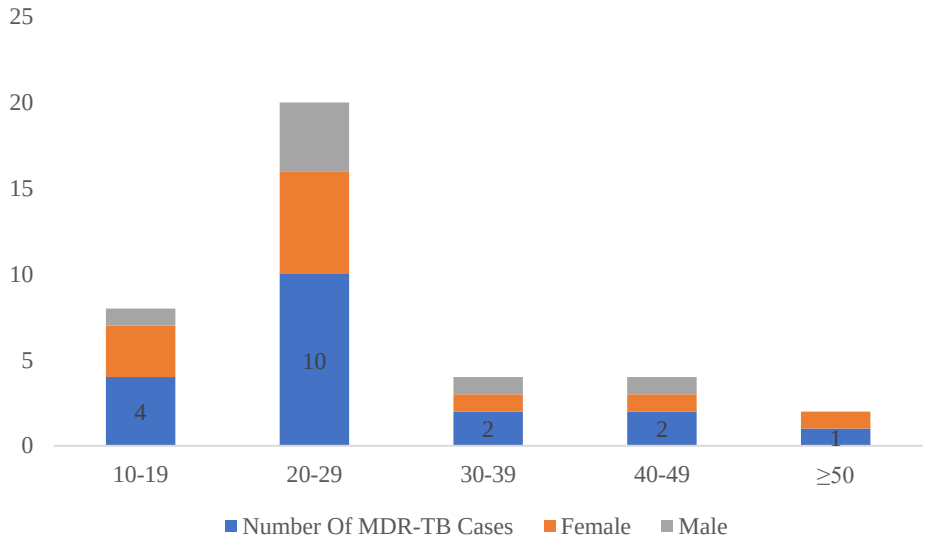


Figure 8: Distribution of MDR-TB cases by age group and gender

2.2 COVID-19 Integrated Influenza surveillance:

A total of 142,726 PCR samples were tested for COVID-19 and detected 28,388 (19.9 %) new cases during the second quarter of 2022 (week 14 to 16) through enhanced surveillance. The highest cases were detected during epi-week 14 (10,785) and 15 (10,574) with positivity rate 36.2% and decreases gradually over the week (**Figure 9**). The most affected age group for COVID-19 during the second quarter was 25 – 49 (61.3 %), followed by age group 20 – 24 (12 %) and >60 years (10.1 %). Males (64.0 %) were affected more than the females (36.0 %) **(Figure 10**). All cases were detected from community outbreak, quarantine facilities and in-coming travelers. The cases were reported from all the districts across the country. Thimphu (14,130) reported highest cases followed by Paro (3606) and Chukha (2373) (**Figure 11**).

