ROYAL CENTER FOR DISEASES CONTROL

QUARTERLY BULLETIN: fourth Quarter 2022

(Epi-week 39 - 52)

Contents

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

a) NEWARS:

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

ii) A majority of the immediately notifiable diseases/syndromes reported were suspected measles/rubella cases. Of 61 samples collected and tested from suspected measles and rubella cases, two tested positive for measles IgM and none tested positive for rubella IgM.

iii) Forty-four Dengue fever cases, two malaria, two bacterial meningitis, and five acute encephalitis syndromes were reported during the quarter

iv) Thirteen diseases outbreak reported were reported during the quarter, of which 10 were Influenza-like illness, one outbreak of measles, one outbreak of glossitis and one outbreaks of chickenpox 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 restwere not reported (**Figure 1**).

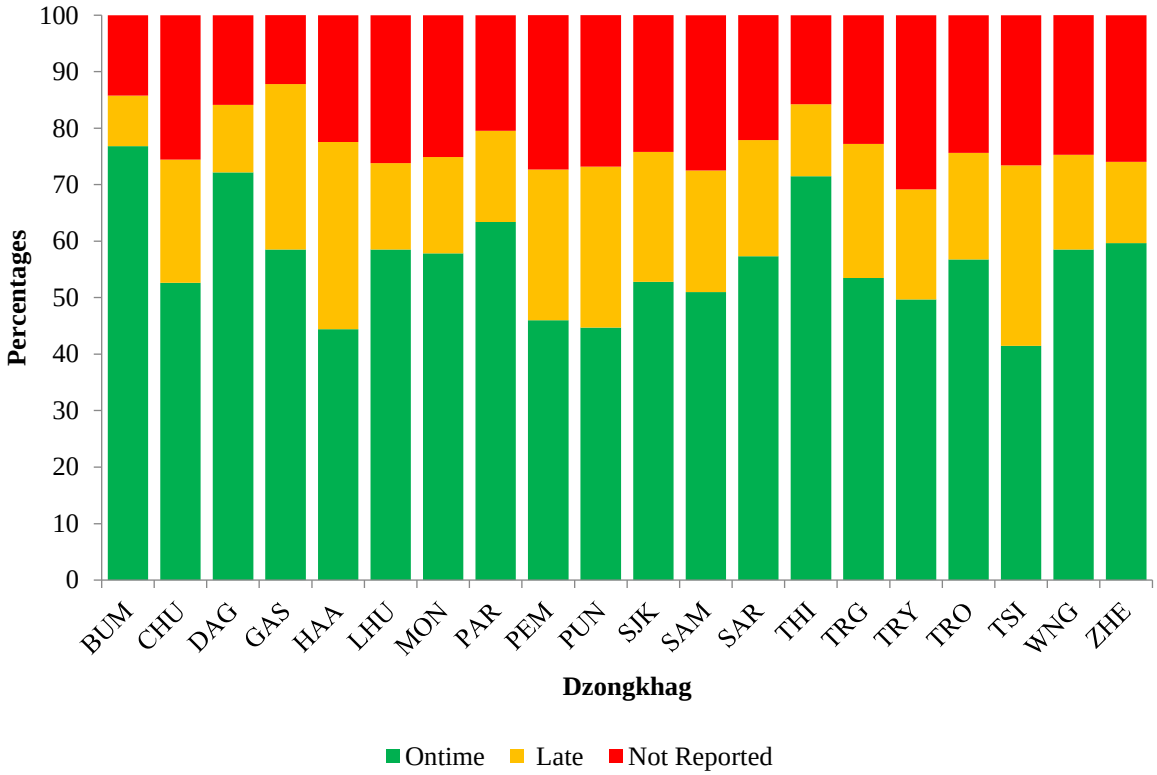


Figure 1: Dzongkhag-wise weekly reporting status for 4th quarter 2022

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 (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 were ARI- 56294(90.0%) followed by AWD- 5192 (8.0%), **(Table 1)**. The total number of cases reported was higher in this quarter compared to the third quarter 2022.

Table 1: Notifiable diseases/syndromes reported by Dzongkhags

DZO	ABD	AWD	AJS	ARI	MUM	FWR	FDP	TPF	SAR	RKS
BUM	8	299	13	2774	0	0	0	0	23	1
CHU	33	234	8	3281	0	0	0	24	92	4
DAG	4	255	48	2930	0	2	0	2	26	4
GAS	7	41	0	148	0	1	0	0	0	0
HAA	5	87	0	746	0	0	0	0	0	0
LHU	21	68	0	1072	0	0	0	0	3	0
MON	32	226	0	2815	0	2	0	0	36	4
PAR	43	286	0	2163	0	1	0	0	45	0
PEM	3	168	0	2428	1	0	0	5	2	1
PUN	20	216	0	617	2	0	0	0	6	0
SJK	20	251	0	3391	1	2	18	1	33	0
SAM	12	474	1	7266	2	23	0	3	8	3
SAR	34	377	0	6142	0	119	0	1	75	1
THI	51	769	1	5263	1	14	2	1	48	0
TRG	34	452	38	3217	5	41	6	7	9	5

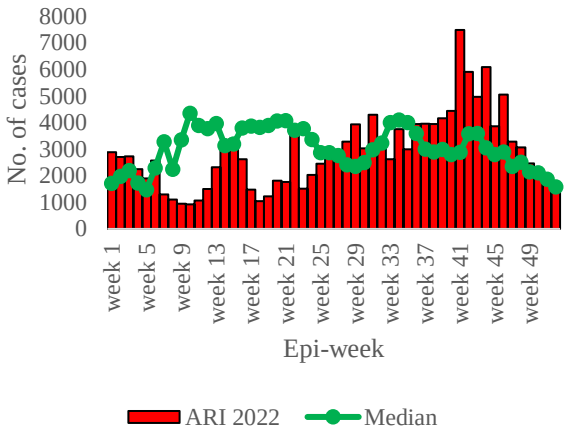
TRY	12	165	0	4461	0	2	0	0	25	5
TRO	2	287	0	1947	0	9	3	0	5	0
TSI	13	107	0	1696	0	0	0	0	13	0
WNG	42	310	31	2679	3	0	0	0	19	0
ZHE	9	120	0	1258	1	2	0	1	1	5
Total	**405**	**5192**	**140**	**56294**	**16**	**218**	**29**	**45**	**469**	**33**

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).

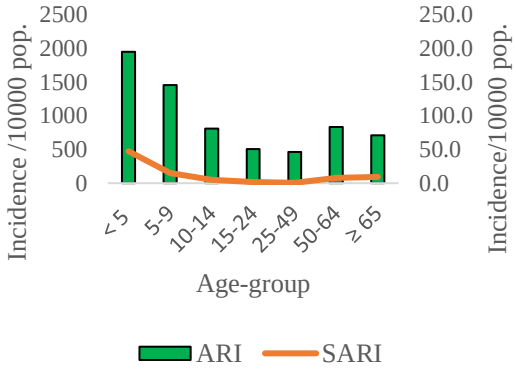
1.3 Descriptive analysis of most common notifiable diseases:

1.3.1 Respiratory Illness (ARI and SARI) syndrome

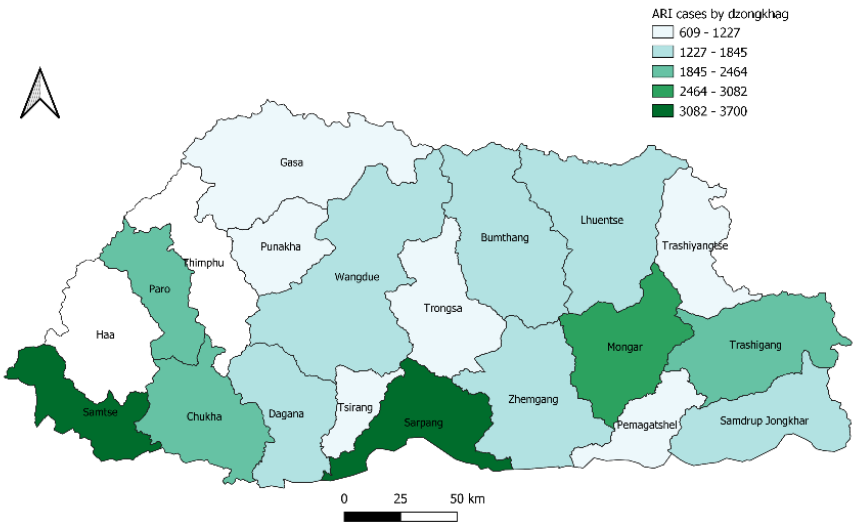
A total of 56763cases of respiratory illness were reported, almost all cases were ARI (99.0%)and rest were SARI cases. The trend of ARI cases was found consistently lower compared with the median of the last three years of the same quarter (**Figure 2A**). The most commonly affected age group by respiratory illness was observed in the younger age-group (**Figure 2B**). By district, Sarpang and Samtse reported the maximum number of ARI cases (**Figure 2C**).



