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Quarterly Morbidity & Activity Report

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Meningococcal Meningitis Outbreak in School (Thinlaygang Middle Secondary School)

IN THIS ISSUE:

Contents

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Abstract

Outbreak of meningococcal meningitis has been reported in the past (late eighty's) in the country and after many years, meningococcal meningitis outbreak was reported and confirmed in Thinlaygang Middle Secondary School on 17th April 2010. The outbreak was confined in boy's hostel which was very congested and probable factor for an outbreak. The mortality rate was 60% and among survived, 50% had developed neurological sequale. The cause for high mortality rate was mainly because of fulminant meningococcemia which is very severe disease and if early diagnosis and management is missed, patient dies within 12 hours.

1. Introduction

The bacterium *Neisseria meningitidis,* the **meningococcus,** is identical morphological characteristics to *Neisseria gonorrhoeae*. However, at the ultrastructural level, *N. meningitidis*
has a prominent antiphagocytic polysaccharide capsule. *N. meningitidis* strains are grouped on the basis of their capsular polysaccharides, into 13 serogroups, A, B, C, D, E, H, I, K, L, W-135, X, Y, and Z. Serogroups A, B, and C are responsible for most cases of meningococcal disease throughout the world. Historically, serogroup A was the main cause of epidemic meningococcal
disease globally, and it is still the predominant cause of meningococcal meningitis in Africa and Asia

Call for Feedback

Without feedback or constructive criticism we can only do so much. In the first place we will not know if we are doing the right thing. Even if we know we are doing the right thing we will not know if we are doing it right. Yet, people often do not like feedback because their mistakes are pointed out. However, we must remember that if we have to improve and keep improving ourselves or any undertaking a good feedback system is a necessary evil.

Sadly, QMAR is in dire need of feedback. This is the QMAR Volume 3 Issue 2; which means it's the 10th issue of the QMARs. When it comes to feedback received by the editorial board or the publisher of QMAR, so far we have just received one feedback. The feedback was provided by Hon'ble Minister of Health. It was regarding the late submission of reports by some of the Dzongkhags for the first quarter of 2010. So, for the second quarter of 2010 everyone put their best in ensuring timely report collection. As a result, all Dzongkhags have submitted their report on time.

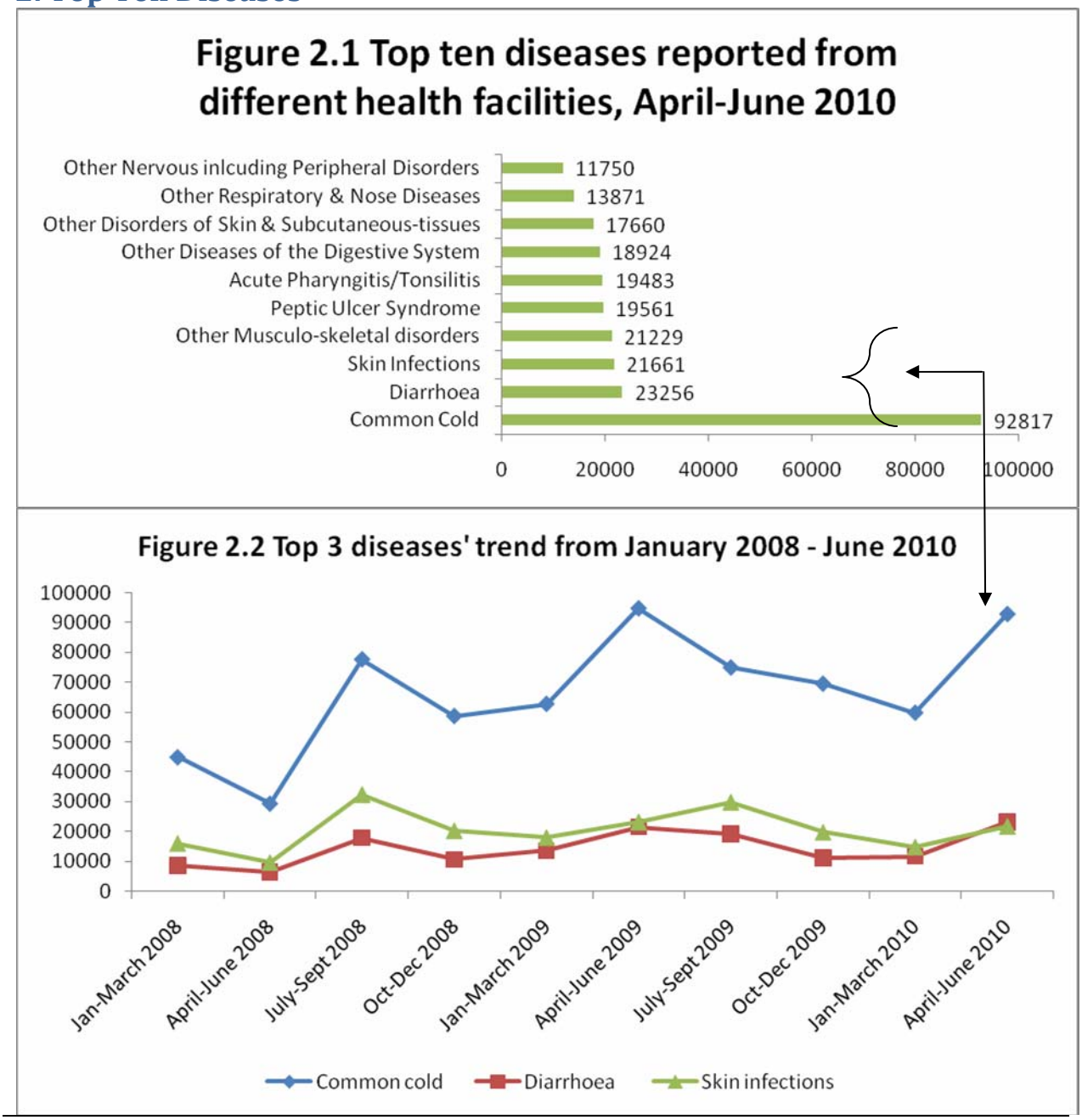
This is an epitome of how feedback does miracles. In a parallel argument the Editorial Board and the Publisher of QMAR are very much optimistic of the feedback and sincerely welcome a lot of feedback from all stakeholders - healthcare providers, policy makers, planners, students and all the readers.