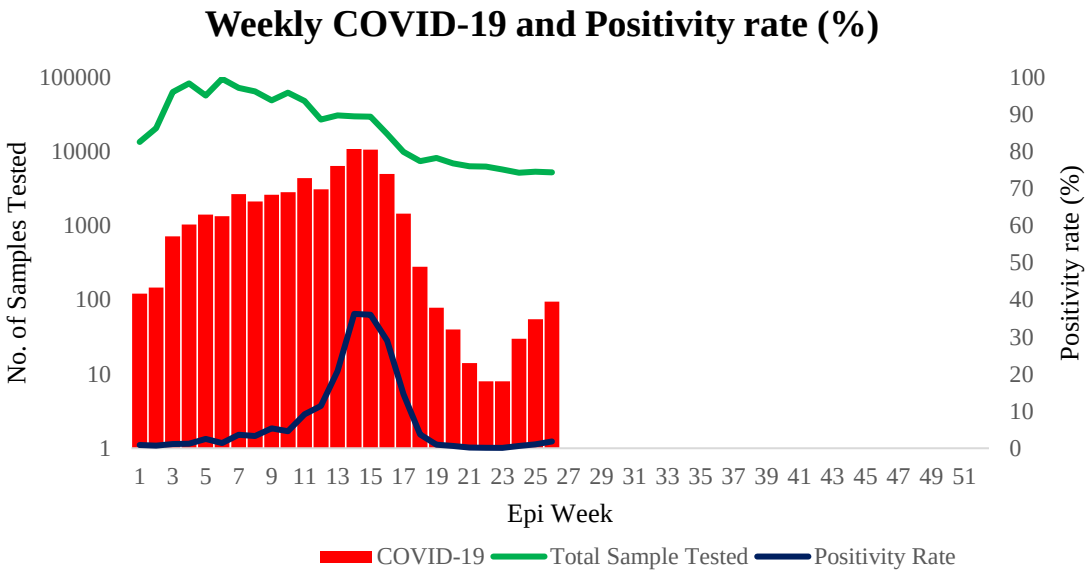


Figure 9: Weekly SARS-CoV-2 positives and its positivity rate against total samples tested in the country

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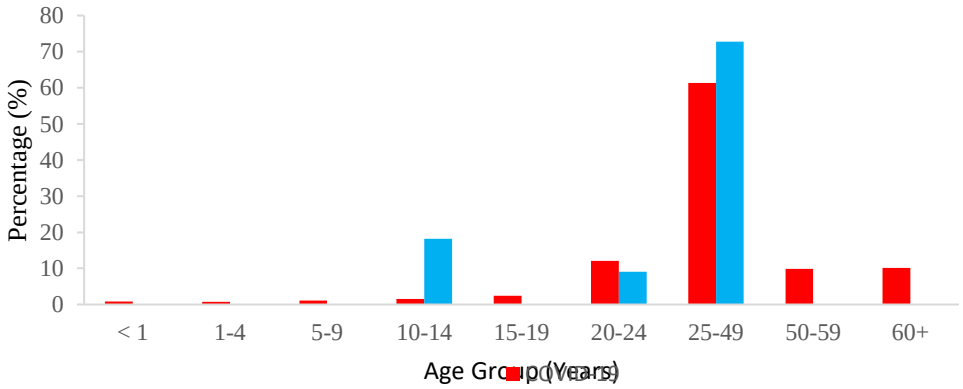

Figure 10: COVID-19 and Influenza positives by age group and gender for second quarter, 2022

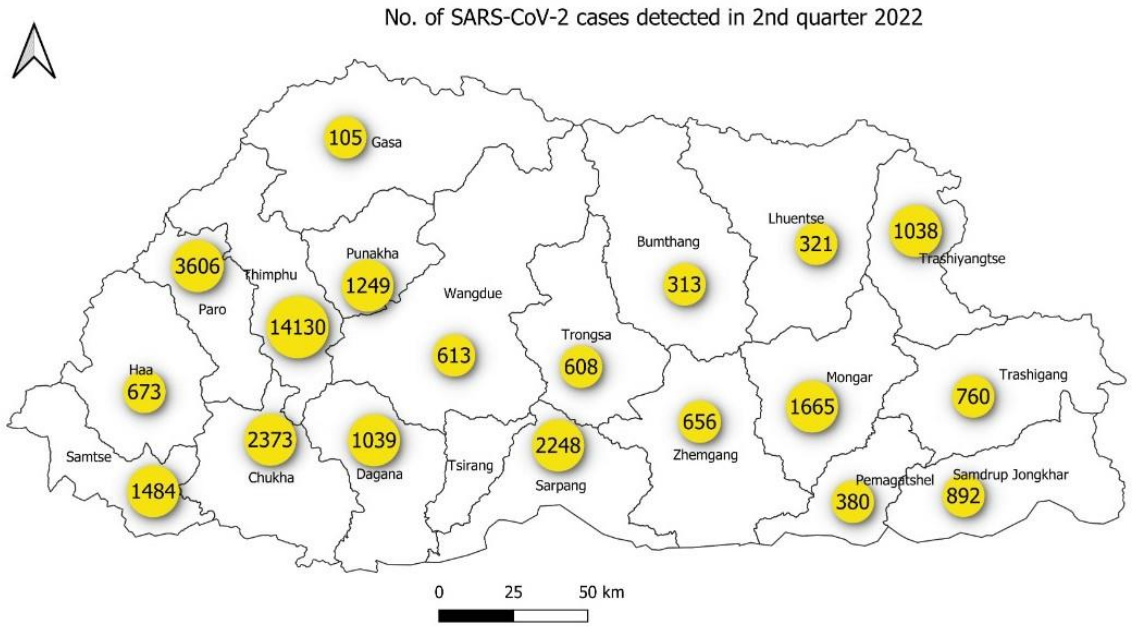

Figure 11: No. of COVID-19 positives cases detected by district in second quarter