A: Incidence by Epi-week



B: Incidence by age group

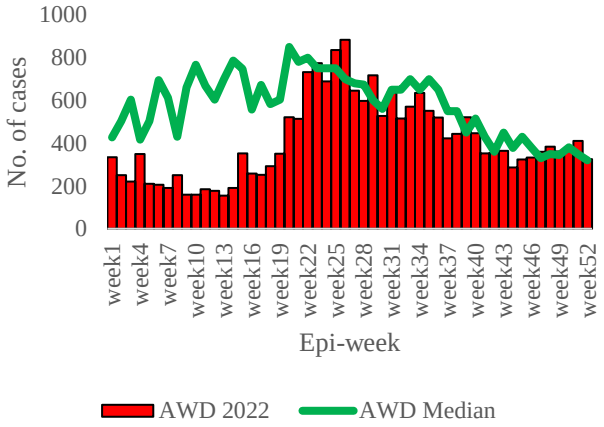


C: Incidence by district

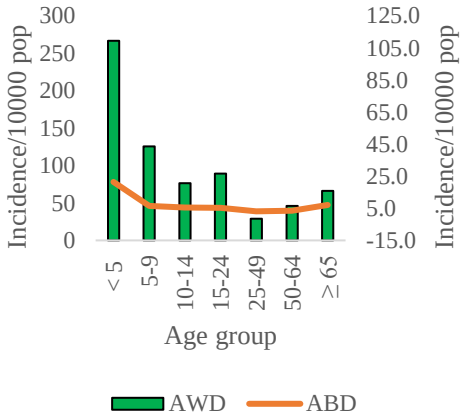
Figure 2: Respiratory illness incidence by epidemiological weeks, age groups and place.

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

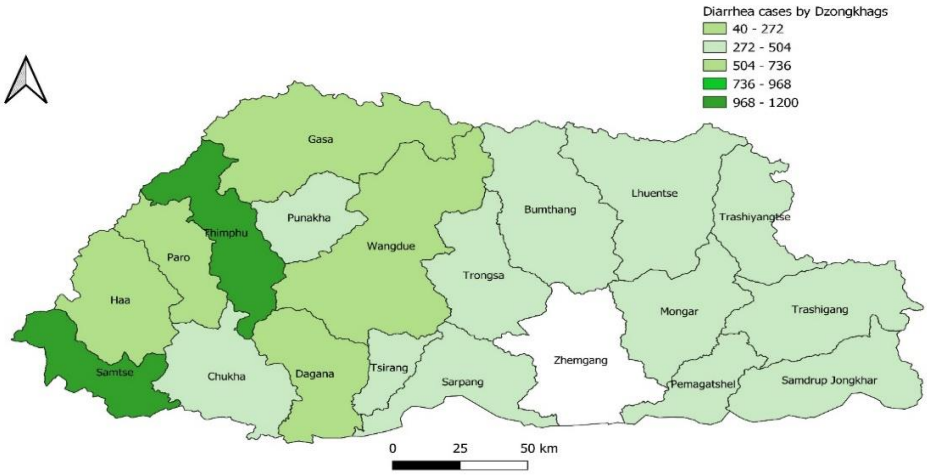
A total of 8546 cases of diarrheal cases were reported (AWD: [7668] 90.0% and ABD: [878] 10.0%). The trend for diarrheal diseases was found at-par with the median for the last three years (**Figure 3A**). A high incidence of diarrheal diseaseswas observed in children 0-4 years (**Figure 3B**). Diarrheal diseases were reported from all the dzongkhag while Thimphu and Samtsereported maximum AWD (**Figure 3C**).



A: Incidence by Epi-week



B: Incidence by age groups

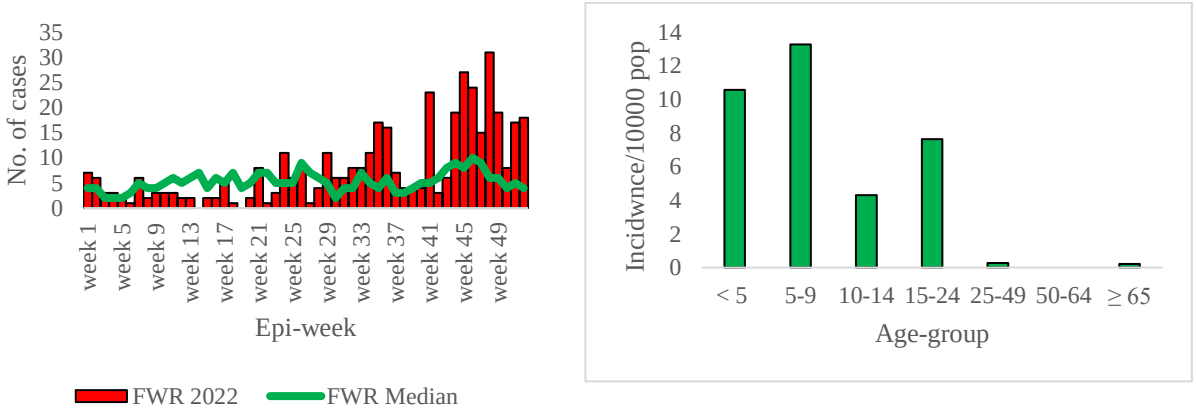


C: Incidence by district

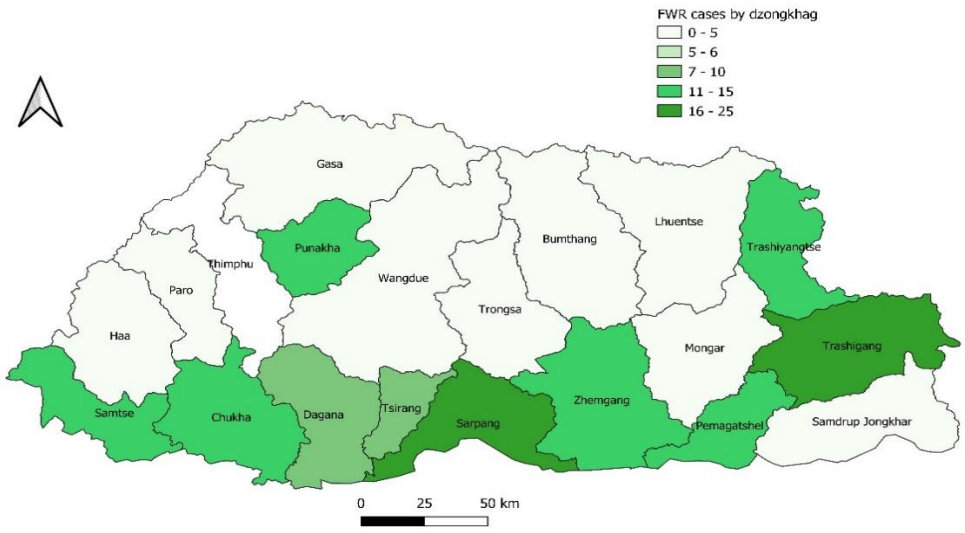
Figure 3: Diarrheal syndrome (AWD and ABD) incidence by Epi-week, age group and place

1.3.3 Fever with Rashes syndrome:

A total of 218 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 dzongkhagSarpang 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 two samples from Trongsa tested positive for measles IgM. Forty-four Dengue fever cases, two malaria, two bacterial meningitis, and five acute encephalitis syndromes were reported from different dzongkhag during the quarter (**Figure 5**).

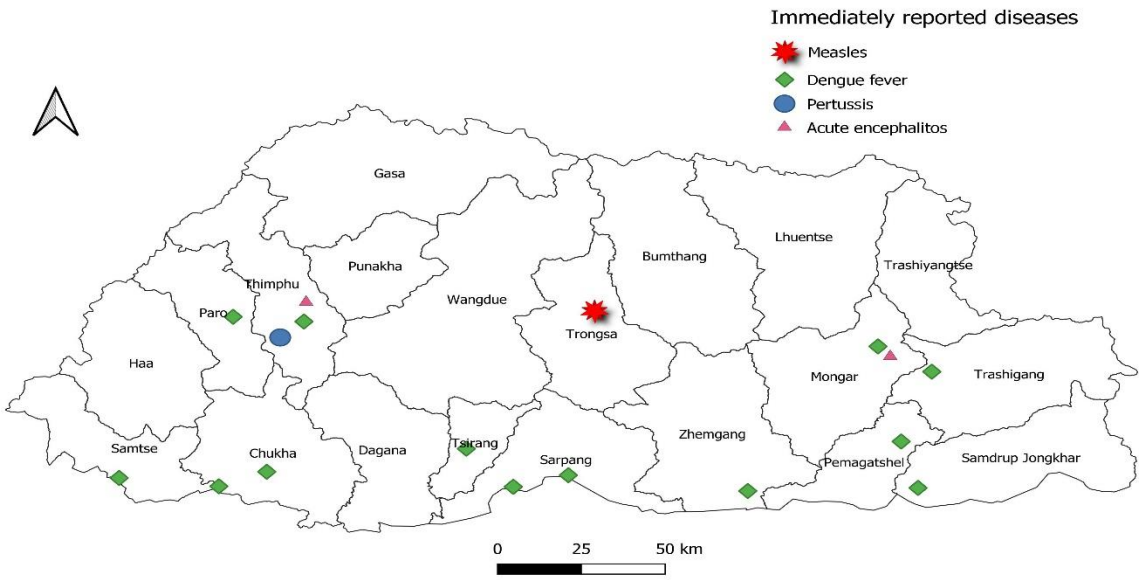


Figure 5: Distribution of immediately notifiable diseases/syndrome by dzongkhag

Thirteen diseases outbreak reported were reported during the quarter, of which 10 were Influenza-like illness (ILI)one outbreak of measles, one outbreak of glossitis and one outbreaks of chickenpox were reported. (**Figure 6**). Specimens from seven ILI outbreak were tested, Influenza subtype FLU A/H3 (69.3%) was detected from all the outbreak samples.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.