(Mongal Singh Gurung)
Assistant Research Officer

1. Timeliness of the report

We are pleased to announce that all the districts have reported on time in this quarter (April – June 2010). This report will cover only the data received by Health Management and Information Unit (HMIS) through the morbidity and activity reports.

2. Top Ten Diseases



Among the top ten diseases reported, common cold reported the highest with 92 817 cases in the 2nd quarter (April-June 2010), followed by Diarrhea and skin infections as indicated in figure 2.1.

In figure 2.2, the trend line indicates that diarrhea is taking lead over skin infections, which till the 1st quarter of 2010 was second highest number of cases reported. The trend line also indicated that the common cold cases are gradually increasing over the years, whereas skin infection and diarrhea cases seem to have remained unchanged.

3. Top Ten Other Diseases

Figure 3.1 Top ten other diseases reported in different health facilities, April-June 2010

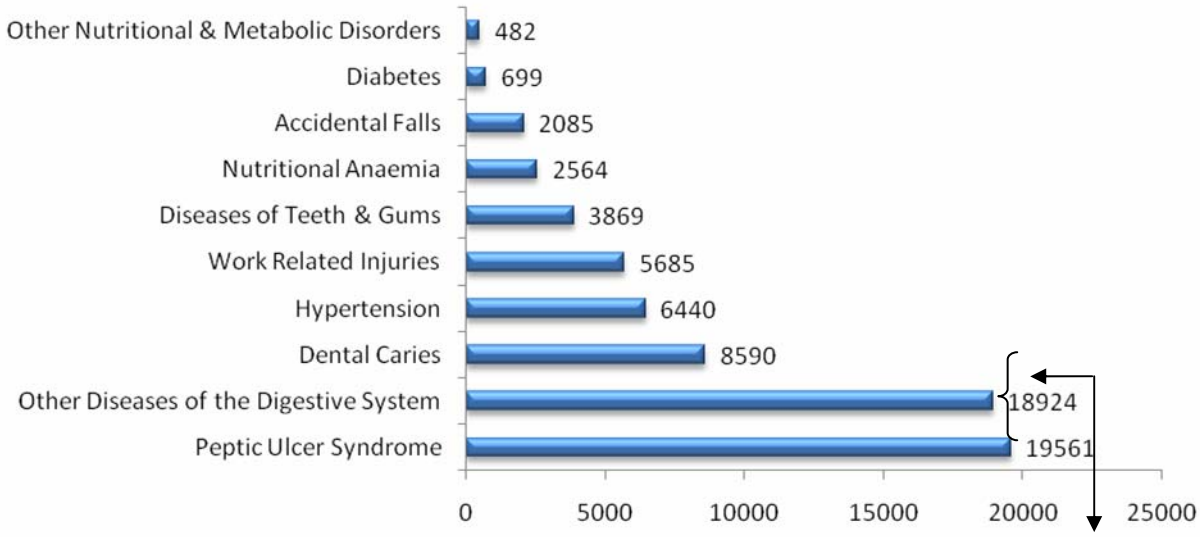
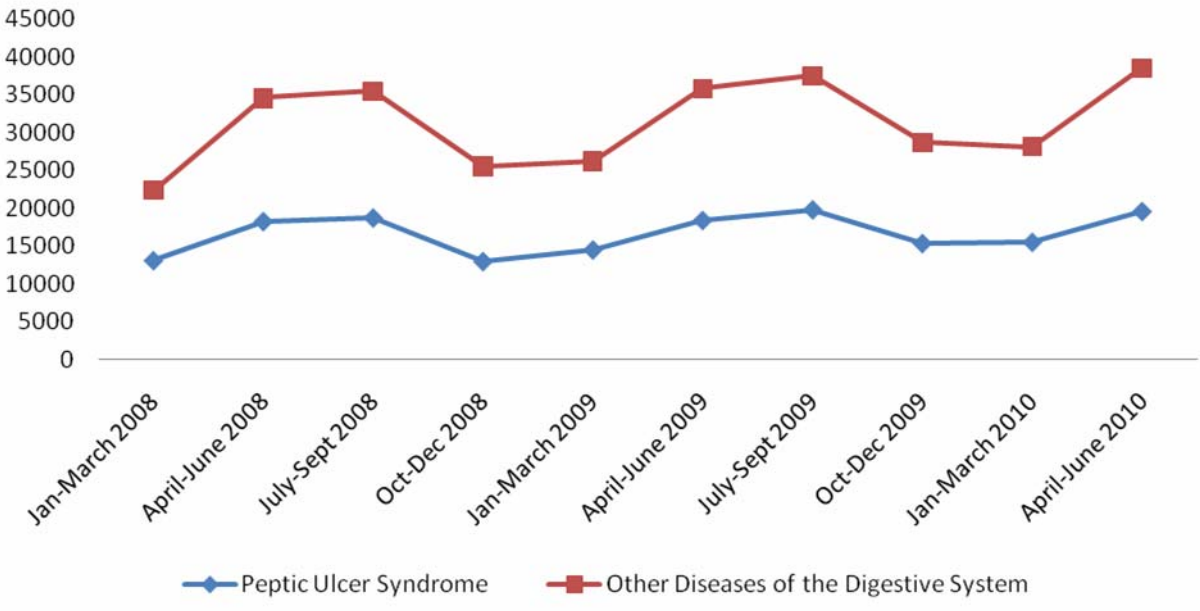


Figure 3.2 Top two other diseases trend, January 2008-June 2010



Among the top ten other diseases reported, Peptic Ulcer Syndrome was the highest with 19561 cases in the 2nd quarter (April-June 2010). This was followed by other diseases of the digestive system and dental caries as indicated in figure 3.1.