2.2.1 Influenza like Illness and SARI Surveillance:

A total of 283 samples were tested for Influenza and detected 11 (4.0%) influenza positives. Influenza subtype Flu A/H3 (11) was found most predominant strain during the quarter (**Figure 12**). While 209 samples were tested from ILI patients and 74 samples from SARI cases respectively (**Table 3**). Five positive cases were detected from ILI surveillance. The highest cases were reported from Punakha hospital (8) followed by Trashigang hospital (2) (**Figure 13**).

The most affected age group for Influenza during the second quarter was 25 – 49 (73.0%), followed by age group 10 – 14 (18.2 %). Males (54.5 %) were affected more than the les (45.5 %) (**Figure 10**).

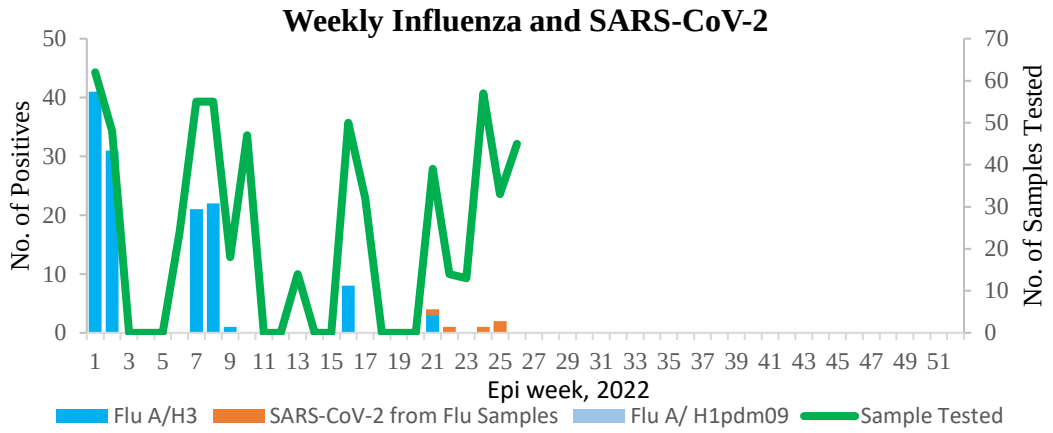

Figure 12: Influenza positives by subtype and SARS-CoV-2 positives against total Flu samples tested

