

**Report on Quality Assessment of smear
microscopy for acid fast bacilli in National
External Quality Assessment Service
conducted by National Tuberculosis
Reference Laboratory, Royal Center for
Disease Control**

2017-2018

Background

Direct sputum smear microscopy still remains the most cost effective tool for diagnosing patients with infectious tuberculosis and monitoring the progress of treatment. The World Health Organization global strategy to fight against tuberculosis relies on a network of laboratories that provide quality sputum microscopy service. Since both diagnosis and treatment monitoring depends on sputum microscopy, providing reliable smear result is pivotal. The reliable results can only be assured through implementation of quality assurance program; National External Quality Assessment Service (NEQAS) which aims to assess the quality standard and implement improvement measures. NEQAS on sputum microscopy was started in 2005 with 28 District Hospital Laboratories in the network. It is a program whereby the national reference laboratory (NTRL, RCDC) monitors quality and results of AFB sputum microscopy centers in the district hospitals. NEQAS methods comprise of:

1. Panel testing
2. Blinded Rechecking
3. On-site evaluation

NEQAS on sputum microscopy network currently covers thirty six district hospital laboratories providing sputum microscopy service in the country. Panel testing is conducted twice every year and Blinded rechecking is conducted every quarterly for an entire year.

Panel Testing Objectives:

Panel testing method can be used to determine whether a laboratory technician can adequately perform AFB smear microscopy. This method tests individual performance but not the overall laboratory performance. Utilization of panel testing for EQA is considered to be less effective than rechecking because, it does not monitor routine performance. Panel testing is useful to:

- Supplement rechecking programs
- Evaluate proficiency of laboratory technicians
- Provide some preliminary data on district laboratories capabilities prior to implementing a rechecking program
- Assess the current status of performance or to quickly detect problems associated with very poor performance
- Monitor performance of individuals when adequate resources are not available to implement a rechecking program

Panel testing Methods:

A panel of 10 slides was prepared and validated at NTRL according to WHO/IUATLD guidelines and sent to 36 microscopy centers and were requested to examine the panel of slides by any two or more laboratory staff, who are responsible for the regular sputum smears microscopy and send back report along with slide within one month.

Blinded Rechecking Objectives:

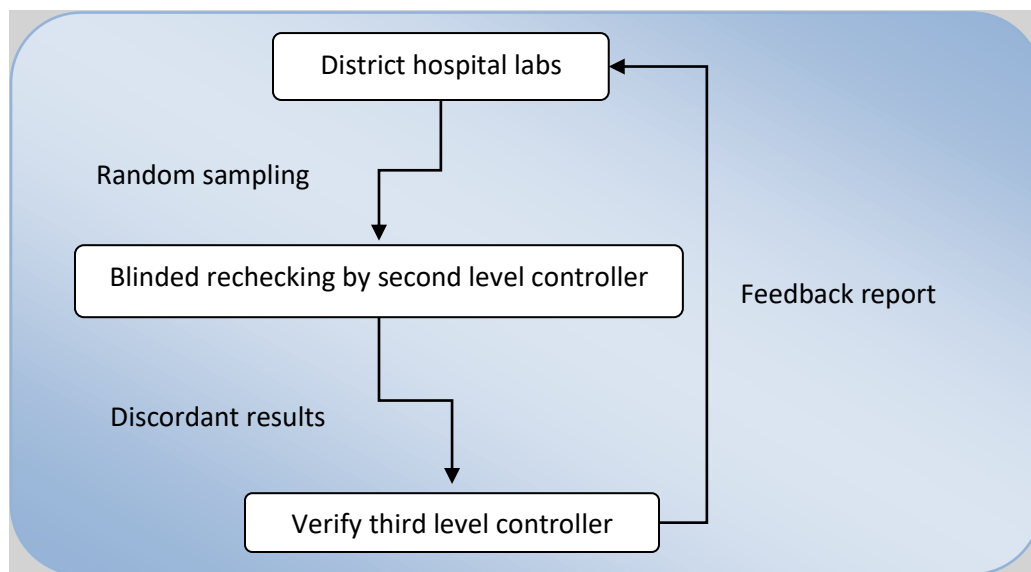
Blinded rechecking is the best method for evaluating performance and providing motivation to staff for improvement. It is a process of rereading a sample of slides from a laboratory to assess whether that laboratory has an acceptable level of performance. Blinded rechecking is useful to:

- Analyze the errors made in reporting the result of smear microscopy results
- overall performance of the laboratory

Blinded Rechecking methods:

Microscopic centers stores all the AFB slides as per the laboratory serial number and send to NTRL on quarterly basis with the results and blinded rechecking forms. Once it reached RCDC, random sampling is done by a sampling method called Lot Quality Assessment Scheme (LQAS).

