WEEKLY EPIDEMIOLOGICAL REPORT

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231, de Saram Place, Colombo 01000, Sri Lanka
Tele: + 94 11 2695112, Fax: +94 11 2696583, E mail: epidunit@sltnet.lk
Epidemiologist: +94 11 2681548, E mail: chepid@sltnet.lk
Web: http://www.epid.gov.lk

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Antimicrobial Resistance

Until modern times, the major cause of death in mankind was infection due to microorganisms such as bacteria, fungi, parasites and viruses. In low-resource settings, infectious diseases continue to be the major killer.

The discovery of penicillin on a moldy Petri dish in 1928 by Alexandar Fleming launched a new era in medicine. This natural compound, produced by the Penicillium fungus, was found to be toxic to bacteria, but safe for use in humans. The use of penicillin in World War II is credited with the saving of hundreds of thousands of lives.

The discovery of penicillin was followed by a vigorous search for other natural or synthetic compounds which could be used to treat other microbial pathogens. For some organisms, the quest has been more challenging than for others. Bacterial cells differ from human cells in many fundamental ways, so there are more opportunities for new drug development. In contrast, fungi, parasites and viruses share many pathways and structures with human cells, so researchers must contend with fewer target sites of action and greater risks of patient toxicity.

The origin of antimicrobial resistance

For billions of years, certain bacteria and fungi have produced chemical substances to protect them from attack from other microorganisms. Those used in clinical medicine today are referred to as "antibiotics" or "antimicrobial agents". As a survival mechanism, other microbes have developed mechanisms for resisting the toxic effect of antimicrobials. "Antimicrobial resistance" is thus an ancient phenomenon encoded on resistance genes passed down through microbial lineages.

Susceptible strains can become resistant either through mutations in existing genes or by acquiring a resistance gene from another organism that is already resistant. This is the first step in the emergence of "new resistance". Fortunately for most organisms, susceptible organisms do not easily become resistant -resistance that we observe today in clinical practice usually developed in another person, animal or environmental reservoir in some other part of the world many years earlier.

Though for most organisms the sudden appearance of new resistance is rare, this is not the case for all pathogens. For example, in patients with tuberculosis or HIV infection, new mutations in susceptible strains can occur within a patient, especially when therapy is suboptimal. The emergence of resistant strains during therapy greatly increases the risk of a poor clinical outcome, including death. Consequently, effective treatment is absolutely critical to avoid the development of resistance during treatment.

Selection and spread

The main drivers of resistance rates are not new mutations but rather antimicrobial selection pressure and transmission.

Antimicrobial selection pressure-

A person's normal flora consists of millions of strains of both susceptible and resistant microbial strains and species. The use of an antimicrobial to treat an infection impacts not only the specific pathogen causing disease, but also decimates populations of susceptible organisms throughout the body. Resistant strains thrive and expand, putting the patient at higher risk of a resistant infection in the future.

Transmission of resistance microbes-

Because of the movement of microorganisms between patients, healthcare workers and family contacts, antimicrobial use in a single patient poses risks locally and ultimately to the global community. Resistant organisms spread via direct contact, environmental surfaces, waterways and food.

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Public Health Importance of Antimicrobial Resistance

Antimicrobial resistance is not a "disease". Typically, there is no difference in the severity of disease caused by susceptible strains and resistant ones. Resistance is generally not a problem of disease pathology but one of limited therapy options.

The core issue is our dependence on antimicrobials for treating infections. If there were alternate methods of treating infections, antimicrobial resistance would persist in the world but would no longer be relevant as a public health concern.

Antimicrobial resistance is a public health threat driven by healthcare practices, most notably the overuse of antimicrobials in conditions for which they provide no benefit.

Resistance is a characteristic of many pathogens causing different diseases. Containment strategies thus must be adopted to the needs of specific disease control and treatment programmes.

Some Leading Resistant Pathogens

Many types of microorganisms cause infection in humans and animals, so disease prevention and treatment strategies must be adapted to reflect infection risk factors and available treatment options. Over the past decades, most pathogenic species have developed resistance to one or more antimicrobials. Some of the species in which resistance is of greatest public health concern are listed below.

Bacteria - Community

Mybocaterium tuberculosis, Neisseria gonorrhoeae, Salmonella typhi, Staphylococcus aureus, including community-associated MRSA (Methicillin-Resistant S. aureus, Streptococcus pneumonia

Bacteria - Hospitals

Acinetobacter baumannii, Enterococcus faecium and Enterococcus faecalis, including VRE (Vancomycin-resistant enterococci), Multidrug-resistant enteric pathogens, including Escherichia coli and Klebsiella pneumoniae producing ESBL and KPC enzymes, Pseudomonas aeruginosa, Staphylococcus aureus, including MRSA (Methicillin-Resistant S. aureus), Stenotrophomonas maltophilia.