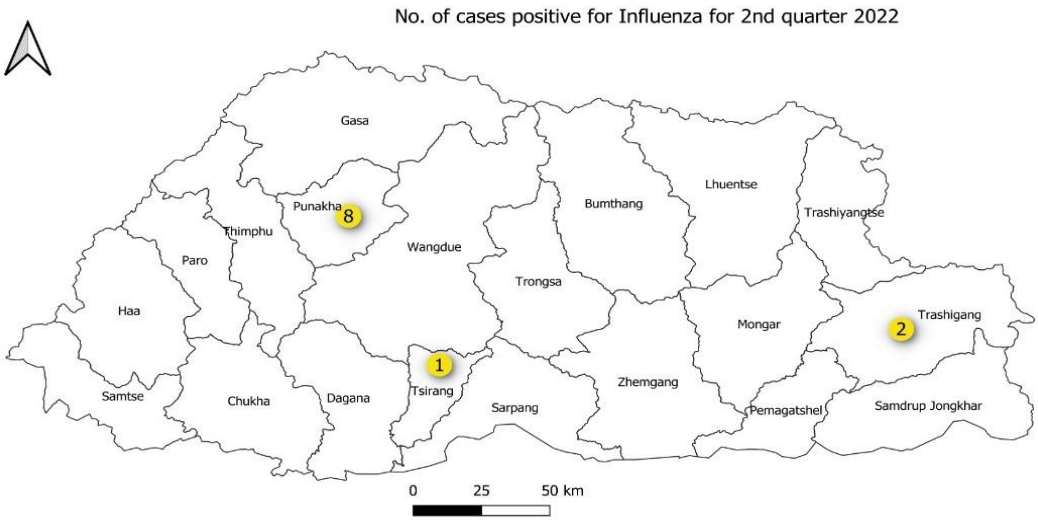

Figure 13: No. of Influenza positives cases reported from district Hospitals in second quarte

Table 3: Summary table for Influenza subtypes and sample tested for second quarter, 2022

Sl. No.	Sentinel & Non-sentinel Hospitals	ILI				SARI			
		COVID-19	FLU A/H3	Negative Influenza & COVID-19	**ILI Total**	COVID-19	Negative Influenza & COVID-19	**SARI Total**	Grand Total
1	Gedu						3	3	3
2	Gelephu			2	2		25	25	27
3	JDWNRH			60	60	1	6	7	67
4	Lungtenphu			25	25				25
5	Paro	1		19	20		20	20	40
6	Punakha	1	8	12	21				21
7	Samdrup Jongkhar						3	3	3
8	Samtse			27	27		8	8	35
9	Trashigang		2	1	3				3
10	Trongsa	1		40	41	1	7	8	49
11	Tsirang		1	6	7				7
12	Wangdue			3	3				3
	Total	**3**	**11**	**195**	**209**	**2**	**72**	**74**	**283**

2.3 laboratory-based surveillance for vaccine-preventable diseases

During the last quarter of the year, 46 samples were received for MR testing, seven for AES and three for *Bordetella pertussis*. IgM ELISA performed on these samples resulted in one positive each for *measles* and *rubella*. Detection by PCR and further genotyping of these samples are pending. IgM ELISA for *Japanese encephalitis* (JE) virus on samples received for AES and *Bordetella pertussis* performed did not yield any positive results (**Table 4)**.

Table No 4: Number of samples received from health centers for MR, JE, and Pertussis surveillances

Surveillance	Site/ Hospital	Number of samples received	Positive
Measles/ Rubella	Wangdiphodrang	2	1 (measles)
	Punakha	2	0
	Paro	22	1 (rubella)
	JDWNRH	13	0
	Gedu	2	0
	Gomtu	1	0
	Trashigang	3	0
	Samtse	1	0
AES (JE)	JDWNRH	7	0
Pertussis	JDWNRH	2	0
	Samtse	1	0

2.3.2 **Dengue and Acute Undifferentiated Febrile Illness (AUFI) surveillances:**

There were 10 samples received for dengue virus testing and four samples for investigation of AUFI. Apart from one DENV IgM positive sample from Gedu, the rest were all negative for the given panel of tests (**Table 5**).

Table 5: Samples received and tested for dengue and AUFI sentinel surveillances

Surveillance /Test requested	Site/ Hospital	No. of samples tested	Positive test result					
			DENV NS1	**DENV IgM**	**Scrub typhus IgM**	**Leptospira IgM**	**JE IgM**	**CHIKV IgM**
Dengue surveillance	Sarpang	1	0	0	NA	NA	NA	NA
	Samtse	2	0	0	NA	NA	NA	NA
	Phuntsholing	1	0	0	NA	NA	NA	NA
	Gedu	4	0	1	NA	NA	NA	NA
	Paro	2	0	0	NA	NA	NA	NA
AUFI sentinel surveillance	S/Jongkhar	1	0	0	0	0	0	0
	Gedu	1	0	0	0	0	0	0
	Wangdue	2	0	0	0	0	0	0

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

2.4. Sentinel Surveillance for Diarrheal Etiologic Agents:

A total of 50 samples were received from seven sentinel sites (**Figure 14**) for this quarter. Most of the samples received were from the CRRH.