Figure 1: Organization of Rechecking Process



Panel Testing Report

The panel testing report are tabulated and analyzed by using the following WHO guidelines.

Report of Laboratory	Result of the controller (RCDC)				
	No AFB Seen	1-9 AFB/100F	1+	2+	3+
No AFB Seen	Correct	LFN	HFN	HFN	HFN
1-9 AFB/100 F	LFP	Correct	Correct	QE	QE
1+	HFP	Correct	Correct	Correct	QE
2+	HFP	QE	Correct	Correct	Correct
3+	HFP	QE	QE	Correct	Correct

Types of Errors

Correct	No error	
QE	Quantitative Error	Minor Error
LFN	Low False No AFB Seen	Minor Error
LFP	Low False Positive	Minor Error
HFP	High False Positive	Major Error
HFN	High False No AFB Seen	Major Error

Criteria for acceptable performance

Panel of 10 slides, each slide of known worth 10 points, total possible score= 100

- a. Scores of Major Errors= 0
- b. Scores of Minor Errors= 5
- c. Passing Score= 90

33rd round of proficiency testing report

33rd round of proficiency testing for TB microscopy was carried out for 36 microscopy center during the 3rd & 4th quarter of 2017. One laboratory didn't sent back the feedback report. The overall findings of the panel testing carried out for 2017 is given below in table 1 and 2, Figure 2 and 3.

Table 1. Panel Testing Result of District Lab. For 33rd Round Proficiency Testing, 2017

SI No	Lab ID No.	Name of Hospital	Total Slide	HFN	HFP	LFN	LFP	QE	Total errors	OAR %	Total Score	Remarks
1	LAB-01	Wangdue Hospital	10	0	0	2	0	0	2	80	90	
2	LAB-06	Bali BHU-1	10	0	0	0	0	0	0	100	100	Screened by two technicians
3	LAB-02	Bumthang Hospital	10	0	0	0	0	2	2	80	90	
4	LAB-30	Chukha BHU-I	10	0	0	0	0	0	0	100	100	Screened by two technicians
5	LAB-28	Dagana BHU-1	10	0	0	0	0	0	0	100	100	
6	LAB-29	Dagapela Hospital	10	0	0	0	0	0	0	100	100	
7	LAB-25	Damphu Hospital	10	0	0	0	0	1	1	90	95	Screened by two technicians
8	LAB-03	Dewathang Military Hospital	10	0	0	0	0	1	1	90	95	Screened by three technicians(2 different result)
			10	0	0	0	0	2	2	80	90	
9	LAB-31	Gasa BHU-I*	0						0	#DIV/0!	#DIV/0!	
10	LAB-04	Gedu Hospital	10	0	0	0	0	0	0	100	100	
11	LAB-05	Gelephu RRH	10	0	0	0	0	1	1	90	95	Screened by three technicians (2 different result)
			10	0	0	0	0	0	0	100	100	
12	LAB-27	Gidakom Hospital	10	0	0	1	0	0	1	90	95	Screened by three technicians
13	LAB-12	Gomtu Hospital	10	0	0	0	0	2	2	80	90	
14	LAB-33	Kanglung BHU-I	10	0	0	0	0	1	1	90	95	
15	LAB-34	Lhamoyzingkha BHU-I	10	0	0	0	0	4	4	60	80	
16	LAB-08	Lhuentse Hospital	10	0	0	0	0	0	0	100	100	
17	LAB-07	Lungtenphu Military Hospital	10	0	0	1	0	1	2	80	90	
18	LAB-09	Mongar RRH	10	0	0	0	0	2	2	80	90	Screened by two technicians
19	LAB-10	Paro Hospital	10	0	0	0	0	2	2	80	90	Screened by eight technicians (eight different result)
			10	0	1	0	0	2	3	70	80	
			10	0	0	0	1	0	1	90	95	
			10	0	0	0	0	3	3	70	85	
			10	0	0	1	0	0	1	90	95	
			10	0	0	0	0	2	2	80	90	
			10	0	0	0	0	0	0	100	100	
			10	0	0	0	0	2	2	80	90	
20	LAB-11	Pema Gatshel Hospital	9	0	0	0	0	1	1	88.88 889	94	1 slide broken
21	LAB-36	JDWNR Hospital	10	0	0	0	0	0	0	100	100	
22	LAB-32	Pangbang BHU I	10	0	0	0	0	1	1	90	95	
23	LAB-13	Phuntsholing Hospital	10	0	0	0	0	3	3	70	85	
24	LAB-14	Punakha Hospital	10	0	1	1	0	0	2	80	85	Screened by two technicians (2 different result)
			10	0	1	0	0	0	1	90	90	
25	LAB-15	Nanglam BHU-1	10	0	0	0	0	2	2	80	90	Screened by two technicians
26	LAB-16	Riserboo Hospital	10	0	0	0	0	3	3	70	85	
27	LAB-17	Samdrupjongkhar Hospital	10	0	0	0	0	3	3	70	85	Screened by three technicians (2 different result)
			10	0	0	0	0	1	1	90	95	