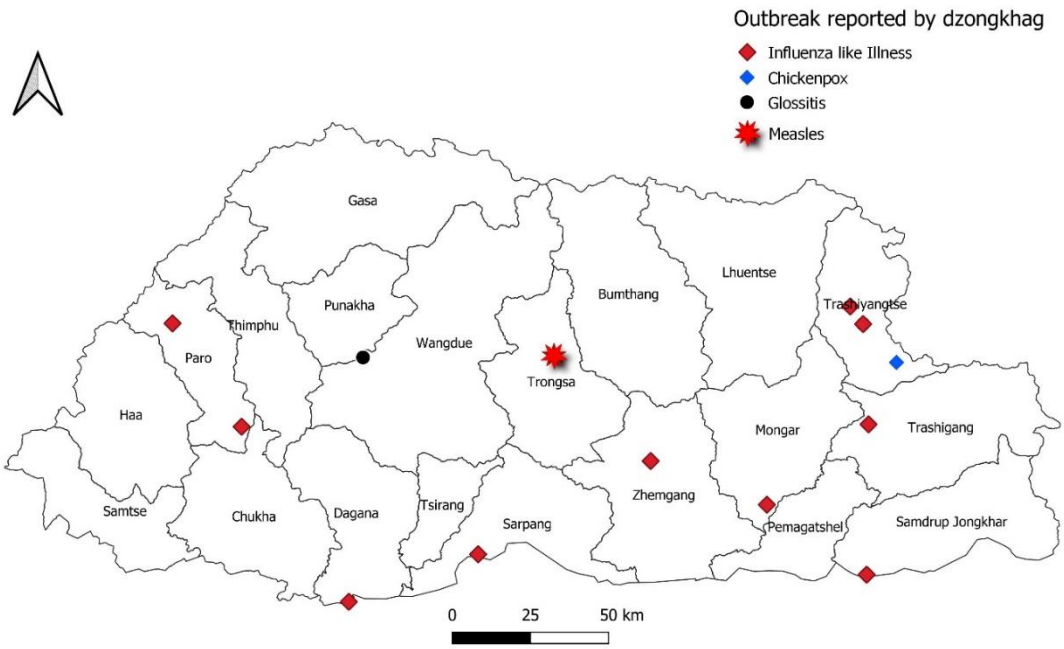


Figure 6: Distribution of events by dzongkhag

2. Laboratory based surveillance

2.1.1 Drug-Resistant Surveillance for Tuberculosis:

A total of 547 patient samples were received at National Tuberculosis Reference Laboratory (NTRL) for culture and drug susceptibility testing for anti-tuberculosis drugs. Of the 547 samples, 337 (61.6%) were pulmonary samples, 26(4.8%) were extra-pulmonary samples and 101(18.5%) were pulmonary samples received for TB screening for VISA. In addition, 83(15.2%) follow-up samples were received for culture from MDR-TB patients under treatment.

Among the pulmonary samples, new smear positive (NSP) constituted 17.8% (n=60) of the total samples, followed by 80.7% (n=272) of new smear negative samples, 1.2 % (n=4) did not have record of case type and 0.3%(n=1)were previously treated cases (**Figure 7**).

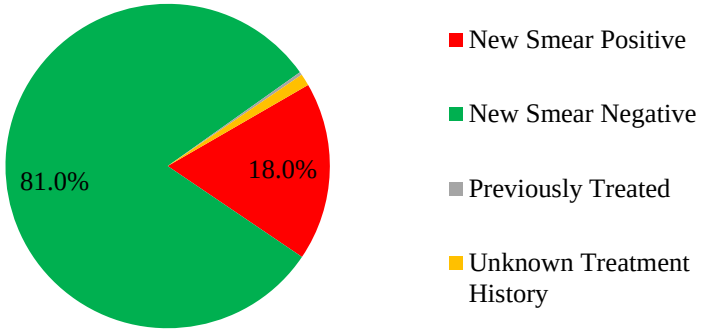


Figure 7: Classification of Pulmonary TB samples

2.1.2. Drug Sensitivity Test

Drug sensitivity test report was available for 76samples using Line Probe Assay and 10 samples had reports for Liquid DST for first line drugs. A total of 13multi-drug resistant tuberculosis (MDR-TB) cases were detected among patients with complete drug susceptibility report. Ten of the MDR-TB cases were from new smear positive pulmonary samples, one MDR-TB case was detected from NSN samples, one from VISA screening sample and one MDR-TB case was detected from EPTB sample. MDR-TB cases were highest in the age group of 20-29years (8/13) (**Figure 8**). Eight MDR-TB cases with second line LPA reports were sensitive to both Fluoroquinolones and aminoglycoside. No resistance in second line drugs was detected.

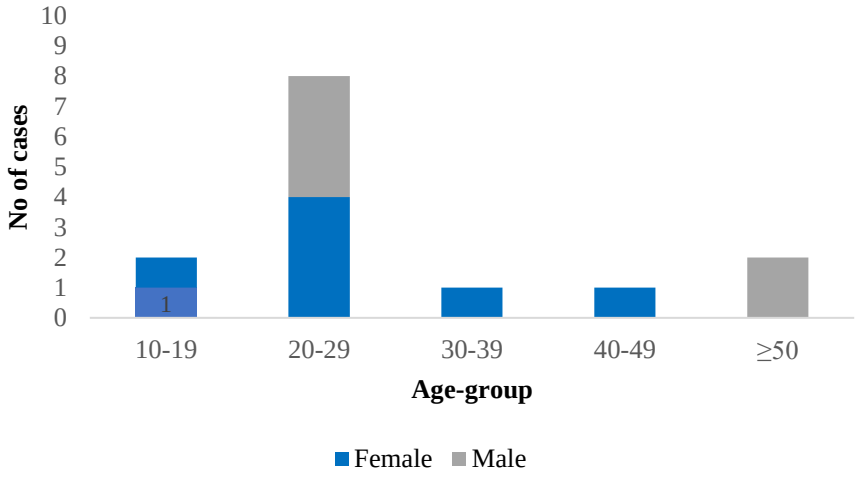


Figure 8: Distribution of MDR-TB cases by age group and gender

2.2 COVID-19 Integrated Influenza surveillance:

2.2.1. COVID-19 Integrated Influenza Surveillance

A total of 384 (6.3 %) new cases of COVID-19 were detected during fourth quarter of 2022 through enhanced surveillance of COVID-19 Integrated Influenza Surveillance. A total of 6,131 samples were tested for COVID-19 of which 4,604was tested by Rapid Antigen test, and 1,527 by RT-PCR assay. The highest casewas detected inepi-week 40 (n=103), followed by week 41(n=76) and decreased gradually over the week (**Figure 9**). Cases were detected from community, close contact and in-coming travelers (imported cases).Thimphu (153) reported the highest cases followed by Paro (58) and Chukha (50), there was no cases reported from Gasa, Wangduephodrang, Sarpang, Mongar, Pemagathsel, Trashigang&Trashiyangtse.

The mean age was 36.9 years and median age was 38 years (Range: 1 – 89 years). The most affected age group for COVID-19 was 25 – 49 years (50.6 %), followed by 50 – 59years (11.4 %) and >60 years (11.7 %). Most males (51.9 %) were affected more than the females (48.1 %) **(Figure 10**).

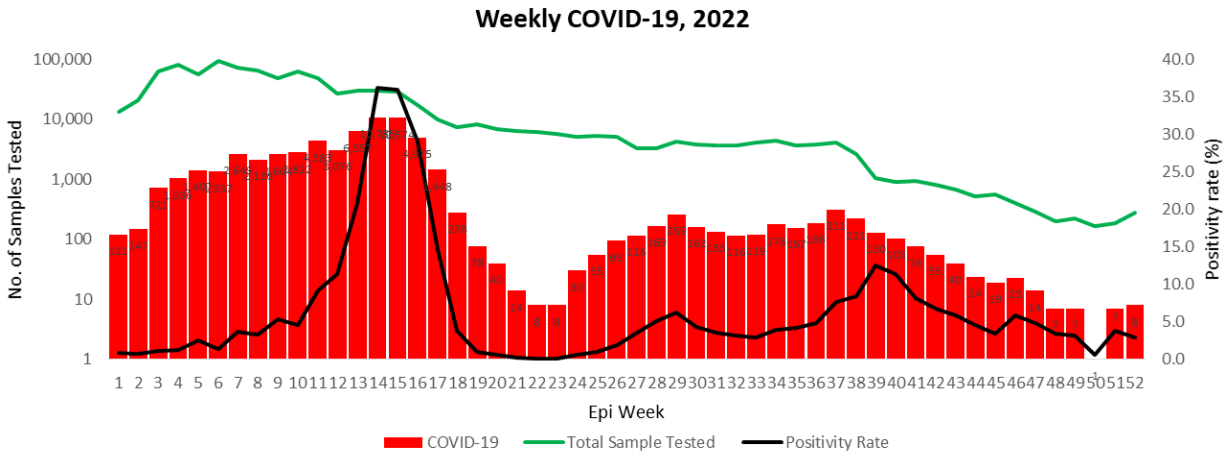


Figure 9: Weekly COVID-19 and positivity rate since week 1 – 52, 2022 (Source: HFS & RCDC)