In figure 3.2, the trend line indicates that Peptic Ulcer syndrome and other disease of the digestive system have remained unchanged

4. Ante Natal Care, Post Natal Care and Attended Delivery

Table 4.1: ANC and PNC availed at the health facilities, April-June 2010

District	ANC1Visit	ANC2Visit	ANC3Visit	ANC4Visit	ANCMVisit	PNC1Visit	PNCMVisit
Bumthang	84	85	88	53	64	36	10
Chukha	370	359	311	257	552	160	82
Dagana	104	108	69	41	42	31	26
Gasa	12	12	7	4	4	5	2
Haa	51	38	30	36	67	14	14
Lhuentse	77	75	63	49	48	51	14
Mongar	235	217	204	140	98	122	82
Paro	195	156	163	165	315	142	11
P/gatshel	130	114	82	50	65	34	20
Punakha	129	150	124	117	150	81	81
S/Jongkhar	179	181	151	85	62	51	24
Samtse	304	305	250	185	317	118	101
Sarpang	222	216	170	156	177	57	58
Thimphu	531	688	633	536	806	488	292
T/gang	261	227	193	129	77	106	77
T/Yangtse	96	92	81	50	64	60	27
Trongsa	67	67	55	30	23	27	18
Tsirang	110	89	67	53	14	30	32
Wangdi	181	192	170	114	129	71	33
Zhemgang	110	88	64	33	40	35	13
Total	**3448**	**3459**	**2975**	**2283**	**3114**	**1719**	**1017**

Table 4.2: TT Doses and Attended Deliveries by the Health Personnel, April-June 2010

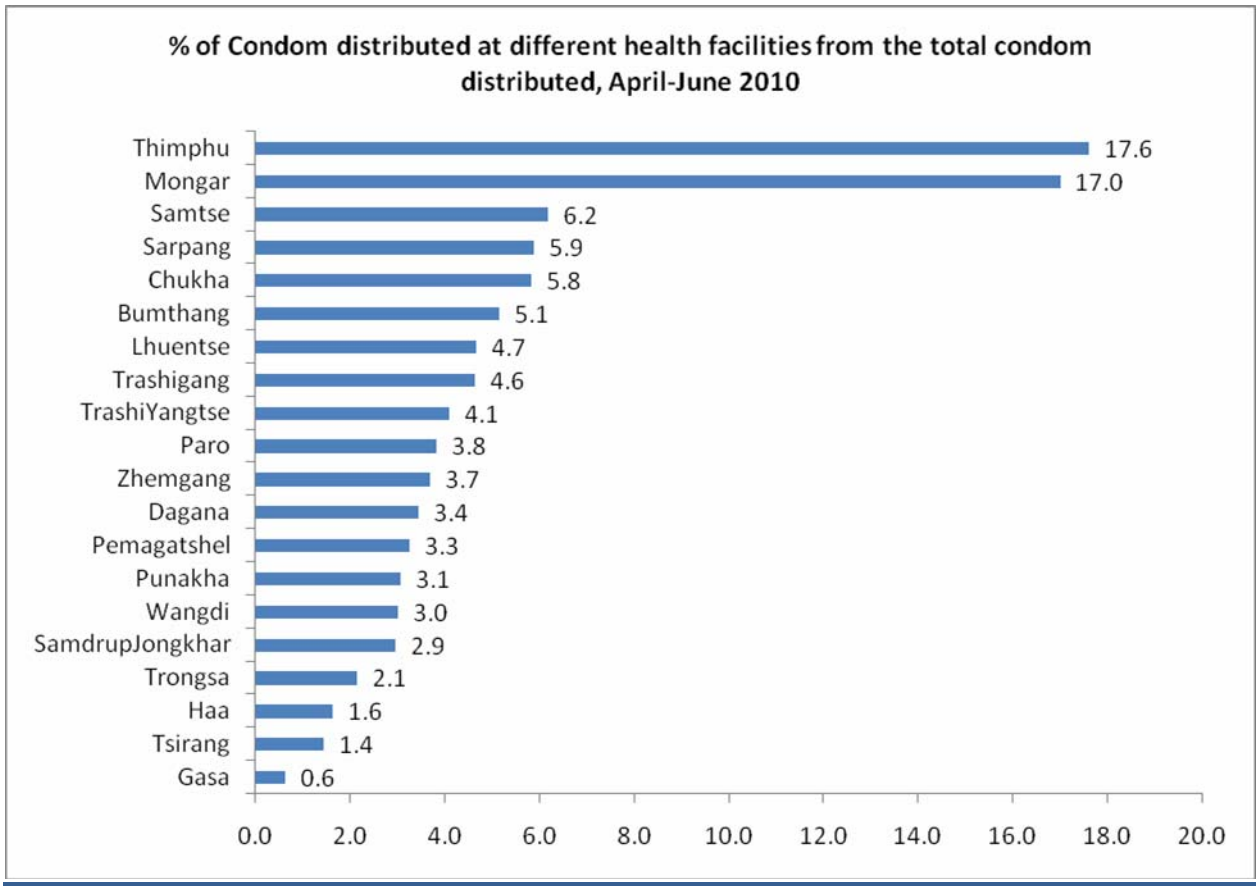
			Attended Deliveries		
District	TT2Plus	TTOthers	Home	Facility	Vaccum Delivery
Bumthang	74	347	7	39	0
Chukha	339	1034	15	268	14
Dagana	77	214	2	15	2
Gasa	15	18	3	1	0
Haa	43	185	3	19	0
Lhuentse	68	183	3	21	0
Mongar	216	361	33	134	2
Paro	166	659	0	143	9
Pemagatshel	65	268	12	15	0
Punakha	90	126	8	83	6
S/Jongkhar	125	301	21	68	0
Samtse	263	963	3	85	1
Sarpang	231	773	1	136	0
Thimphu	495	499	0	242	1
Trashigang	227	672	17	80	0
TrashiYangtse	77	163	2	23	0
Trongsa	73	196	5	17	0
Tsirang	82	338	1	24	0
Wangdi	177	690	10	62	0
Zhemgang	94	270	13	17	0
Total	2997	8260	159	1492	35

5. Family Planning Method Report

Among the different kinds of available family planning methods excluding condom use, the most preferred method is DMPA (21388) followed by oral pills (13055) and IUD (705).

Table 5.1: Different family planning methods availed from the health facilities, April-June 2010

District	IUD	Oral Pills	DMPA
Bumthang	0	282	509
Chukha	49	1871	2057
Dagana	4	796	1075
Gasa	3	12	644
Haa	0	229	460
Lhuentse	11	283	545
Mongar	34	534	1799
Paro	13	573	1004
Pemagatshel	9	398	727
Punakha	20	569	671
SamdrupJongkhar	7	813	1109
Samtse	2	1454	1509
Sarpang	25	995	1581
Thimphu	484	1174	2436
Trashigang	21	878	1619
TrashiYangtse	3	141	429
Trongsa	3	270	454
Tsirang	0	825	1087
Wangdi	16	326	900
Zhemgang	1	632	773
Total	705	13055	21388



From the total numbers of condoms distributed (269344), Thimphu district distributed the maximum with 17.6% followed by Mongar with 17.0%. The minimum condoms distributed were by Gasa dzongkhag with 0.6%.