28	LAB-18	Samtse Hospital	8	0	0	0	0	0	0	100	100	Screened by four technicians (2 different result), 2 slides broken
			8	0	0	0	0	2	2	75	88	
29	LAB-19	Sarpang Hospital	10	0	0	0	0	3	3	70	85	Screened by two technicians
30	LAB-20	Sipsoo Hospital	10	0	0	0	0	1	1	90	95	Screened by three technicians (2 different result)
			10	0	0	0	0	0	0	100	100	
31	LAB-22	Tashigang Hospital	10	0	0	0	0	2	2	80	90	
32	LAB-21	Tashiyangtse Hospital	10	0	0	0	0	0	0	100	100	
33	LAB-23	Trongsa Hospital	10	0	0	0	0	1	1	90	95	Screened by three technicians (2 different result)
			10	0	0	0	0	2	2	80	90	
34	LAB-24	Tsimalakha Hospital	10	0	0	0	0	1	1	90	95	
			10	0	0	0	0	2	2	80	90	
35	LAB-26	Yebilaptsa Hospital	10	0	0	0	0	1	1	90	95	
36	LAB-35	Zhemgang BHU-I	10	0	0	1	0	2	3	70	85	
Total Error			0	3	7	1	59	70				

* Feedback report not received

Table 2: Summary report of 33rd Round Proficiency Testing for TB Microscopy, 2017

Total number of slides sent	Major Error		Minor Error		Quantification Error (QE)
	High False Negative (HFN)	High False Positive (HFP)	Low False Negative (LFN)	Low False Positive (LFP)	
360	0	3	7	1	59