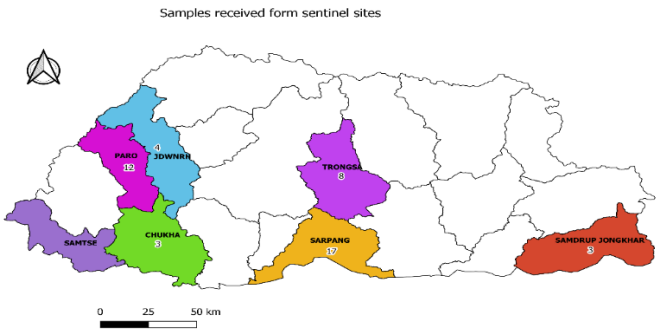

Figure 14: Number of fecal specimens collected from sentinel sites

The sample's character consists of watery (56.0%), and loose (44.0%). The mean age of the patients enrolled was 24 years. The mean duration of illness was 31 hours. Of 50 cases, 22.0% required hospital admission while the rest were treated on OPD basis. Of all, one diarrhea case was found linked to having consumed a suspected food.

The proportion of bacterial pathogens isolated during the 4th quarter is shown in (**Figure 15**). The antimicrobial resistant pattern for the isolated pathogens is provided in (**Table 5**).

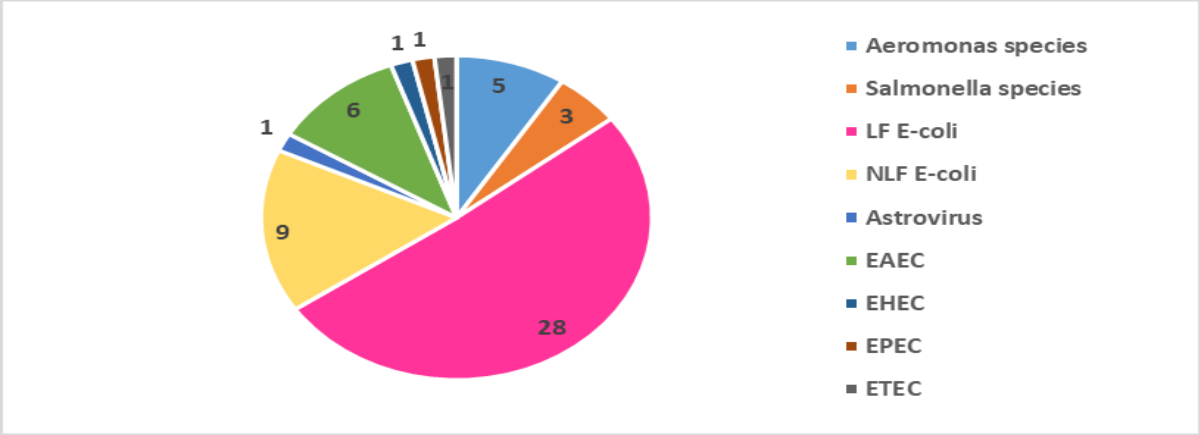

Figure 15: Proportion of enteric pathogens isolated

Table 5: Anti-bio gram (Resistant pattern) for enteric pathogens:

Pathogen	AMP	CZO	CRO	LEX	CHL	CIP	GEN	NAL	TCY	SXT
Aeromonas species (n=5)	**5**	**5**	0	**4**	0	0	0	0	0	0
Salmonella species (n=3)	**1**	0	**1**	0	0	0	0	**2**	0	0
EAEC (n=6)	**5**	**4**	0	**1**	0	**1**	0	**5**	**2**	**1**
EPEC (n=1)	**1**	**1**	**1**	**1**	0	0	0	0	0	**1**
ETEC (n=1)	**1**	**1**	**1**	**1**	0	**1**	**1**	0	**1**	**1**

S: Susceptible; I: Intermediate; R: Resistant

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

2.5. Food safety surveillance:

Food-borne diseases are caused by a wide range of microbiological and chemical or toxins with different levels of severity, which range from mild sickness to life-threatening illness. It is accepted internationally that food safety surveillance systems have a dual purpose; the first is to detect, control and prevent foodborne disease outbreaks. During the 2nd quarter of 2022 food safety surveillance conducted by Food and Nutrition Laboratory, RCDC a total of 25 ready to eat food samples were received from the surveillance sites (**Figure 16**).