6. Health Facility Admissions

Table 6.1 Average patient days of different health facilities, April-June 2010

District_Name	Total no. of Patients	Absconded	Patient Days	Average Patient days
Bumthang	183	1	867	4.7
Chukha	1511	9	2599	1.7
Dagana	25	0	37	1.5
Gasa	0	0	0	0.0
Haa	46	0	201	4.4
Lhuentse	286	1	1131	4.0
Mongar	677	2	6275	9.3
Paro	916	7	2252	2.5
Pemagatshel	278	0	770	2.8
Punakha	638	8	2300	3.6
SamdrupJongkhar	145	0	1388	9.6
Samtse	777	4	3500	4.5
Sarpang	1090	6	4500	4.1
Thimphu	3483	8	27802	8.0
Trashigang	850	4	3830	4.5
TrashiYangtse	271	0	758	2.8
Trongsa	157	2	305	1.9
Tsirang	319	0	0	0.0
Wangdi	446	2	1463	3.3
Zhemgang	300	2	1060	3.5
Total	12398	56	61038	4.9

7. Laboratory Examinations

Table 7.1 Laboratory Examinations Conducted at Health Facilities, April-June 2010

District	Total Lab test	Hemoglobin	Blood Group	Malaria slide	TB Sputum	Urine	Stool	HIV
Bumthang	1159	510	185	15	27	401	2	76
Chukha	33573	5046	1354	2312	359	3746	118	448
Dagana	4497	624	209	715	35	1093	37	45
Gasa	111	37	14	0	1	44	4	11
Haa	1290	396	138	14	29	533	9	64
Lhuentse	3697	701	167	8	27	1022	12	67
Mongar	7424	2956	819	153	457	2358	188	493
Paro	3825	1159	465	65	214	1676	28	212
Pemagatshel	3295	483	386	162	74	639	17	103
Punakha	3737	1651	423	141	97	1100	46	280
S/Jongkhar	7081	1334	417	2258	291	1935	56	275
Samtse	9472	2270	689	3146	205	2034	29	297
Sarpang	37516	3470	892	8696	267	3068	230	478
Thimphu	284966	16037	25193	1603	1223	12612	840	3449
Trashigang	5689	1079	672	40	159	1743	27	186
T/Yangtse	3462	396	110	2	40	447	9	4
Trongsa	8940	370	190	10	19	337	36	47
Tsirang	2817	893	280	576	22	439	7	65
Wangdi	3741	1278	494	147	77	1659	41	391
Zhemgang	4028	829	138	734	29	659	39	78
Total	430320	41519	33235	20797	3652	37545	1775	7069

8. Nutritional Status of Children less than Five Years of Age

Table 8.1 Nutritional status of Children < Five years of age reported at health facilities, April-June 10

District	Over weight	Normal	Malnourish	Severely malnourish
Bumthang	29	1614	35	3
Chukha	167	4935	208	33
Dagana	72	1921	213	11
Gasa	15	151	14	2
Haa	17	856	44	1
Lhuentse	54	1271	107	17
Mongar	167	4272	284	35
Paro	144	3253	169	11
Pemagatshel	215	1539	209	19
Punakha	71	1419	54	10
SamdrupJongkhar	93	2300	181	24
Samtse	67	3575	283	46
Sarpang	189	2892	192	12
Thimphu	106	9050	325	35
Trashigang	101	3331	268	31
TrashiYangtse	55	1530	136	18
Trongsa	85	1102	69	8
Tsirang	271	1671	127	10
Wangdi	105	2395	107	16
Zhemgang	123	1417	142	9
Total	2146	50494	3167	351

9. Surgical Procedures

Table 9.1 Surgical procedures conducted at different health facilities, April-June 2010

	General					
	Abdominal			Others		
District	Major	Minor	Laparoscopic	Major	Minor	Laparoscopic
Bumthang	0	0	0	0	0	0
Chukha	10	98	0	0	16	0
Dagana	0	0	0	0	0	0
Gasa	0	0	0	0	0	0
Haa	0	0	0	0	0	0
Lhuentse	0	0	0	0	0	0
Mongar	19	0	3	23	29	4
Paro	9	42	0	1	28	0
Pemagatshel	0	0	0	0	0	0
Punakha	0	1	0	0	7	0
SamdrupJongkhar	0	0	0	0	606	0
Samtse	4	0	0	0	177	0
Sarpang	5	2	0	5	69	0
Thimphu	161	461	93	156	739	0
Trashigang	14	0	0	2	44	0
TrashiYangtse	0	0	0	0	0	0
Trongsa	0	0	0	0	0	0
Tsirang	0	0	0	0	0	0
Wangdi	0	0	0	0	479	0
Zhemgang	0	0	0	0	5	0
Total	222	604	96	187	2199	4

Orthopedics						
	Extremities			Others		
District	Major	Minor	Laparoscopic	Major	Minor	Laparoscopic
Bumthang	0	0	0	0	0	0
Chukha	0	0	0	0	6	0
Dagana	0	0	0	0	0	0
Gasa	0	0	0	0	0	0
Haa	0	0	0	0	0	0
Lhuentse	0	0	0	0	0	0
Mongar	47	23	0	3	4	0
Paro	0	0	0	0	0	0
Pemagatshel	0	0	0	0	2	0
Punakha	0	8	0	0	0	0
SamdrupJongkhar	0	25	0	4	44	0
Samtse	0	0	0	0	7	0
Sarpang	0	6	0	0	0	0
Thimphu	124	92	0	0	27	0
Trashigang	0	0	0	0	0	0
TrashiYangtse	0	0	0	0	0	0
Trongsa	0	0	0	0	0	0
Tsirang	0	0	0	0	0	0
Wangdi	0	1	0	0	57	0
Zhemgang	0	0	0	0	0	0
Total	171	155	0	7	147	0

	Gynecology			ENT		
District	Major	Minor	Laparoscopic	Major	Minor	Laparoscopic
Bumthang	0	0	0	0	0	0
Chukha	12	7	0	0	0	0
Dagana	0	0	0	0	0	0
Gasa	0	0	0	0	0	0
Haa	0	0	0	0	0	0
Lhuentse	0	0	0	0	0	0
Mongar	20	34	3	4	15	0
Paro	5	33	0	0	0	0
Pemagatshel	0	0	0	0	0	0
Punakha	0	0	0	0	0	0
SamdrupJongkhar	0	14	0	0	0	0
Samtse	0	2	0	0	0	0
Sarpang	1	41	0	0	2	0
Thimphu	50	92	0	66	30	0
Trashigang	1	16	0	0	0	0
TrashiYangtse	0	0	0	0	0	0
Trongsa	0	0	0	0	0	0
Tsirang	0	0	0	0	0	0
Wangdi	0	0	0	0	15	0
Zhemgang	0	0	0	0	0	0
Total	89	239	3	70	62	0