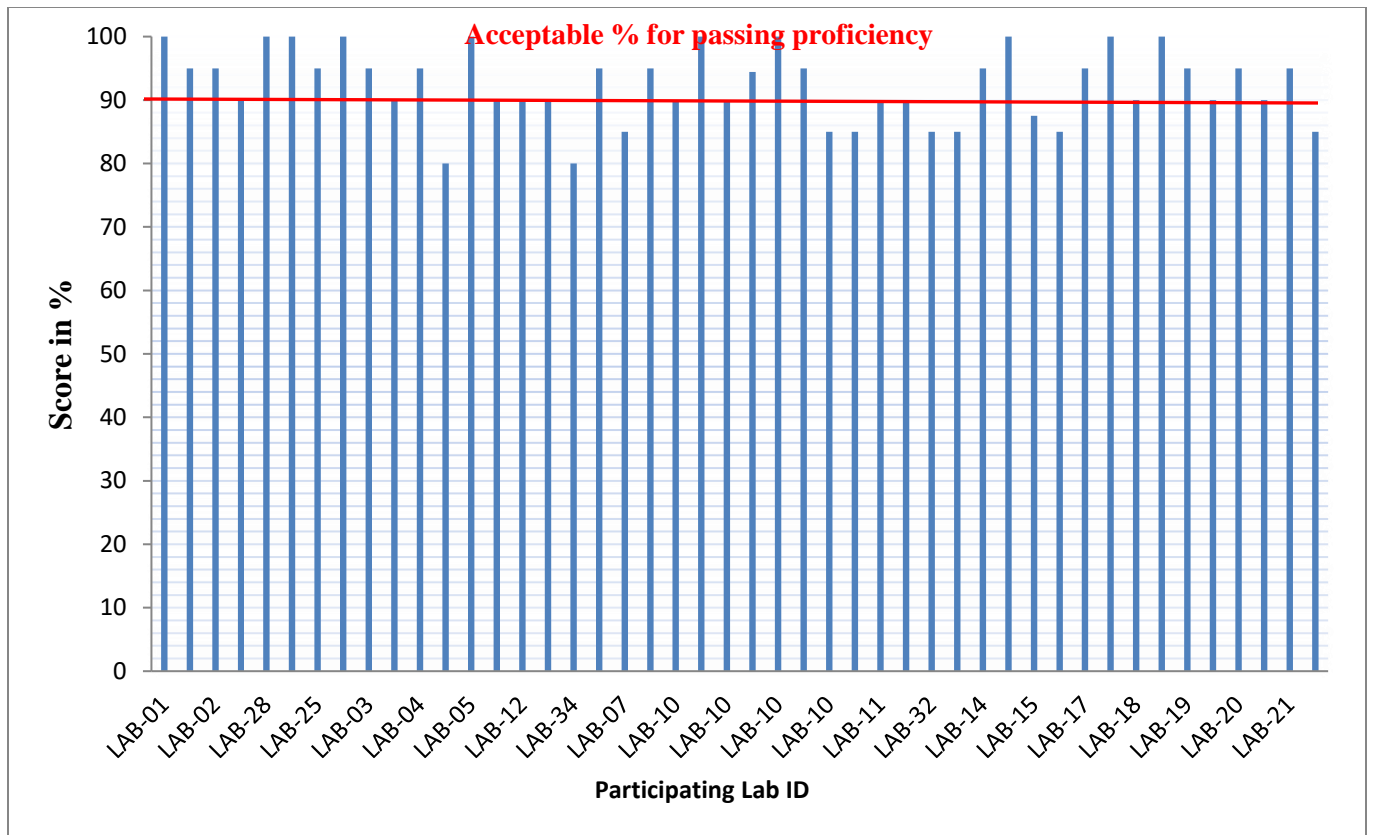


Figure 2: Result of 33rd round proficiency testing on TB microscopy for 36 laboratories, showing 10 laboratories below the acceptable % for passing proficiency

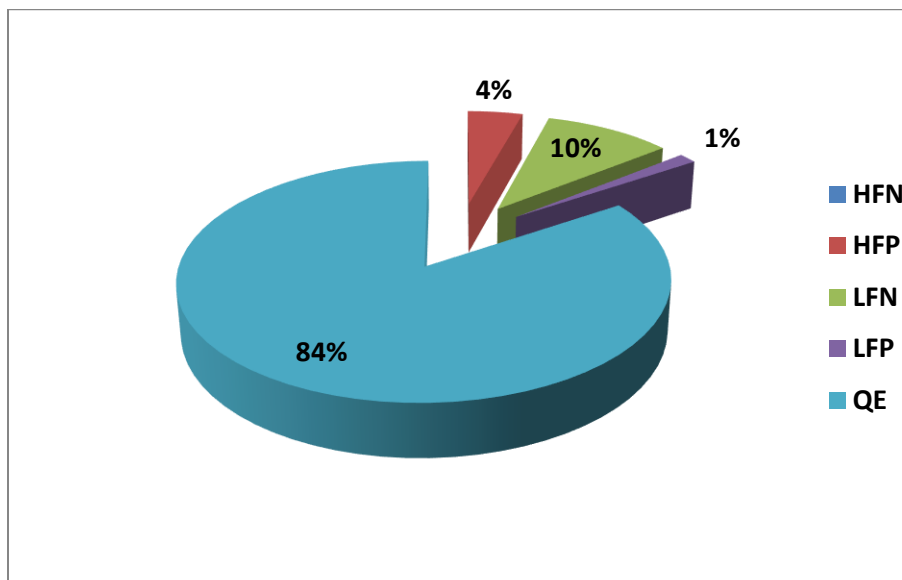


Figure 3: Percentage of Error for the 33rd round proficiency test

34th round of proficiency testing report

34th round of proficiency testing for TB microscopy was carried out for 35 microscopy center during the 1st quarter (Jan-March) of 2018. Two laboratory didn't sent back the feedback report. The overall findings of the panel testing carried out for 2018 is given below in table 3 and 4, Figure 4 and 5.