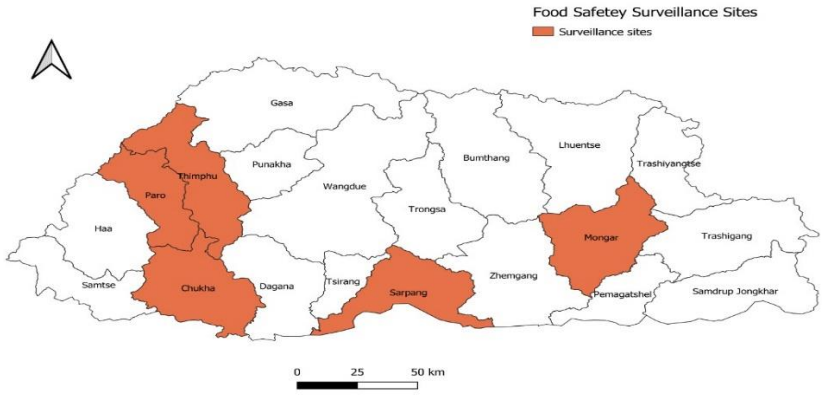

Figure 16: Food safety surveillance sites

Total plate count of aerobic microorganisms, total *Enterobacteriaceae* count, total coliform count and yeast mould count are used as indicators to access the food quality and also used as a hygiene indicator. Of the total 25 samples 24% (n=6 samples) (Total plate count of >10 log 5 and *E.coli* of >10 log 2). presented with indicator test organism growth. The common foods with indicator organism growth were ready-to-eat food (Chowmein).

Sixteen percent of the samples were contaminated with pathogenic organisms, the commonly isolated pathogen includes *Staphylococcus aureus* and *Bacillus ceres*. The common food detected with pathogenic organism includes bakery products and Channa fried.

During the same period, suspected food poisoning was reported from Gelephu. The samples collected were contaminated with Salmonella spp.

2. 6. Drinking Water Quality Surveillance

2.6.1 Bacteriology test report of Urban Drinking Water Quality Monitoring (UDWQM):

In the second quarter of 2022, 311 out of 906 drinking water samples were tested by the urban health centers. Out of which more than half (68.5%) of the tested samples were found fit for consumption and the rest 31.5% were found to be contaminated by fecal coliform hence, it is unfit for drinking. 21 out of 34 health centers have not reported for this quarter (**Figure 17**).

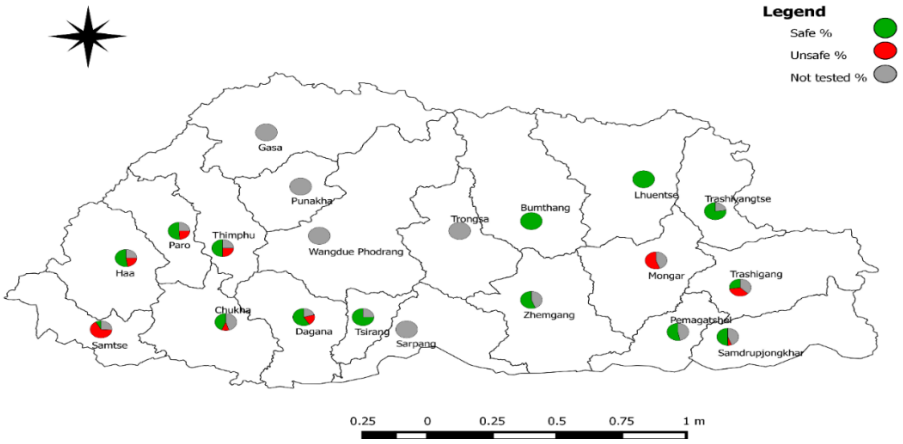

Figure 17: Bacteriology test report of 34 Hospitals/BHU-1 in urban area

2.6.2, Chlorination Report:

Three (Bumthang, Royal center for disease Control, Samtse) out of six health centers monitoring residual chlorine have reported for this quarter. In this quarter, 42 samples were tested and 14.3% of drinking water has been adequately chlorinated and the rest of the samples (85.7%) has not been adequately chlorinated (**Figure 18**).

