BACTERIOLOGY RESEARCH DIVISION

Deputy Director & Head	…	Dr. Mya Mya Aye MBBS, MMedSc, PhD(Microbiology) (UM1)
Research Scientist	…	Daw Thuzar Myint BSc(Zoology) (YU) DPMS
Research Officer	…	Dr. Nan Aye Thida Oo, MBBS (UM2) MMedSc (Microbiology) (UM1)
	…	Dr. Hpoo Pwint Myo Win, MBBS (UM1) MMedSc (Microbiology) (UM1)
	…	Dr. Yu Wah Lwin, MBBS (UM2) MMedSc (Microbiology) (UM1)
	…	Daw Than Mya BSc(Hons) MSc (Zoology) (YU)
Research Assistant (2)	…	Daw Aye Aye Maw BSc (Mathematics) (YU)
	…	Dr. Thida Kyaw BSc (Zoology) MSc (Biotechnology) PhD (Zoology) (YU) (Attached to Virology Research Division)
Research Assistant (3)	…	Daw Aye Yin Shwe BA(Geography) (DU)
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	…	Daw Saw Nan Wai

The Bacteriology Research Division was engaged in the research activities on respiratory, bacteriological aspects on therapeutics and environmental health. One of the main areas of research was the detection of antimicrobial resistant organisms in clinical samples of the patients.

RESEARCH PROJECTS

1. COMMUNICABLE DISEASES

1.1. CHOLERA

1.1.1. Molecular characterization of *Vibrio cholerae* in Yangon and Mandalay (2016)

(Please refer to the Annual report of Molecular Technology Applications Division)

1.2. ANTIMICROBIAL RESISTANT BACTERIAL INFECTIONS

1.2.1. Distribution of Carbapenem- Resistant *Enterobacteriaceae* in Yangon General Hospital, Myanmar (2016)

This study was carried out in collaboration with Osaka University, Japan to determine the Phenotypic and genotypic characterization of carbapenemase producing *Entero-bacteriaceae*. The clinical samples including urine, pus, sputum, throat swab, wound swab and blood submitted to Microbiology Laboratory at Yangon General Hospital were subjected to determine the bacteriological identification and antimicrobial susceptibility testing by using VITEK2 automatic system (SysmexbioMerieux, Marcy l'Etoile, France) at the Microbiology laboratory, Yangon General Hospital. *Enterobacteriaceae* isolates showing minimum inhibitory concentration (MIC) levels of 2 μg/mL or more for meropenem were transferred to Bacteriology Research Division, Department of Medical Research and Osaka University,

Japan, for further phenotypic and molecular analysis. Of 98 isolates tested, 41 (41.8%) isolates were reconfirmed to show the higher MIC levels to both imipenem and meropenem. There were 27 isolates of *Escherichia coli*, 8 isolates of *Klebsiella pneumoniae* and 6 isolates of *Enterobacter cloacae*. The clinical specimens were mostly blood, followed by urine, sputum and peritoneal fluid. Sources of the pathogens were distributed to various clinical wards; haematology ward (21 cases), medical ward (4 cases), intensive care unit (6 cases) and surgical ward (2 cases). MIC levels of the carbapenems were ranged from 2 to more than16 μg/mL. All these CRE-suspected isolates were subjected to PCR analysis to screen for major carbapenemase genes (bla_{NDM}, bla_{KPC}, bla_{IMP}, bla_{OXA-48}). The PCR products were purified and subsequently sequenced by the 3130xl Genetic Analyzer (Applied Biosystems, Foster City, CA). The results demonstrated that all strains harbored bla_{NDM} genes and the nucleotide sequencing showed bla_{NDM-1} (1 strain), bla_{NDM-4} (6 strains), bla_{NDM-5} (19 strains) and bla_{NDM-7} (5 strains). Results of PCR for the other major carbapenemase genes were all negative. The multi-locus sequence typing (MLST) and pulsed-field gel electrophoresis (PFGE) were further carried out. The allele sequences and sequence types (STs) were identified at reference websites. The results detected that ST2 (4 strains), ST8 (1 strain), ST39 (1 strain), ST477 (4 strains), ST649 (2 strains) and ST692 (1 strain) for *E. coli*. The findings from this study uncovered that New Delhi metallo-β-lactamase (NDM) producing CRE is widely prevailing among clinical samples at Yangon General Hospital (YGH).

1.2.2. Emergence of multi drug resistant bacteria in diabetic wounds

The present study aimed to isolate multi-drug resistant bacteria (resistant to three or more classes of antibiotics) from wound swab samples of chronic diabetic wound. This cross-sectional hospital and laboratory based descriptive study were conducted during June 2016 to May 2017. The isolation, identification and drug susceptibility profile of isolated pathogenic bacteria were done by VITEK 2 Compact automated culture and sensitivity system. Among tested 100 wound swab samples, 91 samples (91%) showed growth of bacteria. Out of 91 samples, 52 samples (57.1%) had growth of single organism while the rest 39 samples (42.9%) were polymicrobial. A total of 137 bacterial pathogens were isolated. Among them 13.1% was gram positive bacteria (18/137) and 86.9% were gram negative bacteria (119/137). Among gram positive bacteria, *Staphylococcus aureus* 55.5% (10/18) was the predominant isolate followed by *Enterococcus* species 16.7% (3/18) and coagulase negative staphylococci 11.1% (2/18). Among gram negative bacteria, *Pseudomonas* species 37% (44/119) was the predominant isolate followed by *Citrobacter freundii* 26.9% (32/119), *Escherichia coli* 13.4% (16/119), *Acinetobacter* species 11.8% (14/119), *Proteus* species 5% (6/119) and *Klebsiella pneumoniae* 1.7% (2/119). Among isolated gram positive bacteria, 66.7% (12/18) were multidrug resistant bacteria. *Enterococcus* species showed 100% resistant to levofloxacin and gentamicin**.** Among gram negative bacteria, 73.1% (87/119) were multidrug resistant bacteria (MDR). *Pseudomonas* species was the most commonly isolated MDR bacteria followed by *Citrobacter freundii*, *E.coli*, *Acinetobacter species*, *Proteus mirabilis* and *Klebsiella pneumoniae*. Most of the isolated gram negative bacteria were resistant to cephalosporin groups of antibiotics; cefuroxime was 100% resistant antibiotics for isolated. *Acinetobacter species* and cefotaxime was 100% resistant in isolated *E.coli*. The findings from this research could help the clinicians in the management of diabetic wound infection and also aid in the management of septic morbidity and mortality.