Table 3. Panel Testing Result of District Lab. For 34th Round Proficiency Testing, 2018

SI No	Lab ID No.	Name of Hospital	Total Slide	HFN	HFP	LFN	LFP	QE	Total errors	OAR%	Total Score	Remarks
1	LAB-01	Wangdue Hospital	10	0	0	0	0	0	0	100	100	Screened by 5 staffs
2	LAB-06	Bali BHU-1	10	0	0	0	0	1	1	90	95	Screened by 3 staffs
3	LAB-02	Bumthang Hospital	10	0	0	0	0	0	0	100	100	Screened by 3 staffs
4	LAB-30	Chukha BHU-I	10	0	0	0	0	0	0	100	100	
5	LAB-28	Dagana BHU-1	10	0	0	1	1	0	2	80	90	
6	LAB-29	Dagapela Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
7	LAB-25	Damphu Hospital	10	0	0	1	0	0	1	90	95	Screened by 2 staffs(2 different results)
8	LAB-25	Damphu Hospital	10	0	0	0	0	0	0	100	100	
9	LAB-03	Dewathang Military Hospital	10	0	0	0	1	0	1	90	95	Screened by 4 staffs(4 different result)
10	LAB-03	Dewathang Military Hospital	10	0	0	0	0	0	0	100	100	
11	LAB-03	Dewathang Military Hospital	10	0	0	1	0	1	2	80	90	
12	LAB-03	Dewathang Military Hospital	10	0	0	0	0	1	1	90	95	
13	LAB-04	Gedu Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
14	LAB-05	Gelephu RRH	10	0	0	0	0	0	0	100	100	Screened by 3 staffs
15	LAB-27	Gidakom Hospital	10	0	0	0	0	0	0	100	100	Screened by 4 staffs
16	LAB-12	Gomtu Hospital	10	0	0	0	0	0	0	100	100	
17	LAB-33	Kanglung BHU-I	10	0	0	2	0	0	2	80	90	
18	LAB-34	Lhamoyzingkha BHU-I	10	0	0	4	0	4	8	20	60	
19	LAB-08	Lhuentse Hospital	10	0	0	0	0	0	0	100	100	
20	LAB-07	Lungtenphu Military Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
21	LAB-09	Mongar RRH	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
22	LAB-10	Paro Hospital	10	0	0	0	0	0	0	100	100	Screened by 5 staffs
23	LAB-11	Pema Gatshel Hospital*	10									No report
24	LAB-36	JDWNR Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
25	LAB-32	Pangbang BHU I	10	0	0	0	0	0	0	100	100	
26	LAB-13	Phuntsholing Hospital	10	0	0	0	1	0	1	90	95	
27	LAB-14	Punakha Hospital	10	0	0	1	0	1	2	80	90	Screened by 2 staffs (2 different result)
28	LAB-14	Punakha Hospital	10	0	0	1	0	0	1	90	95	
29	LAB-15	Nanglam BHU-1	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
30	LAB-16	Riserboo Hospital	10	0	0	0	0	1	1	90	95	
31	LAB-17	Samdrupjongkhar Hospital	10	0	0	0	0	1	1	90	95	Screened by 5 staffs (2 different result)
32	LAB-17	Samdrupjongkhar Hospital	10	0	0	0	0	0	0	100	100	
33	LAB-18	Samtse Hospital	10	0	0	1	0	2	3	70	85	Screened by four staffs (3 different result)
34	LAB-18	Samtse Hospital	10	0	0	2	0	0	2	80	90	
35	LAB-18	Samtse Hospital	10	0	0	1	0	0	1	90	95	