		Eye		Caesarean
District	Major	Minor	Laparoscopic	Major
Bumthang	0	0	0	0
Chukha	0	0	0	66
Dagana	0	0	0	0
Gasa	0	0	0	0
Haa	0	0	0	0
Lhuentse	0	1	0	0
Mongar	16	4	0	45
Paro	0	0	0	35
Pemagatshel	0	0	0	0
Punakha	0	0	0	0
SamdrupJongkhar	0	2	0	30
Samtse	0	3	1	0
Sarpang	3	2	0	30
Thimphu	207	9	0	208
Trashigang	0	3	0	30
TrashiYangtse	0	3	0	0
Trongsa	0	0	0	0
Tsirang	0	0	0	0
Wangdi	0	6	0	0
Zhemgang	0	0	0	0
Total	226	33	1	444

10. Diagnostic Procedures

Table 10.1 Diagnostic procedures conducted at health facilities, April-June 2010

	X-Ray			Ultrasound		
District	Chest	Extremities	Others	Gynaecology	Abdominal	Others
Bumthang	75	60	36	0	0	0
Chukha	528	297	207	1106	929	64
Dagana	0	0	0	0	0	0
Gasa	0	0	0	0	0	0
Haa	44	29	4	162	35	31
Lhuentse	73	38	20	0	1	0
Mongar	804	270	341	637	599	31
Paro	209	211	116	0	0	0
Pemagatshel	32	33	17	77	71	0
Punakha	100	55	37	182	195	1
SamdrupJongkhar	259	122	69	100	101	83
Samtse	444	220	151	0	70	10
Sarpang	584	267	179	780	447	0
Thimphu	3256	2307	3332	3279	3150	387
Trashigang	474	101	108	586	207	7
TrashiYangtse	27	18	5	0	0	0
Trongsa	54	32	14	0	0	0
Tsirang	45	44	35	85	55	3
Wangdi	139	160	235	484	266	263
Zhemgang	29	22	28	0	0	0
Total	7176	4286	4934	7478	6126	880

11. Dental Services

Table 11.1 Dental services availed by people at health facilities, April-June 2010

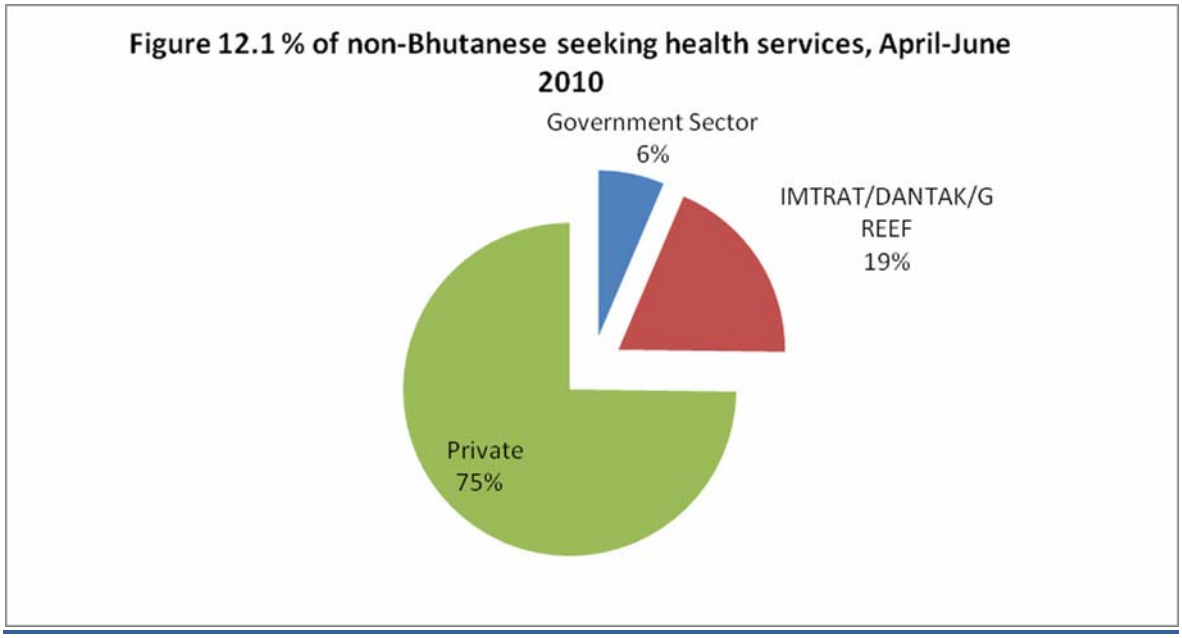
District	Prophylaxis	Scaling	Filling	Extraction	Others
Bumthang	2	0	89	174	191
Chukha	46	18	912	882	1514
Dagana	17	0	13	165	113
Gasa	0	0	0	0	0
Haa	9	3	85	182	202
Lhuentse	13	2	127	71	93
Mongar	34	74	321	364	537
Paro	31	14	812	468	650
Pemagatshel	17	1	154	139	84
Punakha	194	5	165	303	232
SamdrupJongkhar	12	7	132	310	147
Samtse	163	0	365	222	288
Sarpang	26	0	842	500	1835
Thimphu	456	102	2054	2704	4498
Trashigang	23	16	291	507	480
TrashiYangtse	11	0	89	91	149
Trongsa	17	6	57	132	253
Tsirang	15	0	202	187	261
Wangdi	13	5	314	269	112
Zhemgang	15	4	92	94	97
Total	1114	257	7116	7764	11736

12. Non-Bhutanese

Table 12.1 Health services availed by non-Bhutanese, April-June 2010

District	Government Sector	IMTRAT/DANTAK/GREEF	Private
Bumthang	2	0	170
Chukha	128	673	306
Dagana	7	5	122
Gasa	0	0	0
Haa	0	0	0
Lhuentse	4	0	110
Mongar	33	0	328
Paro	18	218	425
Pemagatshel	5	0	103
Punakha	37	0	100
SamdrupJongkhar	20	141	30
Samtse	70	0	1020
Sarpang	68	145	736
Thimphu	56	76	298
Trashigang	21	242	143
TrashiYangtse	15	0	54
Trongsa	4	0	264
Tsirang	0	0	0
Wangdi	0	0	1309
Zhemgang	23	0	451
Total	511	1500	5969