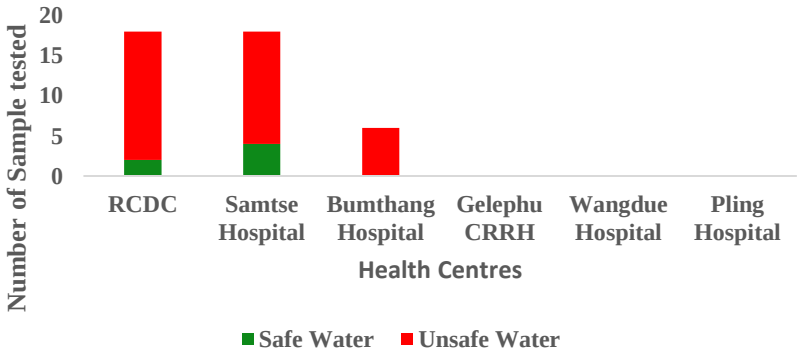

Figure 18: Residual Chlorine test report for 6 health centers in urban area

2.8 Drug Quality Monitoring:

A total of 191 samples were tested at National Drug Testing Laboratory in the 2nd quarter 2022. The samples were tested as per their pharmacopeial claim. From the 191 samples tested, 5 samples were found to be non-compliant. Accordingly, the test reports were communicated to DRA for their necessary regulatory action (**Table 6 and Figure 19**).

Table 6: Distribution of samples collected

Site	Complies	Does not comply	Total
Bumthang Hospital	16	0	16
Drug Regulatory Authority	9	1	10
Gelephu CRRH	11	0	11
JDWNRH	16	0	16
Medical Supply & Distribution Division	1	0	1
Monggar ERRH	24	0	24
Paro Hospital	16	1	17
Phuentsholing Hospital	7	0	7
Punakha Hospital	15	1	16
Samdrup Jongkhar Hospital	12	0	12
Samtse Hospital	8	1	9
Trashigang Hospital	19	0	19
Trongsa Hospital	14	0	14
Tsimalakha Hospital	18	1	19
Total	186	5	191