36	LAB-19	Sarpang Hospital	10	0	0	0	0	0	0	100	100	
37	LAB-20	Sipsoo Hospital*	10									No report
38	LAB-22	Tashigang Hospital	10	0	0	0	0	0	0	100	100	Screened by 4 staffs
39	LAB-21	Tashiyangtse Hospital	10	0	0	0	0	0	0	100	100	
40	LAB-23	Trongsa Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
41	LAB-24	Tsimalakha Hospital	10	0	0	0	0	0	0	100	100	
42	LAB-26	Yebilaptsa Hospital	10	0	0	0	0	0	0	100	100	Screened by 2 staffs
43	LAB-35	Zhemgang BHU-I	10	0	0	1	0	2	3	70	85	
			Total Error	0	0	16	3	14	33			

* Feedback report not received

Table 4. Summary report of 34th Round Proficiency Testing for TB Microscopy, 2018

Total number of slides sent	Major Error		Minor Error		Quantification Error (QE)
	High False Negative (HFN)	High False Positive (HFP)	Low False Negative (LFN)	Low False Positive (LFP)	
350	0	0	16	3	33

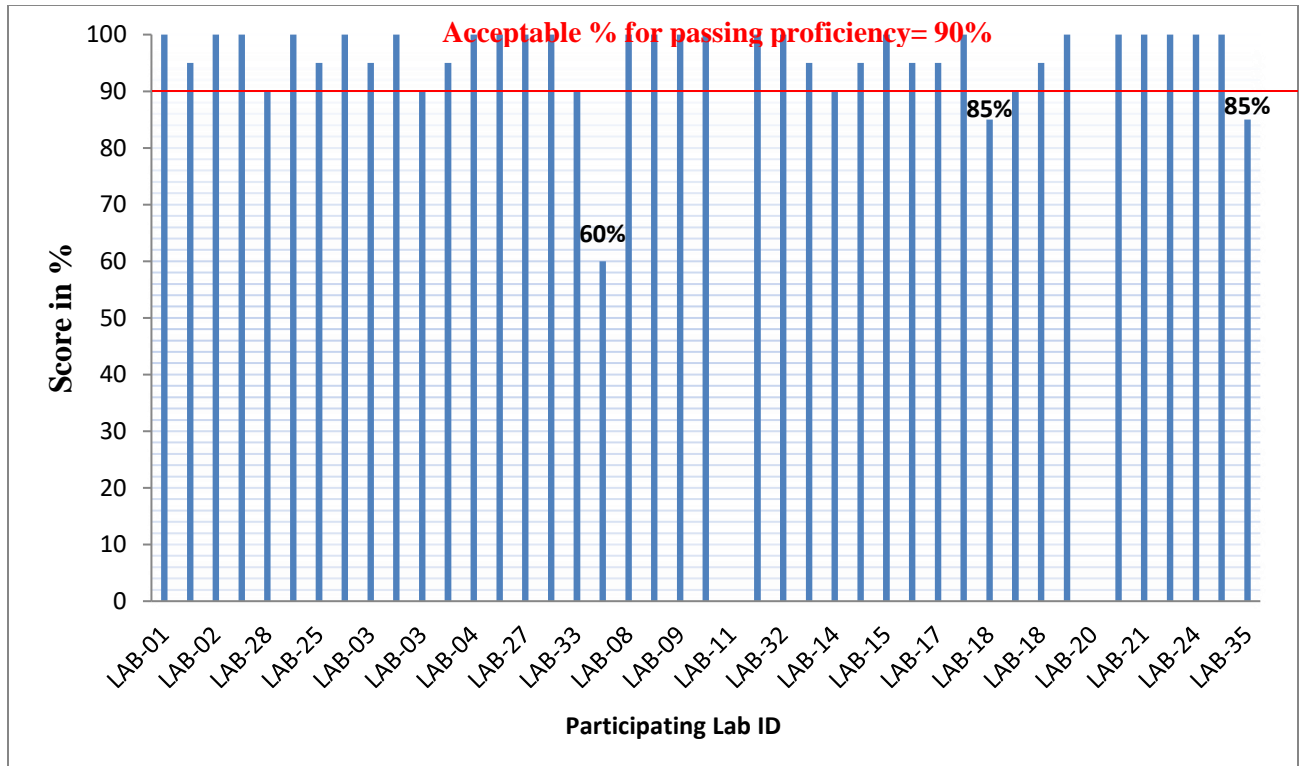


Figure 4: Result of 34th round proficiency testing on TB microscopy for 35 laboratories, showing 3 laboratories below the acceptable % for passing proficiency