*The report is only for the district hospitals



13. Malaria Report

Table 13.1 Malaria report, April-June 2010

Variables	0-4years		5-14 years		15-49 years		>50years		Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Mix	0	1	3	3	10	2	4	0	17	6	23
Pf	2	0	17	7	30	21	13	5	62	33	95
Pv	2	4	20	9	69	25	11	10	102	48	150
Death	0	0	0	0	0	0	0	0	0	0	0
Total	4	5	40	19	109	48	28	15	181	87	268

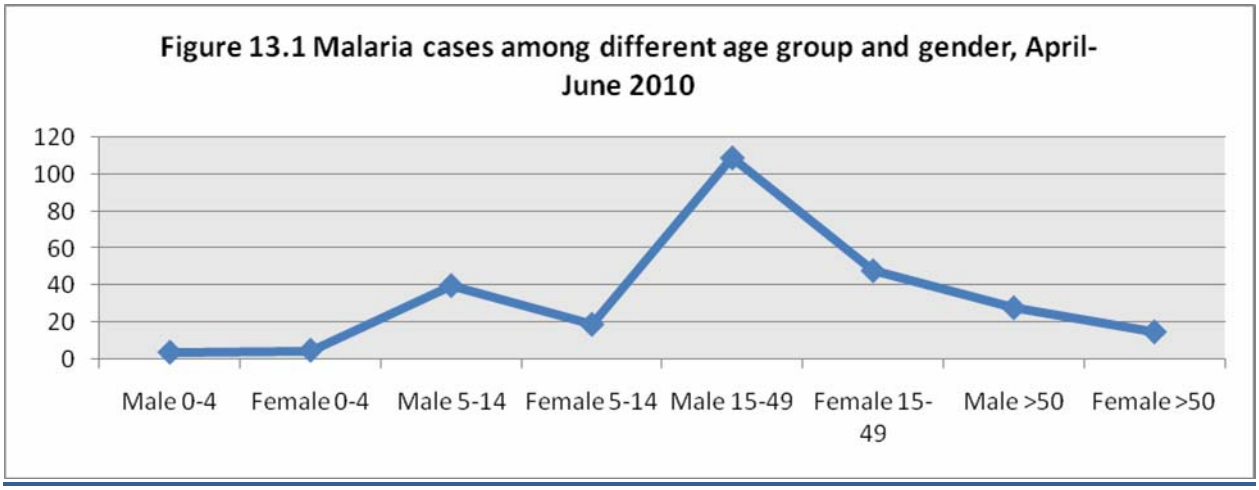


Figure 13.1 shows that the most affected age group is 15-49 years followed by 5-14 years.

14. TB Report

Table 14.1 Treatment Outcome Indicators April-June 2009

Indicators	New P Positive	Relapse	Failure	Default
Cure rate	87.8	80	60	66.66
Completed rate	4.06	4	0	0
Success rate	91.86	84	60	66.66
Mortality D/A	5.69	12	40	0
Failure rate	1.63	0	0	0
Default rate	0.81	4	0	33.33

From page 1

The natural habitat and reservoir for meningococci is the mucosal surfaces of the human nasopharynx and, to a lesser extent, the urogenital tract and anal canal. Approximately 5-10% of adults are asymptomatic nasopharyngeal carriers, but that number increases to as many as 60-80% of members of closed populations (eg, military recruits in camps). Most individuals in close contact with a case of meningococcal meningitis become carriers of the organism. Between 5 and 30% of normal individuals are carriers at any given time, yet few develop meningococcal disease. Carriage rates are highest in older children and young adults. This carrier rate can reach 20 percent of the contact group before the first case is recognized, and may reach as high as 80 percent at the height of an epidemic. The modes of infection include direct contact or respiratory droplets from the nose and throat of infected people. Meningococcal disease most likely occurs within a few days of acquisition of a new strain, before the development of specific serum antibodies. The incubation period averages 3-4 days (range 1-10 days), which is the period of communicability. In most cases, meningococcal colonization of mucosal surfaces leads to subclinical infection or mild symptoms. In approximately 10-20% of cases, *N meningitidis* enters the bloodstream and systemic disease appears with the development of meningococcemia and usually precedes meningitis by 24-48 hours. This can lead to systemic infection in the form of bacteremia, metastatic infection that commonly involves the meninges severe systemic infection with circulatory collapse and disseminated intravascular coagulation (DIC). Meningococcemia leads to diffuse vascular injury, which is characterized by endothelial necrosis, intraluminal thrombosis, and perivascular hemorrhage.

2. Methodology

On 17th April 2010, at about 9.30 a.m., the Superintendent of the JDWNRH informed the DoPH of a suspected bacterial meningitis outbreak in Thinlaygang Middle Secondary School, Punakha Dzongkhag. A team from the DoPH comprising the CPO, CDD, and Head, PHL, left for Thinlaygang at 11.00a.m. to investigate the outbreak.

2.1 Visited Thinlaygang BHU-II to review and investigate referral record of two death cases reported on 17th morning and other cases.
2.2 Interviewed BHU II health workers and reviewed emergency and OPD records to establish an outbreak episode.
2.3 Visited school and interviewed principle, school health in-charge and boys' hostel warden to collect more information of the events in the school.
2.4 Visited boy's hostel to assess the risk factors for an outbreak.
2.5 Interviewed students who had close contact with confirmed cases in boys' hostel.
2.6 Investigated two death cases.

3. Findings/Discussion

The team reviewed BHU OPD and Emergency visits record since March 2010 and discuss with the health workers about possible extent of the outbreak. It was found that there had been a death on the 3rd of April of a student who was a close contact of the first suspected case who had been referred to JDWNRH. In total five cases were investigated in detail out of which there had been three deaths.

3.1 Case investigation

Investigation of the two death cases reported on 17th morning revealed that both cases had reported to Thinleygang BHU on the same day; one at 3:40p.m. (Case UP) and the other at 4:00 p.m. (Case K) on 16th April, 2010.

Case K presented with history of fever, headache and diarrhea for 2 days and on examination had temperature 980F, low blood pressure (60/40 mm Hg), pulse not readable and dehydration(++). The Thinleygang BHU staff stabilized the patient and referred him to JDWNRH at 6:30p.m. The patient was taken by parents to JDWNRH, where he was admitted to the Emergency at 8:20p.m. The patient expired at 3:45a.m. on 17th April.