Bacteria - Zoonotic disease

Campylobacter species, Salmonella species

Fungi

Candida albicans

Parasites

Leishmania species, Plasmodium species, Trypanosoma species

Viruses

Cytomyegalovirus, Herpes simplex virus, HIV

Surveillance of antimicrobial resistance

Surveillance of antimicrobial resistance tracks changes in microbial populations, permits the early detection of resistant strains of public health importance and supports the prompt notification and investigation of outbreaks. Surveillance findings are needed to inform clinical therapy decisions, to guide policy recommendations, and to assess the impact of resistance containment interventions.

Types of surveillance

Appropriate strategies for surveillance of antimicrobial resistance should reflect identified scientific or public health objectives, resources and available technical capacity for testing, and sustainability. A combination of complementary approaches is often desirable.

Alert organism tracking-Identification, confirmation and communication of specific organisms of great public health importance, such as vancomycin-resistant Staphylococcus aureus or extensively drug-resistant Mycobacterium tuberculosis

Enhanced routine surveillance-Active review, interpretation, confirmation and investigation of results generated in the course of routine clinical care

Targeted surveys-One-time or periodic study protocols to address specific scientific or public policy needs not adequately addressed by routine diagnostic test results.

The role of the microbiology laboratory

A key partner is the microbiology laboratory. Healthcare workers and public health authorities rely on the work and expertise of laboratory staff to determine what organism is causing a patient infection and what antimicrobials would be effective treatment options

Software for surveillance of antimicrobial resistance

WHONET-Software for the management and analysis of microbiology laboratory test results with a focus on antimicrobial susceptibility test results

SDRTB4-Surveillance of Drug Resistance in Tuberculosis Version 4.0

Surveillance of antimicrobial use and antimicrobial resistance

Antimicrobial resistance surveillance is enhanced when linked to monitoring of antimicrobial use practices. The collaborative efforts of the European Antimicrobial Resistance Surveillance System and the European Surveillance of Antimicrobial Consumption program have demonstrated that the integrated monitoring of resistance, use, and costs can prove the crucial factor driving political commitment to successful resistance containment campaigns

Antimicrobial use

Prompt antimicrobial therapy for an infected patient can make the difference between cure and death or long-term disability. Unfortunately, the use and misuse of antimicrobials has driven the relentless expansion of resistant microbes leading to a loss of efficacy of these “miracle drugs”.

Improving antimicrobial use

Because of their widespread availability and familiarity, generally low cost and relative safety, antimicrobials are among the most misused of all medicines. Improving antimicrobial use decisions ultimately involves guiding treatment decisions made by patients and healthcare providers.

- Increase appropriate use-Ensure that infected patients who need antimicrobial therapy have access to quality medicines which conform with policy recommendations and standard treatment guidelines.
- Decrease inappropriate use-Discourage the indisciminate use of antimicrobials in patients unlikely to derive any benefit.

Source-Drug resistance, available from *http://www.who.int/drugresistance/Microbes_and_Antimicrobials/en/index.html*

Compiled by Dr. Madhava Gunasekera of the Epidemiology Unit

Table 4: Selected notifiable diseases reported by Medical Officers of Health 14th – 20th September (38th Week)