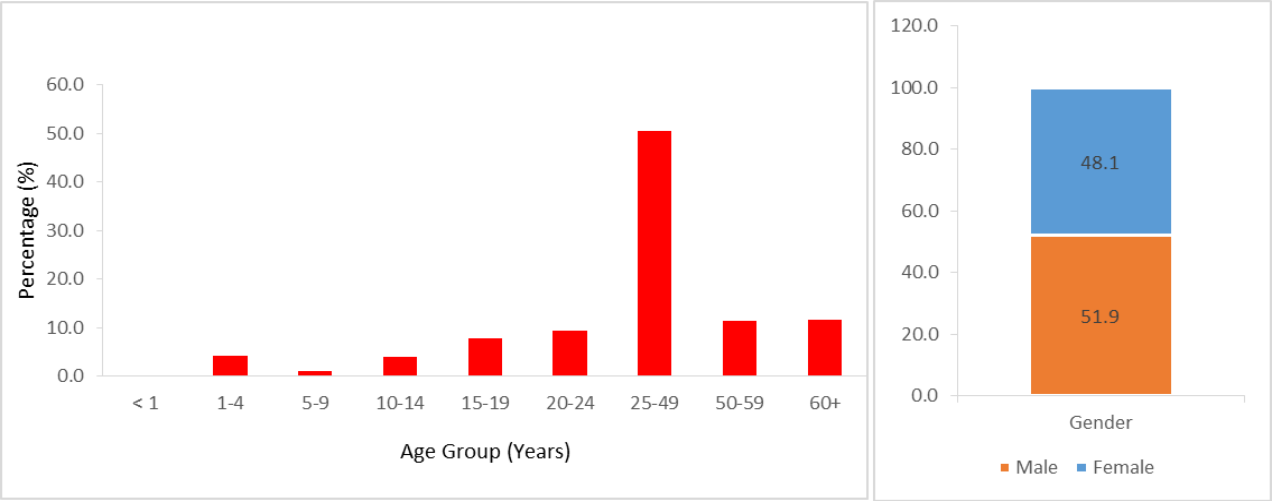


Figure 10: COVID-19 by age and Gender distribution

2.2.2 Influenza

A total of 1125 flu specimens including ARI outbreak samples (ILI- 731, SARI- 230, Outbreak-164) were received and tested for Influenza and SARS-CoV-2 through multiplex RT-PCR (Flu SC2) and detected Influenza positives 24.0% (270/1125), SARS-CoV-2 5.2% (58/1125) and co-infection 0.6% (7/1125). Influenza activity has increased in 4th quarter compared to the previous quarters (**Figure 11**).

Influenza like Illness outbreaks were reported from several districts and received Flu outbreak specimens from atleast seven different places. Influenza subtype FLU A/H3 (69.3%) was most predominating strain than FLU A/H1pdm09 (4.2%) and FLU B/Victoria (2.4%). SARS-CoV-2 (17.3%) wasfound second most predominating strain (**Figure 12& Figure 13**). Influenza (58%) and SARS-CoV-2 (86%) positivity rate was detected more from OPD cases (ILI) than hospitalized patients (SARI) (**Figure 14**).

The median age was 15 years and mean age was 20.4 years (Range: 1 – 78 years). The most affected age group for Influenza was 25 – 49 years (24.4 %), followed by 15 – 19 years (20.5 %). Males (52.0 %) were affected more than females (48.0 %) (**Figure 16**). Samtse Hospital (143) and Trongsa Hospital (114) have sent more samples compared to the rest of the sentinel hospitals (**Table 2**).

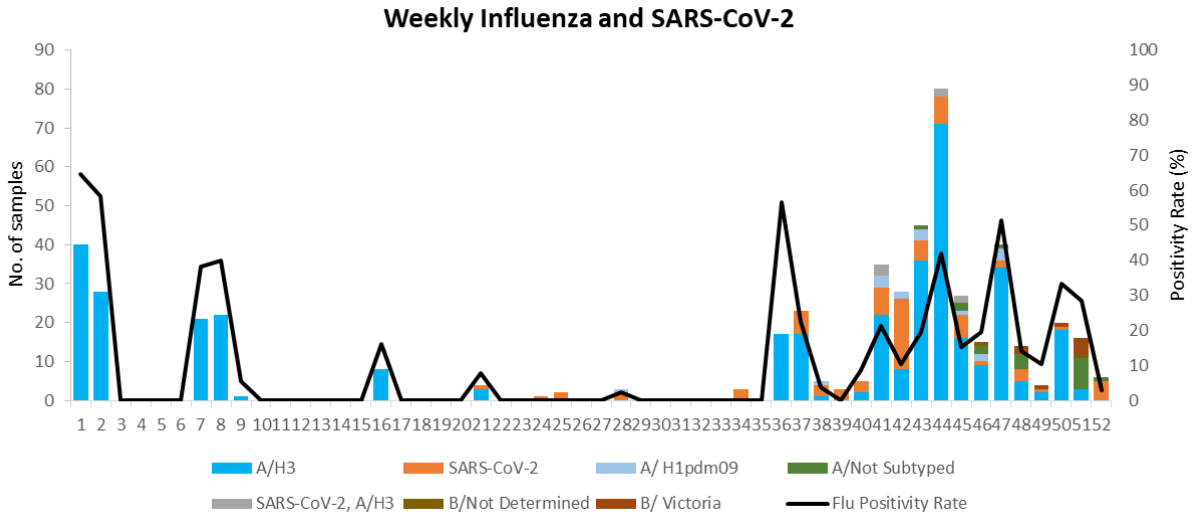


Figure 11: Weekly Influenza subtypes and SARS-CoV-2 (Source: RCDC)

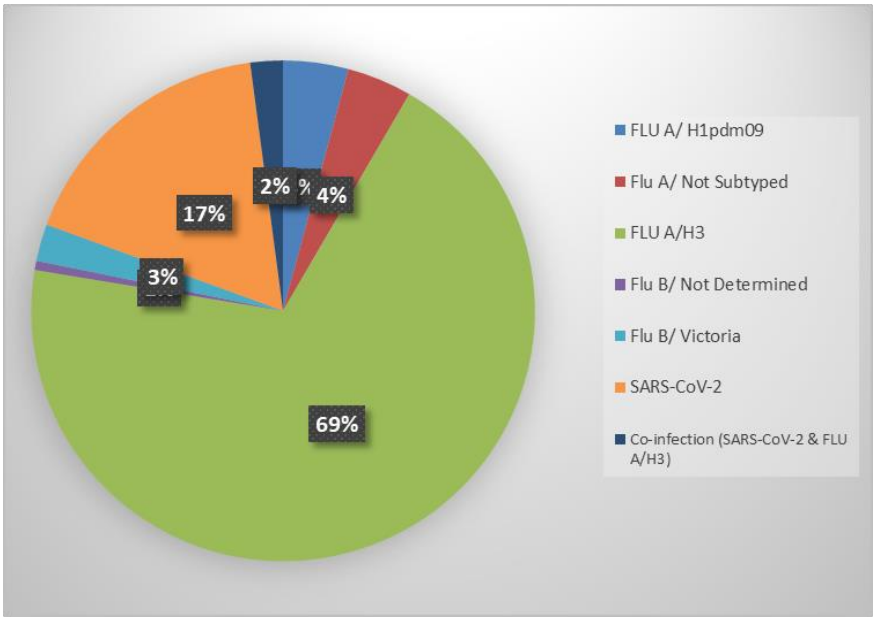


Figure 12:Positivity rate of Influenza subtypes and SARS-CoV-2

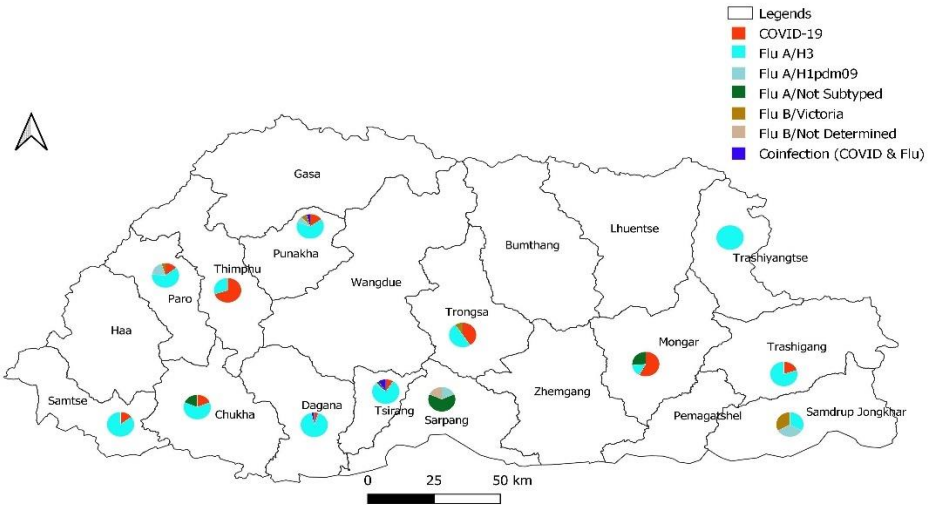


Figure 13: Influenza and SARS-CoV-2 detection by Sentinel Hospitals

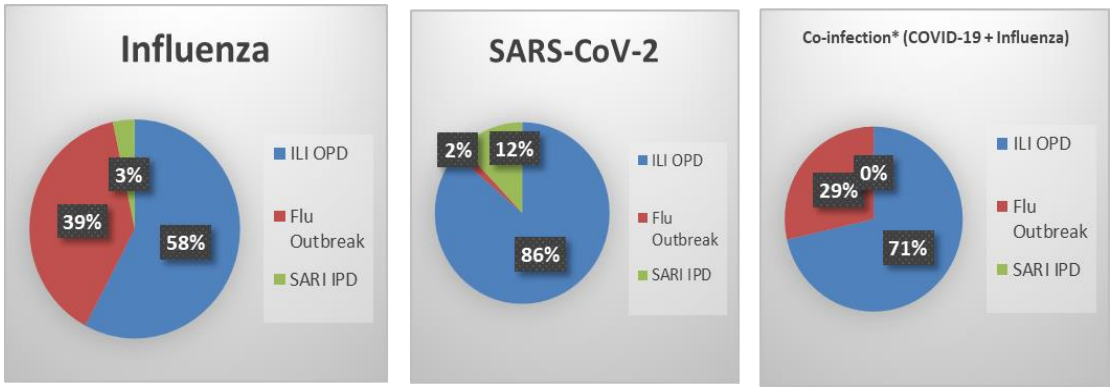


Figure 14: Prevalence of Influenza and SARS-CoV-2 positivity among OPD, IPD patients and Flu Outbreak