Case UP had history of fever and chest pain radiating towards the right shoulder for 2 days and on examination had temperature 1010F, blood pressure 120/80 mm Hg and was referred to Punakha hospital at 5:30 p.m. on the same day but was taken to Bajo BHU 1 by parents. He was admitted to Bajo BHU 1 at 1;40 a.m. on 17th April and died at 6:00 a.m. on the same day.

Further, JDWNRH had also reported one case (Case ST) admitted from same school on 15th April referred from Thinleygang BHU and was clinically suspected to be meningitis (recovered). Based on this information the team reviewed the data at Thinleygang BHU and on enquiry on to the JDWNRH, it was reported that lab tests for CSF culture was negative. It was also found that the patient had actually been referred by the BHU on 11th April to JDWNRH. This case also had similar clinical symptoms as presented by the two death cases (severe headache, fever, vomiting for 2 days).

It was also found from referral record and interview with BHU health workers that the BHU had referred a student from the same school to JDWNRH on 3rd April who had presented with history of similar clinical symptoms (severe headache, fever with chill, vomiting several times for 1 day) on the same date. From JDWNRH records it was found that this case (Case TW) was admitted to JDWNRH on the 5th of April. The clinician had made a clinical diagnosis of bacterial meningitis, however, laboratory CSF reports are not available (the case has recovered with some neurological sequelae and has been discharged from hospital on 14th April).

The BHU staff also informed the team about one student death case (Case JN) from the same school on the night of 3rd April. The case died on the way to Punakha hospital during self referral and had not come to the BHU. During investigation it was found that case JN had very close contact with case TW and had actually carried him to the BHU from the school. From interviews with the teachers, it was discovered that case JN had during the latter part of the day on 3rd April, complained of headache and had gone to his guardian's house. In the evening he complained of severe headache, diarrhoea and vomiting and was taken to Punakha hospital but died on the way, at around 11:30p.m.

After reviewing the 5 cases (3 death and 2 survivors) from the same school, their clinical symptoms and CSF result from case ST, the team concluded that the outbreak was probably bacterial meningitis. The five cases had symptoms consistent with the case definition for bacterial meningitis i.e., "**sudden onset of fever, intense headache, nausea, vomiting, neck stiffness and petechial rash with pink macules**" (*national notifiable diseases surveillance manual*). To confirm the etiological agent of the outbreak microbiological laboratory result for the two cases admitted in JDWNRH were enquired. No lab result was available for case TW but for case ST CSF culture was already known to team as negative but Gram stain result was not available. Upon follow up, gram stain from CSF sample for case ST was carried out on the afternoon of 17th April and reported as Gram negative diplococcic seen with numerous WBC's

and also positive with agglutination test for *N. meningitidis*. The Outbreak was then confirmed as an outbreak of **meningococcal meningitis**.

3.2 Epidemiological investigation

Based on sign and symptoms presented by the 5 cases (one confirmed case, 3 deaths and one epidemiological linked), case definition was defined for the outbreak as "**any student from Thinlaygang Middle Secondary School who visited Thinleygang BHU from 2nd -16th April, 2010 suffering from fever, headache, nausea and vomiting or diarrhea associated with or without stiff neck and unconsciousness'** to line list the cases. Based on the case definition, cases were line listed and classified (Table 1) from BHU emergency and OPD records. Interestingly all 19 cases were boys.

Table 1: Case classification

Cases classified	No. of cases
Suspect	Not applicable
Probable	18 (3 death)
Confirmed	1

A total of 19 cases were registered in Thinleygang BHU from 2nd – 16th April 2010. The index case was Tandin Wangchuk (case TW) 19/Male who was bought to BHU on 3rd April morning because this case was referred to JDWNRH where the clinician had made a clinical diagnosis of bacterial meningitis (however, the lab report is not available).

Case JN had epidemiological link (close contact) to probable case (case TW) and had similar clinical symptoms. The date of onset of illness was 2nd April morning and most probably this index case would have acquired infection on 28th or 29th of March from friend (carrier) because the incubation period for *N. meningitidis* averages 3-4 days and ranges from 1-10 days. Going through BHU record, not many cases with similar clinical symptoms of outbreak have been reported on 28th/29th but increase numbers of ARI cases were recorded on 23rd, and 25th March 2010 which could be taken as proxy for probable onset of outbreak. As per the date of onset in the index case, the outbreak started from 3rd April 2010 which was the first wave of outbreak. Since the outbreak was not picked up (possibly due to the low number of cases and lack of laboratory diagnosis), transmission continued among the students and the second wave of outbreak began from 11th April and continued until it was investigated and contained on 17th April (Figure 1). The age group affected ranges from 15-19 years; all age group of boarding student (Figure 2).