RDHS	Dengue Fever		Dysentery		Encephaliti		E Fever		F Poisoning		Leptospiros		T Fever		V Hepatitis		H Rabies		Chickenpox		Meningitis		Leishmaniasis		WRCD %	
	A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**T***	**C****
Colombo	131	7423	1	158	0	16	5	114	0	48	4	166	0	7	0	65	0	1	17	344	2	53	0	0	**85**	**15**
Gampaha	43	2807	1	163	1	14	0	44	3	29	16	305	1	16	1	156	0	0	6	131	1	77	0	5	**67**	**33**
Kalutara	26	1384	1	147	1	18	1	67	0	23	6	305	0	4	0	20	0	0	0	207	1	59	0	0	**77**	**23**
Kandy	20	1466	4	119	0	11	0	21	0	8	1	65	1	91	1	82	0	0	2	104	0	13	0	3	**83**	**17**
Matale	4	373	2	79	0	4	0	23	0	7	1	54	0	4	1	36	0	0	0	39	0	32	1	11	**77**	**23**
NuwaraEliya	7	202	5	133	0	2	0	9	0	144	2	23	0	57	0	19	0	0	1	99	0	12	0	0	**77**	**23**
Galle	24	709	3	93	0	18	0	4	0	79	4	181	0	46	0	11	0	1	2	263	0	43	0	0	**89**	**11**
Hambantota	2	269	0	45	0	3	0	14	0	32	0	157	0	61	0	79	0	0	1	86	1	44	24	270	**83**	**17**
Matara	4	388	0	65	0	10	1	27	0	27	1	127	3	74	0	131	0	2	7	222	0	64	1	74	**100**	**0**
Jaffna	8	572	17	250	0	8	2	290	0	88	0	8	0	326	0	14	0	1	0	129	0	51	0	0	**83**	**17**
Kilinochchi	1	56	1	27	0	0	1	14	0	5	0	9	0	16	0	0	0	1	0	2	0	7	0	10	**50**	**50**
Mannar	1	61	6	59	0	1	0	57	11	36	1	14	0	18	0	2	0	0	0	11	0	5	1	4	**100**	**0**
Vavuniya	0	59	1	37	0	12	0	9	0	16	0	50	0	2	0	3	0	2	0	21	0	30	0	8	**25**	**75**
Mullaitivu	0	103	1	14	0	2	0	7	0	34	0	37	0	6	0	1	0	2	0	8	0	5	2	14	**80**	**20**
Batticaloa	4	486	5	243	0	5	0	6	17	66	0	31	0	2	1	11	0	3	0	39	0	7	0	0	**93**	**7**
Ampara	5	148	5	123	1	1	0	4	1	9	0	31	0	1	0	6	0	0	1	75	1	16	0	3	**100**	**0**
Trincomalee	1	180	3	56	0	3	0	5	1	2	0	59	0	11	0	3	0	1	0	36	0	4	0	27	**58**	**42**
Kurunegala	10	2418	7	142	0	32	1	36	0	23	3	264	3	37	2	46	0	1	1	294	0	92	1	37	**96**	**4**
Puttalam	6	775	1	60	0	7	0	15	0	35	0	39	0	12	1	6	1	1	2	68	0	31	1	8	**54**	**46**
Anuradhapur	4	433	1	84	0	16	0	3	0	35	1	296	0	20	2	20	0	2	0	154	0	86	8	331	**63**	**37**
Polonnaruwa	6	358	1	57	0	1	0	14	0	61	1	152	0	3	0	27	0	2	1	115	0	16	5	135	**86**	**14**
Badulla	8	422	6	153	0	4	0	16	1	9	0	47	1	68	0	40	0	0	1	102	0	52	0	7	**82**	**18**
Monaragala	4	201	3	97	0	4	0	20	0	20	2	193	1	52	40	139	0	1	3	44	0	22	0	10	**82**	**18**
Ratnapura	10	1525	1	304	0	83	0	37	0	16	4	289	2	55	23	351	0	1	2	134	0	73	0	12	**78**	**22**
Kegalle	9	921	0	100	0	14	2	25	0	11	5	169	1	67	6	186	0	0	6	265	2	97	0	0	**91**	**9**
Kalmune	0	485	0	128	0	2	0	3	3	101	0	8	0	2	0	4	0	0	0	76	0	8	0	1	**69**	**31**
SRI LANKA	**338**	**24224**	**76**	**2936**	**01**	**291**	**13**	**884**	**37**	**964**	**52**	**3097**	**13**	**1058**	**78**	**1458**	**01**	**22**	**53**	**3068**	**08**	**999**	**44**	**970**	**80**	**20**

Source: Weekly Returns of Communicable Diseases (WRCD).

***T=**Timeliness refers to returns received on or before 20th September , 2013 Total number of reporting units 339. Number of reporting units data provided for the current week:270 C** Completeness

A = Cases reported during the current week. **B** = Cumulative cases for the year.**H Rabies***= Human Rabies, **E Fever***=Enteric Fever, **F Poison*** =Food Poisoning, **T Fever***=Typhus Fever, **V Hepatitis***=Viral Hepatitis

Table 1: Vaccine-Preventable Diseases & AFP 14th – 20th September 2013 (38th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2013	Number of cases during same week in 2012	Total number of cases to date in 2013	Total number of cases to date in 2012	Difference between the number of cases to date in 2013 & 2012
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	00	00	00	00	00	00	00	00	00	03	68	60	+ 13.3 %
Diphtheria	00	00	00	00	00	00	00	00	00	-	-	-	-	-
Mumps	02	01	03	01	02	01	00	00	03	13	68	1203	605	+ 98.8 %
Measles	40	03	20	00	02	04	00	04	26	99	03	2861	47	+ 5987.2 %
Rubella	00	00	00	00	01	00	00	00	00	01	-	24	-	-
CRS**	00	00	00	00	00	00	00	00	00	00	-	06	-	-
Tetanus	00	00	00	00	00	00	00	00	00	00	00	18	08	+ 125.0 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	-	00	-	-
Japanese Encephalitis	00	00	00	00	00	00	00	00	00	00	-	66	-	-
Whooping Cough	00	01	00	00	00	00	00	00	00	01	03	65	74	- 12.2 %
Tuberculosis	05	00	00	00	16	00	00	15	12	48	148	6264	6403	- 02.2 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,

Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis

CRS =**Congenital Rubella Syndrome

AFP and all clinically confirmed Vaccine Preventable Diseases except Tuberculosis and Mumps should be investigated by the MOH

Dengue Prevention and Control Health Messages

To prevent dengue, remove mosquito breeding places in and around your home, workplace or school once a week.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk. Prior approval should be obtained from the Epidemiology Unit before publishing data in this publication**

ON STATE SERVICE

Dr. P. PALIHAWADANA
CHIEF EPIDEMIOLOGIST
EPIDEMIOLOGY UNIT
231, DE SARAM PLACE
COLOMBO 10