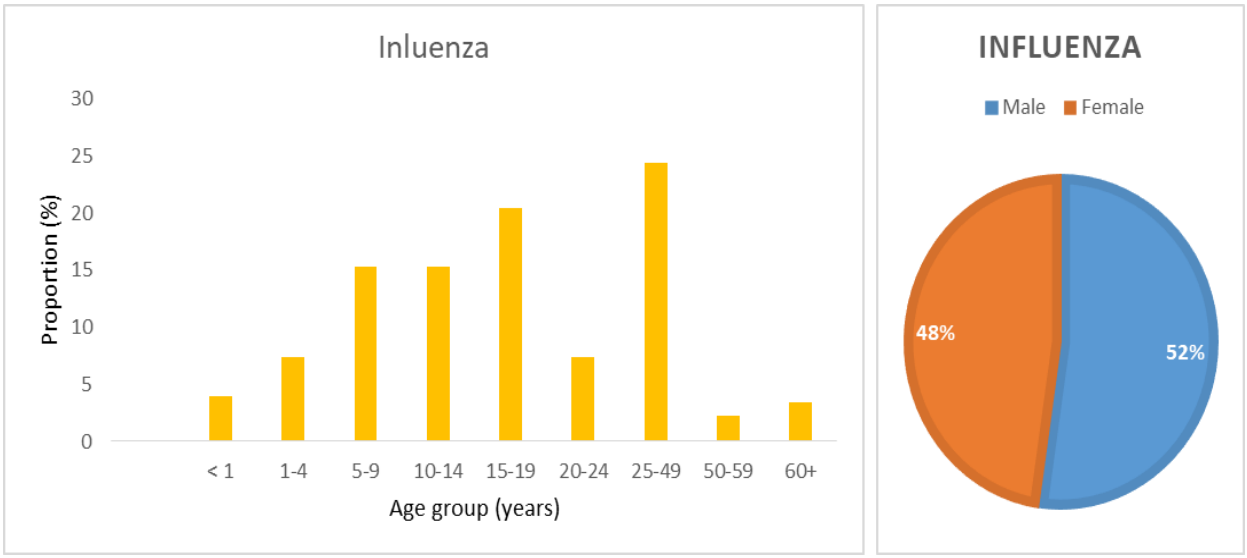


Figure 15: Influenza by age group and gender for fourth quarter, 2022

Table 2: Summary table for Influenza subtypes and sample tested for fourth quarter, 2022

	ILI							ILI Total	Outbreak			Outbreak Total	SARI					SARI Total	Grand Total
Sentinel sites/ Hospitals	FLU A/ H1pdm09	Flu A/ Not Subtyped	FLU A/H3	Flu B/ ND*	Flu B/ Victoria	SARS-CoV-2	SARS-CoV-2, FLU A/H3		FLU A/H3	SARS-CoV-2	SARS-CoV-2, FLU A/H3		FLU A/ H1pdm09	Flu A/ Not Subtyped	FLU A/H3	Flu B/ ND*	SARS-CoV-2		
Drukgyel HSS									19			23							23
Gelephu	1	3		1				19					1	2		1		46	65
JDWNRH															1		4	48	48
Khaling Hospital									4			6							6
Khamdang									11			11							11
Lhamoizingkha						3		19	57		2	92							111
Lungtenphu			2			3		24											24
Mongar		5	3			11		52										6	58
Paro	4		11		1	3		37					1		2			48	85
Phuentsholing		3	9			2		69										19	88
Phuntsholing			1					25									1	25	50
Punakha	4		20		3	6	2	77	10			14	1					5	96
Samdrup Jongkhar	1		1					59										9	68
Samtse			32		1	5		130									1	13	143
Trashi Yangtse									3			4							4
Trashigang			4			2		23											23
Trongsa			16		3	12		111									1	3	114
Tsirang	1	1	25			3	3	86										8	94
Ugyen Academy									1	1		14							14
Grand Total	**11**	**12**	**124**	**1**	**8**	**50**	**5**	**731**	**105**	**1**	**2**	**164**	**3**	**2**	**3**	**1**	**7**	**230**	**1125**

2.2.3. ILI and 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.A total of 1,958ILI cases were reported during 4thquarter. There was surge in ILI cases during the quarter from week 40 – 52, 2022 (**Figure 16**).

A total 293 SARI cases were reported from eleven sentinel hospitals. Phuentsholing Hospital (92) reported highest SARI cases followed by Gelephu Hospital (70) (**Figure 17**). Mostly the ILI cases were reported from 5 – 14 years (25%) age group, while SARI cases were from 0 – 1 years (32%) age group (**Figure 18**).

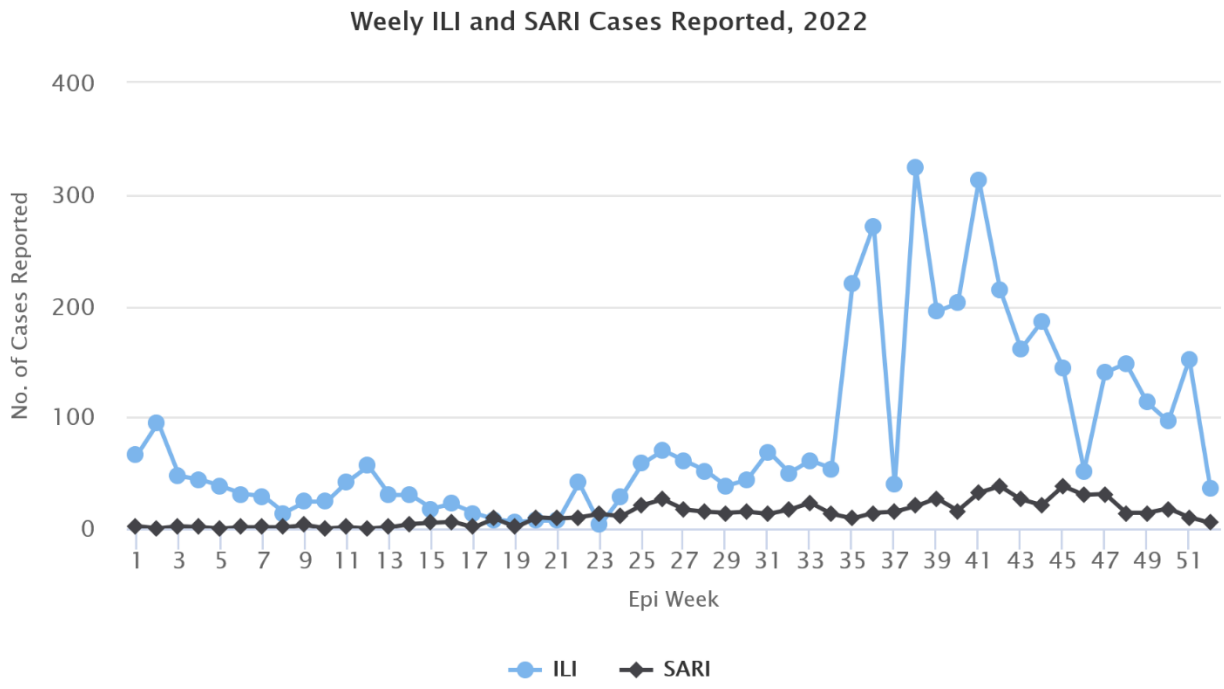


Figure 16: Weekly ILI and SARI cases reported from Sentinel sites

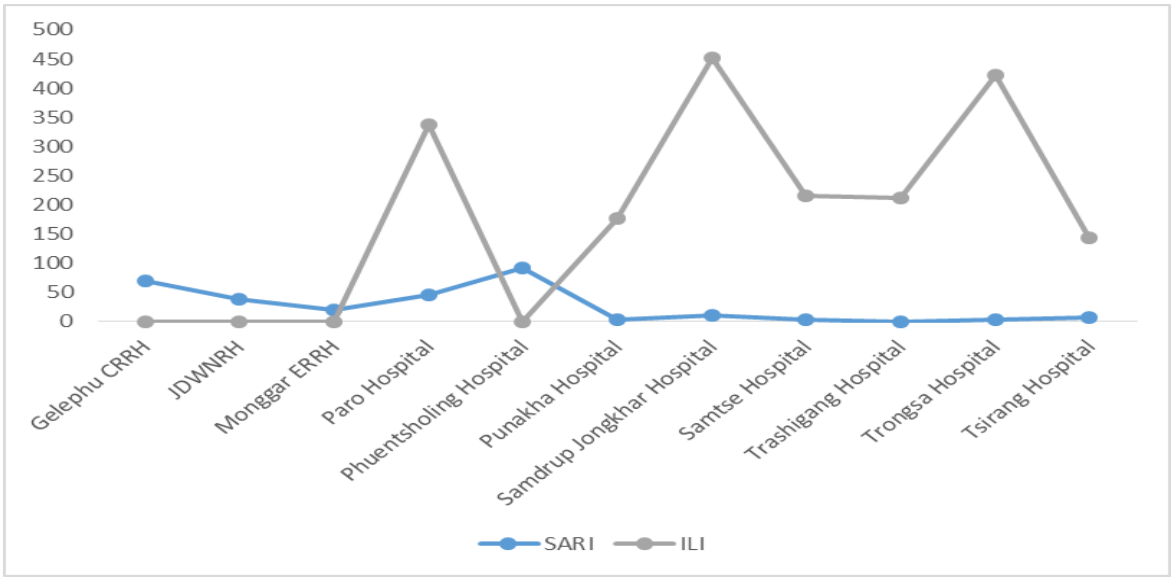


Figure 17: ILI and SARI cases reported by Sentinel Hospitals in fourth quarter of 2022