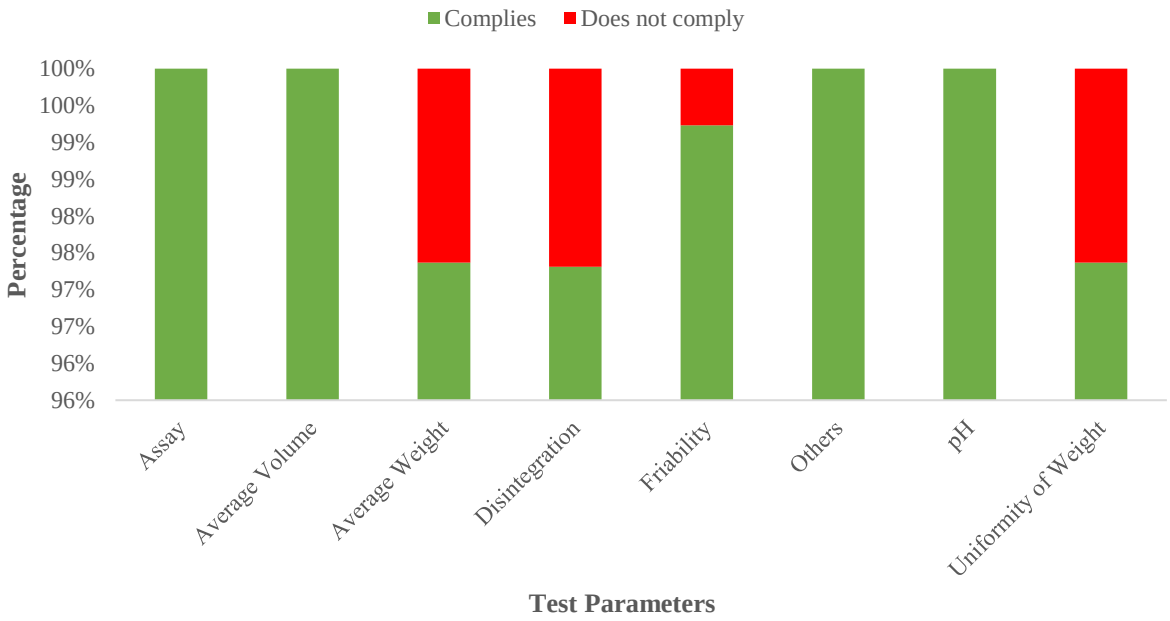

Figure 19: List of test parameters analyzed

2.9. National External Quality Assessment Scheme for Malaria Microscopy:

2.9.1 Blinded rechecking of malaria slides:

In the second quarter, total of 503 malaria slides were received at National Malaria Reference Laboratory for blinded rechecking. From the total slides examined, 2 malaria-positive slides are detected (0.4 %). All the slide received were evaluated on the following parameters and their performance score on sensitivity was 100.0%, specificity was 100.0%, malaria detection was 100.0%, species identification was 100.0%, stages identification was 75.0%, parasite density determination was nil, quality of blood film was 88.0% and quality of stain was 62.0% (**Table 7 and 8**)

Table 7: Report on Malaria Blinded rechecking for 2nd quarter 2022

Second Quarterly report on Malaria Blinded rechecking 2022				
Month	**April**	**May**	**June**	**Total**
Health center participated in blinded rechecking	17	24	23	64
Total slides received for blinded rechecking	109	172	222	503
Total positive detected	1	0	1	2
Total Nmps detected	108	172	221	501
	Total slide Examine			503

Table 8: Report on performance score for Blinded rechecking

Performance score on blinded rechecking				**Quarterly Score**
Month	April	May	June	
Sensitivity (True positive detection)	100		100	100
Specificity (True negative detection)	100	100	100	100
Malaria parasite detection	100	100	100	100
Mp Species Identification	100		100	100
Mp Stages Identification	50		100	75
Parasite density	0		0	0
Quality of blood smear	88	87	89	88
Quality of stain	57	59	70	62

2.10. National Toxicology Center

2.10.1. Determination of Aflatoxins in stable foods:

Aflatoxins are mycotoxins produced by the common fungi Aspergillus flavus and Aspergillus parasiticus and are commonly found in a wide range of crops such as cereals and nuts. They are toxic carcinogen which is classified as Group one human carcinogen by International Agency for Research on Cancer (IARC) that induces liver and colorectal cancer. The presence of aflatoxins in food is a global concern and poses a risk to food safety in less developed countries. Currently,

there is paucity of data on the occurrence of aflatoxin contamination in food items in the country. Therefore, an attempt was made to determine the presence of Total aflatoxins (AFTotal) in selected food items (**Table 9**).

Table 9: Report on food samples tested for aflatoxins

Category	**n**	**Total Aflatoxin level (ng g^{-1})**
Imported Rice	10	<3
Local rice	9	<3
Maize products	6	<3
Peanut	1	3.99
Flour products	5	3.71±1.14
Total	**31**	**3.19±0.58**

A total of 31 food samples were tested for total aflatoxins (AFTotal). The mean level of AFTotal in all the samples were 3.19±0.58 ng g^{-1} and the 95th percentile values were 3.92 ng g^{-1} respectively. Kabchi, which is a flour product had the highest level of AFTotal of 5.71 ng g^{-1}. In rice and maize products, the AFTotal were under the detection limit of <3 ng g^{-1}.

However, human health risk assessment could not be carried out due to limited sample size and the consumption data for exposure estimation and risk characterization. Hence, a detailed study is pertinent to determine the actual level of aflatoxins in all category of food items, estimate the daily intake, calculate the margin of exposure, average potency and risk of cancer respectively.