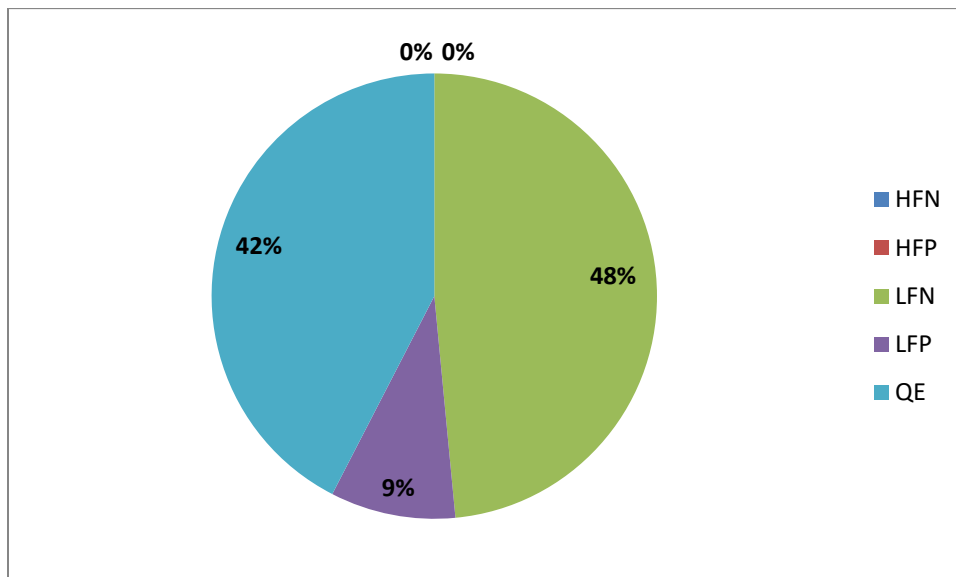


Figure 5: Percentage of Error for 34th round proficiency testing

Overall blinded rechecking report 2017

A total of 21975 AFB slides were received during the entire quarter of 2017. Four hospitals (Bali BHU-1, Gasu BHU-1, Lhamoizingkha BHU-1 and Punakha Hospital) failed to send a single slide during entire quarter of the year. From the total slide received 2359 AFB slides are selected and rechecked. The slides are screened for errors and graded on smear quality based on six grading criteria (Specimen quality, Staining quality, Smear size, Evenness, Thickness and cleanliness). JDWNRH, Phuntsholing and Mongar Hospital used fluorescent stain, overall smear quality for fluorescent stain are graded based on smear size, evenness, thickness and cleanliness.

Table 5: Summary report of overall blinded rechecking for TB Microscopy

Total number of slides received	Total number of slides rechecked	Slide positivity rate	Average Overall Agreement Rate	Major Error		Minor Error		Quantification Error (QE)
				High False Negative (HFN)	High False Positive (HFP)	Low False Negative (LFN)	Low False Positive (LFP)	
21975	2359	4.52%	88.6%	1	0	3	4	1

Table 6: Overall smear quality (%)