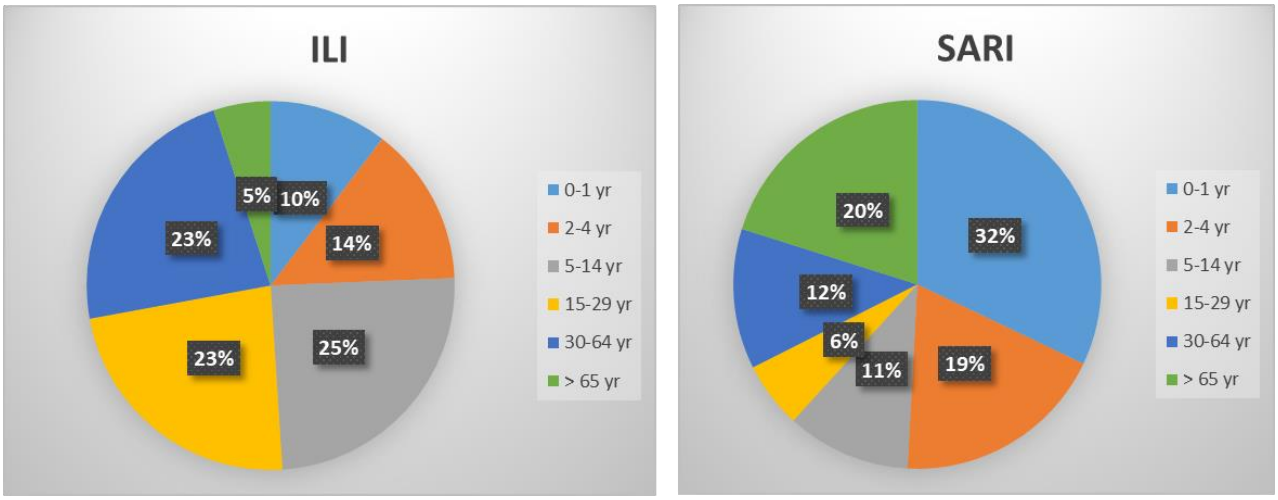


Figure 18: ILI and SARI cases by age group

2.3.1. Laboratory-based surveillance for vaccine-preventable diseases

During the last quarter of 2022, 61 samples were received for MR testing and eight for AES. IgM ELISA performed on these samples resulted in 2 *measles* positive. Both of these samples were from Trongsa (**Figure 19**) Detection by PCR and further genotyping of these samples showed negative result. No samples were detected positive for Rubella. IgM ELISA for *Japanese encephalitis* (JE) virus performed on samples received for AES. Out of eight samples received, one sample was positive from JDWNRH (**Table 3**).

Table 3: Number of samples received from health centers for MR and JE surveillances

Surveillance	Site/ Hospital	Number of samples received
MR	Trongsa Hospital	39
	Paro Hospital	05
	Punakha Hospital	01
	Samtse Hospital	02
	Bumthang	01
	JDWNRH	08
	lhamozingkha	01
	Dagana	02
	Samdrupjongkhar	02
	Wangduephodrang	01
AES (JE)	JDWNRH	08

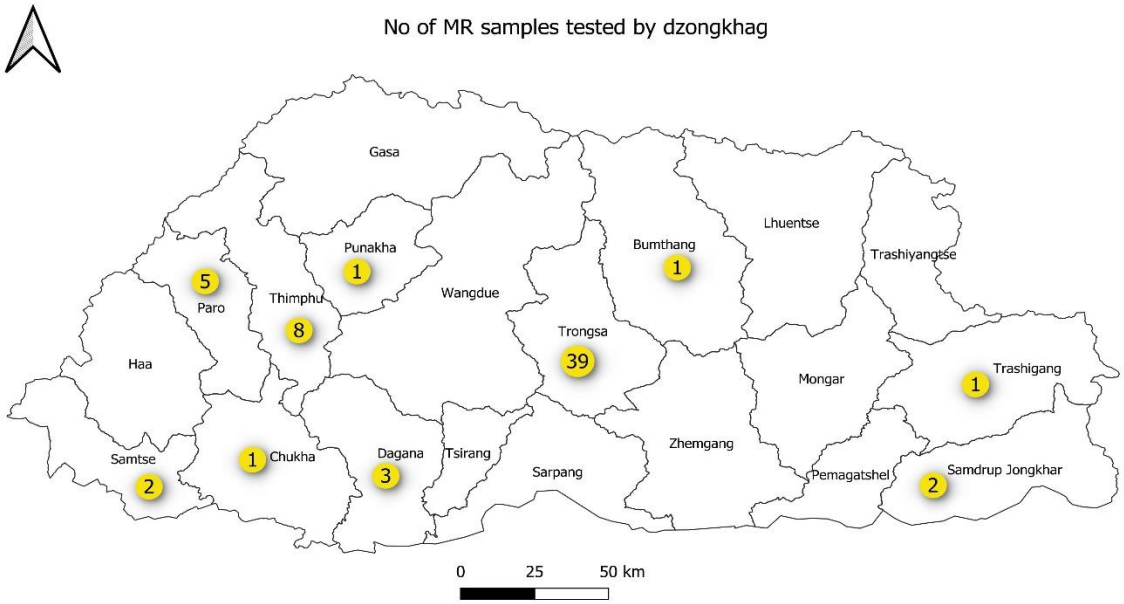


Figure 19: MR samples received and tested by dzongkhag

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

There were 32 samples received for Dengue conformation and one AUFI samples.Of 32 samples for Dengue surveillance six samples were positive to either Dengue NS1 or IgM

2.4.Sentinel Surveillance for Diarrheal Etiologic Agents:

This quarter, 108 samples were received from seven sentinel sites (**Figure 20**). Most of the samples received were from the CRRH. Of these, 59 (55.0%) were male and 49 (45.0%) were females.

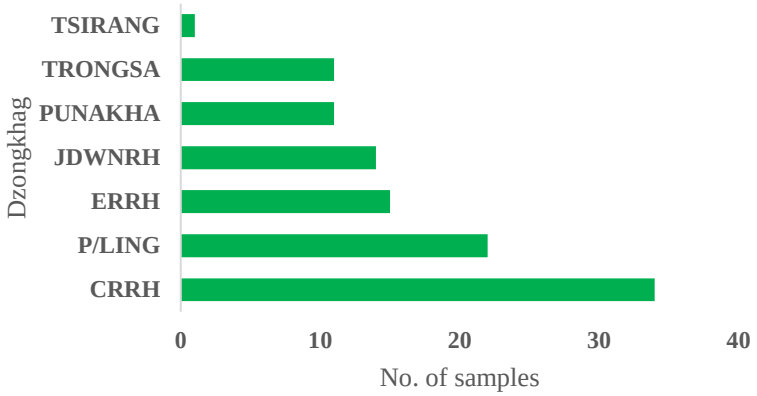


Figure 20: Number of fecal specimens collected from sentinel sites

The sample's character consists of loose (68.0%), and watery (32.0%). The mean age of the patients enrolled was 14 years. The mean duration of illness was 40 hours. Of the 108 cases, 30.0% required hospital admission while the rest were treated on OPD basis. Of all, three diarrhea cases were found linked to having consumed a suspected food.The most detected enteropathogens were *Shigella*spp (n=3), rotavirus (n=8), and DEC (n=10) (**Figure 21**). The antimicrobial-resistant pattern for the isolated bacterial pathogens is provided in (**Table 5**).

Figure 21: Proportion of enteric pathogens isolated

Table 4: Anti-bio gram (Resistant pattern) for bacterial pathogens:

Pathogen	AMP	CZO	CRO	LEX	CHL	CIP	GEN	NAL	TCY	SXT
Shigella sonnei **(n=2)**	2	2	2	2	0	2	0	2	2	2
Shigella flexneri **(n=1)**	1	1	1	1	0	1	0	1	1	0
EAEC **(n=7)**	4	7	1	2	3	1	0	5	1	4
EPEC **(n=1)**	1	1	0	1	0	1	0	1	0	0
ETEC **(n=1)**	1	0	1	0	0	1	0	1	1	1
EHEC **(n=1)**	1	1	0	1	0	0	0	0	0	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:

In the 4th Quarter, the Food and Nutrition Laboratory (FNL) received 60 ready to eat food samples from five pilot food safety surveillance sites (**Figure 22**).Chukha Dzongkhag consistently collected five samples per month for the surveillance. Five samples were received from Paro Dzongkhag during the 4th Quarter 2022.