Figure 1: Epi-curve

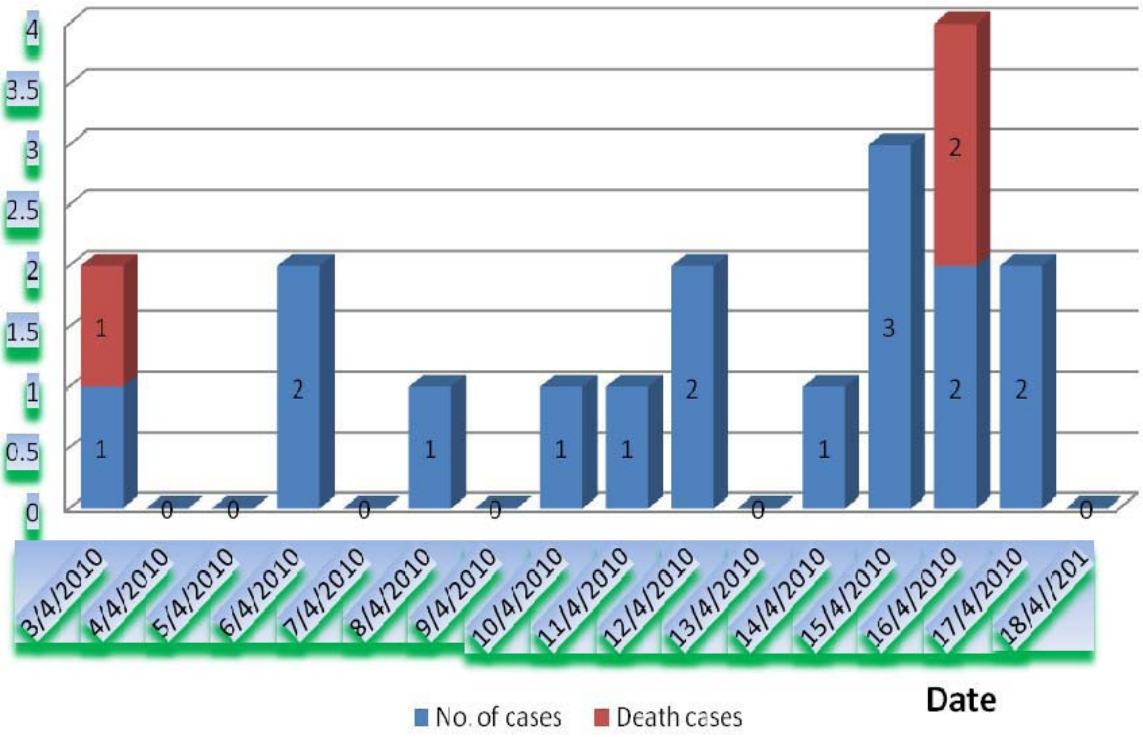
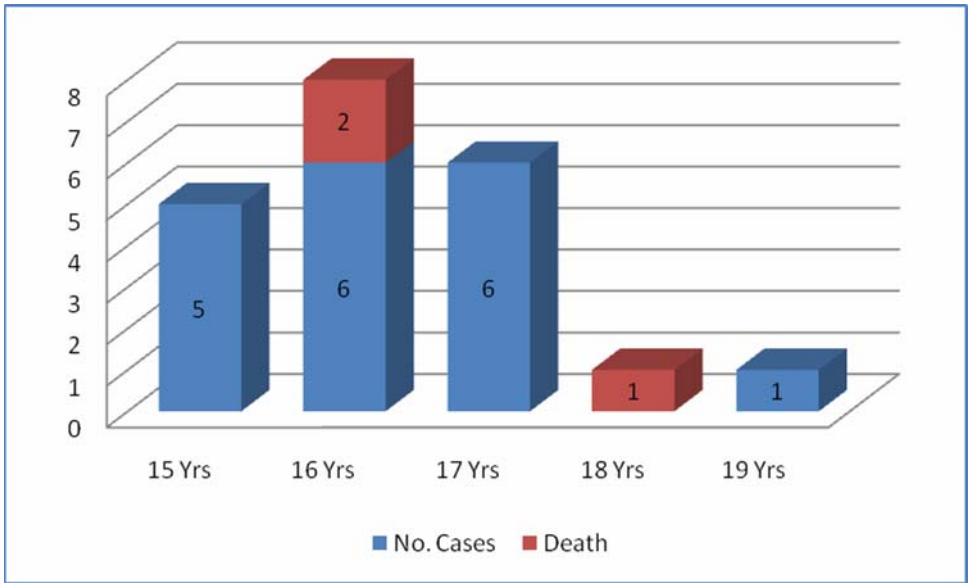


Figure 2: Age breakdown of cases



All 3 deaths were epidemiologically linked to either probable or confirmed cases. Of the 3 deaths, 2 died of ***meningococcemia*** and 1 death was not recorded since patient died on the way to Punakha hospital**.** The case fatality rate was 60% among the students who had suffered from the disease. Normally, the case fatality rate for meningococcal meningitis ranges from 5-10% but in developing countries, the mortality rate from meningococcal meningitis is often much higher (20-40%) than in developed countries and may exceed 40% in patient with meningococcal

sepsis. Mortality rates are dependent on the type and severity of invasive disease, and are greatest for fulminant septicaemia (up to 55%) followed by meningitis with associated septicaemia (up to 5%), and lowest for meningitis without sepsis (generally <5%). However, patients who survive nvasive meningococcal disease often live with a number of physical and mental sequelae, including amputation of limbs and digits, scarring of skin, deafness, speech impairment and seizures. From the cases (3 cases) referred to the JDWNRH 2 has survived but one suffered neurological sequelae (deafness in right ear), i.e., 50% of neurological sequelae among those who survived meningococcal disease. Studies have shown that in meningococcal meningitis outbreak, 10-20% of survivors experience neurological sequelae.

3.3 Environment investigation

The investigation team visited the Thinleygang Middle Secondary School after investigation in the BHU and met with the school Principle and school health teacher. It was found that Thinlaygang Middle Secondary School has 376 students with 297 boarders.

After interviewing the staff, it was learnt that all cases including deaths were in boarder boys. The team then visited the boys hostels and investigated the living environment and condition. There are two hostel buildings (2 storeys) closely located below main academic building and each building housed two houses (Tak, Singye house in one building and Chung, Druk house in another building). Each house has around 34 students living together which have actual capacity for 16 students only. The beds were double bunk beds with hardly any space between them. All rooms (four houses) were totally congested with all belongings together with very poor ventilation (Figure 3). Since the living environment of boys hostel were congested and had poor ventilation, the environment was conducive for *Neisseria meningitidis*, which is transmitted through respiratory droplets created during coughing and sneezing by infected person or carrier. All 3 death cases were from ground floor (2 death cases from Singye house, 1 death case from Chung house). The attack rate of the outbreak ranges from 20% - 26% among students living in the four houses based on the total number of students who fit the case definition.

3.4 Laboratory investigation

Since one of the cases was confirmed as *Neisseria meningitidis* from the outbreak episode, further samples collection and analysis was not required or recommended. Also, no more cases fitting the case definition were reported.

4. Conclusion

The Outbreak in Thinlaygang Middle Secondary School was due to meningococcal meningitis caused by *N. meningitides* and all 3 deaths were epidemiologically linked to a confirmed or probable case.

5. Interventions undertaken

5.1 The students were briefed on the disease, its mode of transmission and prevention.
5.2 All students and staff Thinlaygang Middle Secondary School were administered blanket chemoprophylaxis with Rifampicin 600 mg BD for 2 days.
5.3 The school was advised to isolate suspected cases and to refer them to the BHU.

5.4 Decongestion of students living in hostels; some of the students were moved to the classrooms.
5.5 Advised regular cleaning of hostels.
5.6 Ensure adequate ventilation in hostels.
5.7 Students were advised to practise personal hygiene and sanitation and cough etiquette.
5.8 Posted a GDMO from JDWNRH at Thinleygang BHU temporarily until such time as the MoH is confident that the outbreak has been controlled.

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The Policy and Planning Division would like to solicit reviews and feedbacks for the betterment of the publication. Suggestions, views and constructive criticism are always welcome.

Any queries may be forwarded to address given below.

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