Sl. No.	Lab ID No.	Name	Overall Smear Quality (%)					
			Specimen Quality	Staining Quality	Smear size	Evenness	Thickness	Cleanliness
1	LAB-01	Bhajo BHU-1	45	37	47	33	41	34
2	LAB-06	Bali BHU-1**	0	0	0	0	0	0
3	LAB-02	Bumthang Hospital	21	19	23	16	19	29
4	LAB-30	Chukha BHU-I	18	24	29	21	22	29
5	LAB-28	Dagana BHU-1	31	35	42	36	35	40
6	LAB-29	Dagapela Hospital	48	52	54	46	49	56
7	LAB-25	Damphu Hospital	62	59	77	55	65	60
8	LAB-03	Dewathang Military Hospital	20	16	27	17	19	15
9	LAB-31	Gasu BHU-I**	0	0	0	0	0	0
10	LAB-04	Gedu Hospital	14	13	19	11	12	15
11	LAB-05	Gelephu RRH	68	73	66	69	70	81
12	LAB-27	Gidakom Hospital	27	32	28	24	30	48
13	LAB-12	Gomtu Hospital	33	34	30	25	32	35
14	LAB-33	Kanglung BHU-I	60	55	65	52	57	58
15	LAB-34	Lhamoyzingkha BHU-I**	0	0	0	0	0	0
16	LAB-08	Lhuentse Hospital	36	33	46	35	38	35
17	LAB-07	Lungtenphu Military Hospital	30	25	27	26	26	35
18	LAB-09	Mongar RRH ^a	0	0	59	46	46	59
19	LAB-10	Paro Hospital	48	50	57	43	44	52
20	LAB-11	Pema Gatsel Hospital	8	5	4	3	3	4

21	LAB-36	JDWNR Hospital ^a	0	0	33	25	25	32
22	LAB-32	Pangbang BHU-I	28	29	32	25	27	27
23	LAB-13	Phuntsholing Hospital ^a	0	0	63	60	60	69
24	LAB-14	Punakha Hospital**	0	0	0	0	0	0
25	LAB-15	Nanglam BHU-I	10	9	5	5	5	5
26	LAB-16	Riserboo Hospital	55	36	29	35	39	38
27	LAB-17	Samdrupjongkhar Hospital	56	46	56	45	48	44
28	LAB-18	Samtse Hospital	21	23	26	21	23	27
29	LAB-19	Sarpang Hospital	76	72	78	69	70	75
30	LAB-20	Sipsoo Hospital	41	37	38	20	38	39
31	LAB-22	Tashigang Hospital	26	27	28	21	26	27
32	LAB-21	Tashiyangtse Hospital	53	54	64	47	47	60
33	LAB-23	Trongsa Hospital	46	35	35	27	27	31
34	LAB-24	Tsimalakha Hospital	55	41	49	34	41	39
35	LAB-26	Yebilaptsa Hospital	72	51	79	58	59	35
36	LAB-35	Zhemgang BHU-I	60	67	72	62	67	72

** Slides not received ^a Fluorescent stain

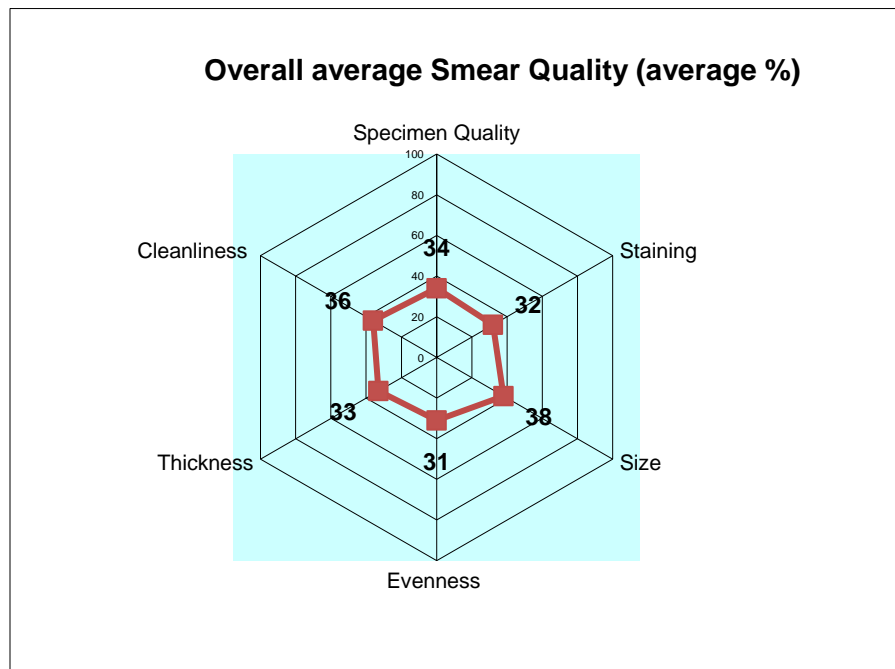


Figure 6: Overall average smear quality