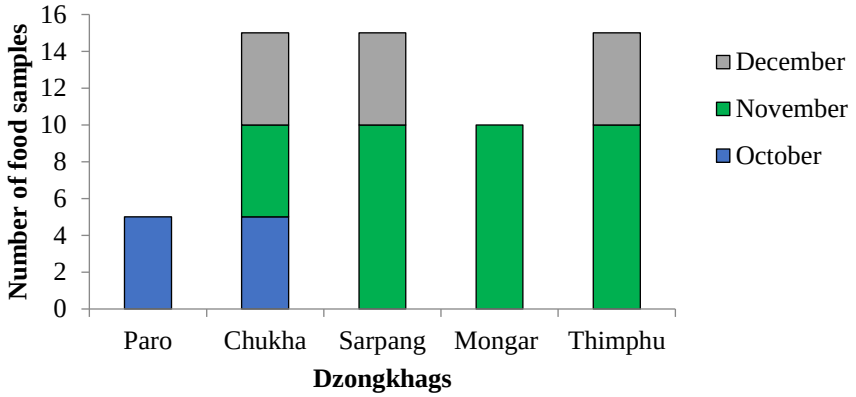


Figure 22: Number of Food safety surveillance samples received (Q4 2022)

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 indicators. These indicators test for the foods accessing food safety and surrogacy for hygiene practice.

During the current period 16.66 % (n=) of food samples had been contaminated with pathogenic organism and 8.33% (n=) with indicator organism. The common pathogens isolated were*Staphylococcus aureus* (5.0%) and *Bacillus cereus* (11.66%) respectively. The common indicator organism was total aerobic count and total *Enterobacteriaceae* of 6.66% each (TPC: >log 10^5CFU/g and Total *Enterobacteriaceae*> log 10^2 CFU/g).

The common ready to food items contaminated with indicators included alcohol, momo and vegetable curry. Similarly, the common foods with pathogenic organisms included, such as chowmein, chilli chop and channa. Both *S. aureus* and *B. cereus* were isolated from the jumma sample.

During the sample period (Oct-Dec 2022) no events of foodborne disease were reported through NEWARS.

2. 6. Drinking Water Quality Surveillance

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

In the fourth quarter of 2022 (October-December) 419 out of 825 drinking water samples was tested by 34 urban health centers. 76.8% of the sample which was tested was found to be safe for consumption while 22.4% was found unsafe for consumption (**Figure 23**).

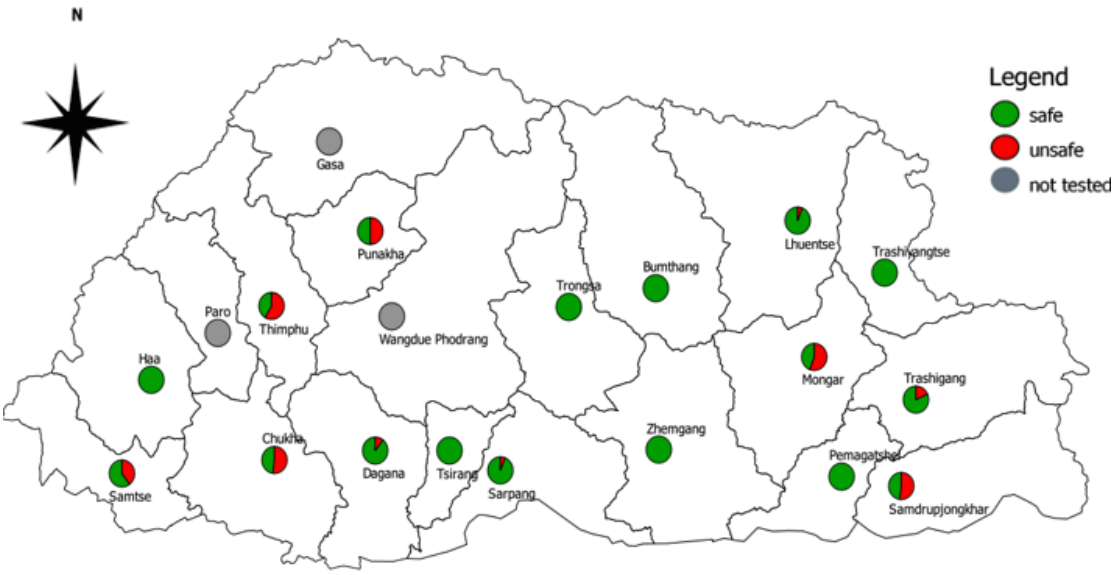


Figure 23: Bacteriology test report of 34 Hospitals/BHU-1 in urban area

2.6.2. Chlorination Report

Out of six health centers monitoring residual chlorine, only Bumthang, Thimphu, Samtse and Gelephu has reported for this quarter. 55 out of 69 sampling station has tested for the free residual chlorine. Out of this, 10.91% of the sample has been adequately chlorinated and 89.09% of the sample tested was found to be inadequately chlorinated. (**Figure 24**)

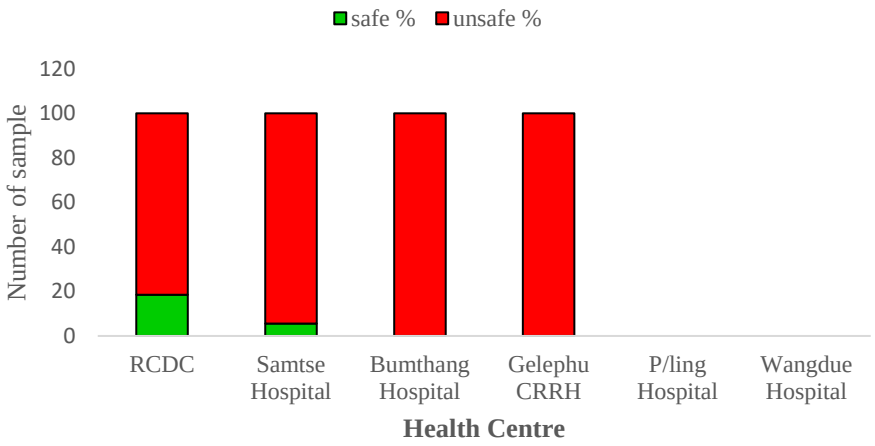


Figure 24: Residual Chlorine test report for six health centers in urban area

2.6.3. Rural Drinking Water Quality Monitoring

A total of 1912 out of 3908 samples were tested for E.coli from the rural health centers for the year 2022. 51.1% (1996) of the total samples were not tested this year. 72.44% of the tested samples were found to be safe while 27.56% were found to be unsafe for consumption. From the unsafe samples, 477 samples are found to be at lower health risk, 40 were found to be an intermediate health risk, and 10 were found to be grossly polluted respectively.

Comparing the result from the two seasons, more samples are found unsafe during the wet season compared to the dry season**(Figure 25**)

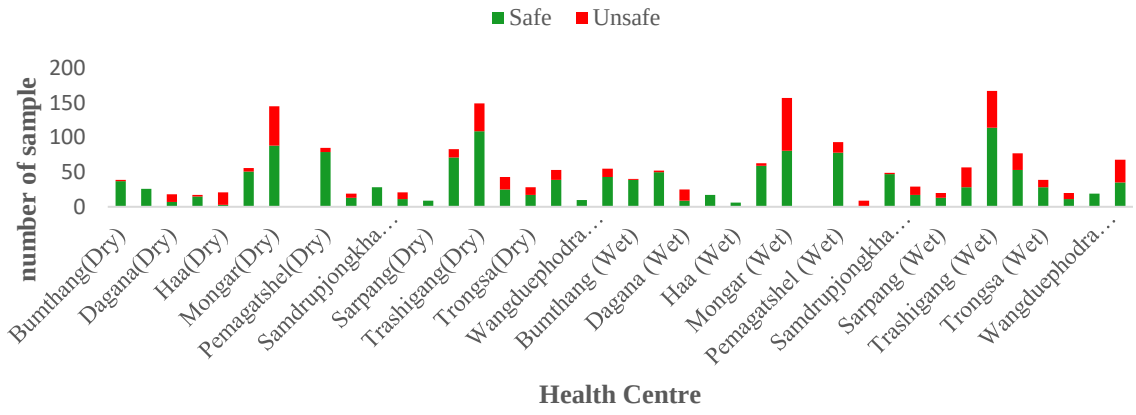


Figure25: Bacteriology test report of Hospitals/BHU-1 in urban area

2.7.Drug Quality Monitoring:

A total of 65 samples were tested at National Drug Testing Laboratory in the 4thquarter 2022. Thesamples were tested as per their pharmacopeial claim. From the 65 samples tested, two sampleswere found to be non-compliant (**Table 6& Figure 26**). Accordingly, the test reports were communicated to DRA fortheir necessary regulatory action.

Table 6: No. of drugs samples tested

Collected By Drug Regulatory Authority	Complies	Does not comply	Total
Bumthang	3	2	5
Medical Supply & Procurement Division	50	0	50
Phuntsholing Hospital	3	0	3
Mongar ERRH	1	0	1
Tashigang Hospital	6	0	6
Total	63	2	65

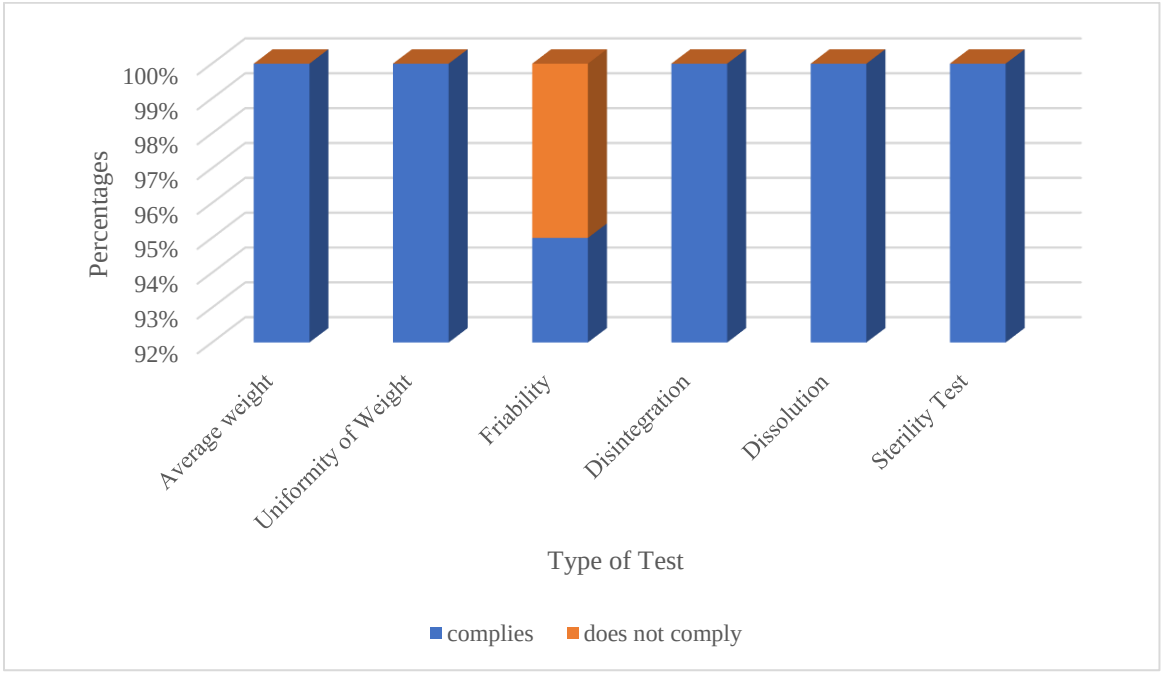


Figure 26: List of test parameters analyzed

2.8.National External Quality Assessment Scheme for Malaria Microscopy:

2.8.1. Reporting status of health centers

In the 3rd quarter, a total of 199 health centers has participated in malaria blinded rechecking. The overall reporting rate with 16.4 % were reported on time, 26.8% were reported late and rest were not reported (**Figure 27**)

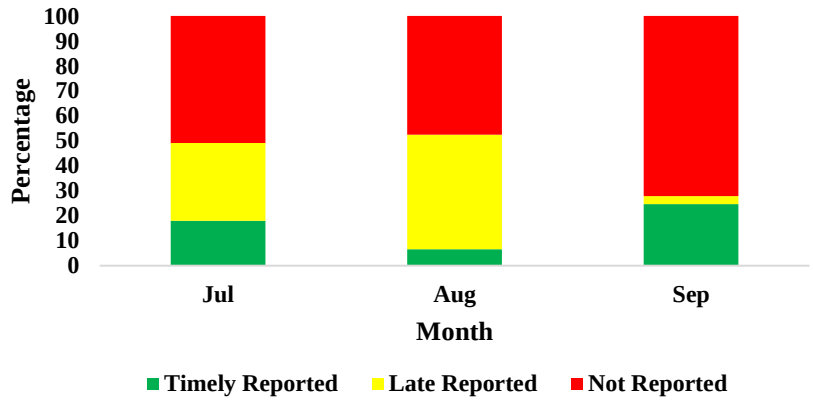


Figure 27: Monthly reporting status for 4th quarter 2022

2.8.2 Blinded rechecking of malaria slides:

Total of 880 malaria slides were received at National Malaria ReferenceLaboratory for blinded rechecking. From the total slides examined, 2 malaria-positive slides aredetected (0.3%). All the slide received were evaluated on the following parameters and theirperformance score on sensitivity was 100.0%, specificity was 100.0%, malaria detection was100.0%, species identification was 100.0%, stages identification was 100.0% and parasite density determination was 100.0% **(Table 7 and 8)**

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

Third Quarterly report on Malaria Blinded Rechecking 2022				
Month	**July**	**August**	**September**	**Total**
Health center participated in blinded rechecking	31	32	26	89
Total slides received for blinded rechecking	351	336	193	880
Total positive detected	1		1	2
Total Nmps detected	350	336	192	878
			Total slide Examined	880

Table 8: Report on performance score for Blinded rechecking

Performance score on blinded rechecking				Quarterly Score
Month	**July**	**August**	**September**	
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	100		100	100
Parasite density	100		100	100

2.9. National Toxicology Center

2.9.1 Survey of selected food items for the presence of Aflatoxins and Determination of Mercury in Dry Fish

A total of 305 food items consisting of 14 different categories of food samples were collected from all 20 dzongkhags and analyzed for the presences of aflatoxins B1, B2, G1 and G2. All samples were collected from over the self from shops based on daily Bhutanese diet (**Figure 28 and 29**). Representative samples were obtained, grinded to <0.84 mm and subsample portion were extracted using methanol extraction. Samples were further analyzed using direct competitive enzyme-linked immunosorbent assay (ELISA) AgraQuant Assay kits.

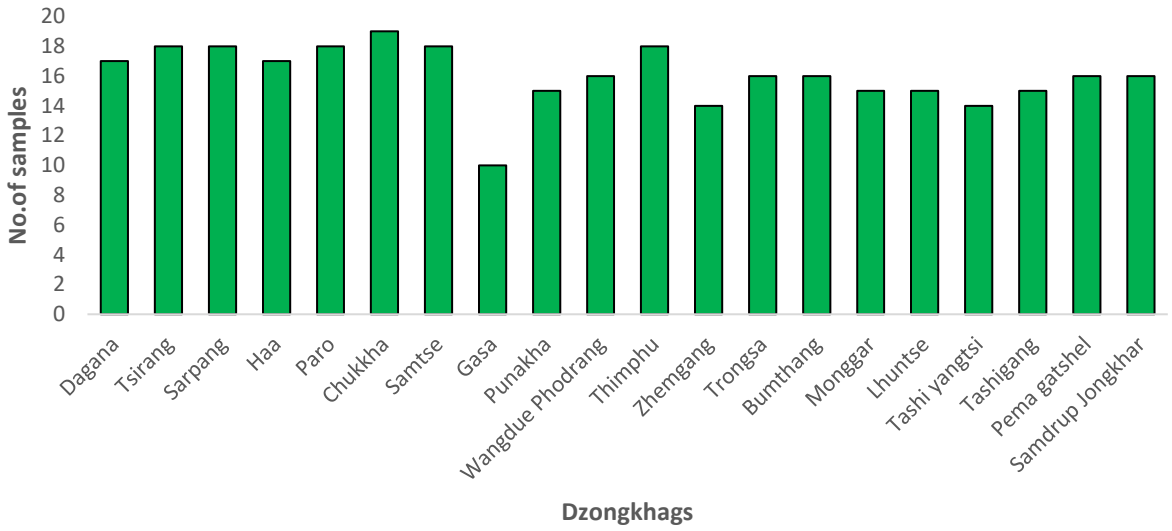


Figure 28. Number of samples collected by dzongkhag

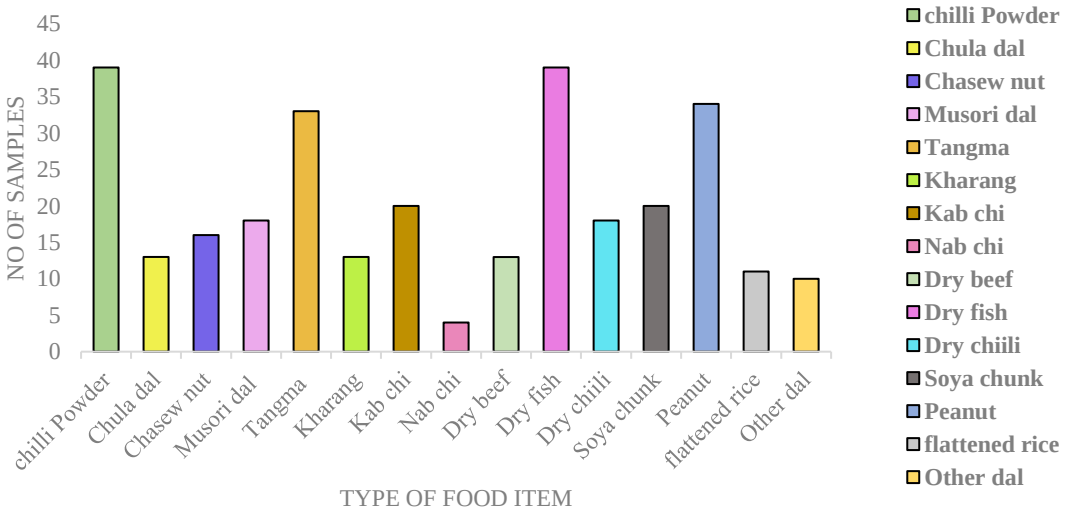


Figure 29: Types of Samples collected and analyzed

Out of 305 food samples, more than half (158 samples) were detected with the presences of total aflatoxins with a mean range of 11.49 $\pm$ 12.8 μg/kg. The maximum and minimum range of total aflatoxins detected were 75.84 and 3.02 µg/kg. The highest amount of aflatoxins were found in chili powder samples with a mean concentration of 19.65 µg/kg.

Furthermore, a total of 38 dried fish samples were collected from 20 dzongkhags. The samples were prepared and their mercury levels were analyzed using mercury analyzer MA-3000 based on cold vapor atomic absorption spectroscopy following US EPA method 7473 (SW-846). The highest concentration of mercury detected was 228 μg/kg.