1.3. ACUTE RESPIRATORY INFECTION

1.3.1. Ventilator associated pneumonia and their bacteriological profile in neonatal unit in Yankin Children Hospital

Non bronchoscopic bronchoalveolar lavage (BAL) samples were collected from neonates with ventilator associated pneumonia by using paediatric suction set in Neonatal Unit of Yankin Children Hospital. The demographic and clinical information were recorded and bacteriological identification and antimicrobial susceptibility testing were carried out in Bacteriology Research Division, Department of Medical Research. Ventilator associated pneumonia (VAP) were identified by daily clinical assessment which contains following criteria such as worsening gas exchange, temperature instability, bradycardia or tachycardia, tachypnoea or apnoea, dyspnoea, increasing production of respiratory secretion and need for suction and elevated C-reactive protein (> 20mg/L). A total of 10 BAL samples from neonates with ventilator were obtained. Among these samples, 13 bacterial pathogens were isolated; gram positive bacteria were isolated in 7.69% (1/13) and gram negative bacteria were isolated in 92.31% (12/13). *Staphylococcus aureus* was the only isolated gram positive bacteria. Among gram negative bacteria, *Acinetobacter lwoffii* 16.67% (2/12) and *Citrobacter freundii* 16.67% (2/12) were the most isolated pathogens followed by *Klebsiella* species 8.33% (1/12), *Pseudomonas aeruginosa* 8.33% (1/12), *Pseudomonas vesicularis* 8.33% (1/12), *Pseudomonas testosterone* 8.33% (1/12), *Pseudomonas mallei* 8.33% (1/12), *Pseudomonas* species 8.33% (1/12), *Acinetobacter baumannii* complex 8.33% (1/12) and *Acinetobacter calcoaceticus* 8.33% (1/12) respectively. *Staphylococcus aureus* was highly sensitive to imipenem, flumox, amikacin and cefoperazone/sulbactam and was intermediately sensitive to meropenem, piperacillin/tazobactam, amoxicillin/clavulanic acid and azithromycin. Cefotaxime, ceftazidime, vancomycin, ceftriaxone, ampicillin, ciprofloxacin and gentamicin were the resistant drugs for isolated *Staphylococcus aureus*. Among gram negative bacteria in the present study, cefoperazone/sulbactam was the most sensitive drug (81.81%) followed by levofloxacin (66.67%). They were highly resistant to ceftriaxone (91.67%) followed by cefotaxime (83.33%), imipenem (83.33%), ceftazidime (83.33%), vancomycin (83.33%), ampicillin (83.33%), gentamicin (83.33%), meropenem (75%), amikacin (75%) and azithromycin (75%). This study focused on the bacteriological profile of ventilator associated pneumonia and the current antibiotics sensitivity pattern of microorganisms in neonatal ICU and thus can help to pediatricians in the management of ventilator associated pneumonia.

2. TRADITIONAL MEDICINE

2.1. Evaluation of anti-bacterial activity of Green tea (*Camellia sinensis* (L.) Kuntze) on oral pathogen (*Streptococcus mutans*)

Extract of Green tea (*Camellia sinensis* (L.) Kuntze) was tested for *in-vitro* antibacterial activity by using agar disc diffusion technique. The standard ampicillin disc was used as positive control and distilled water was used as negative control. The minimum inhibitory concentration (MIC) of the green tea extract with the most significant antibacterial activity was evaluated by both tube dilution and plate dilution method. The bacterial strain tested was *Streptococcus mutans*. The extracts of green tea have antibacterial activity on *Streptococcus mutans* which is the most important bacteria in initial development of dental caries. The extract of green tea showed the lowest MIC (≥ 12.5mg/ml) on *Streptococcus mutans.* The research findings provided that the green tea was found to have

antibacterial activity against *Streptococcus mutans* and thus the green tea extract could be a useful agent for the development of oral health products.

SERVICES PROVIDED

ACADEMIC

Sr.	Name	Course	Responsibility
1.	Dr. Mya Mya Aye	PhD (Microbiology) MMedSc (Microbiology) M. Pharm, MMedTech (Medical Laboratory Technology)	Thesis Supervision and Examiner Teaching, Thesis Supervision and Examiner
2.	Daw Thuzar Myint	MMedSc (Microbiology) MMedTech (Medical Laboratory Technology)	Teaching Teaching
3.	Dr. Hpoo Pwint Myo Win	MMedSc (Microbiology) MMedTech (Medical Laboratory Technology)	Teaching Teaching

LABORATORY

Sr.	Laboratory test	Total Number Tested
1	Determination of TB IgG antibody by ELISA	20

BACTERIOLOGY RESEARCH DIVISION (POL)

Deputy Director &Head	…	Dr. Saw Myat Thwe MBBS, MMedSc (Pathology) (UM 2)
Research Officer	…	Dr. Khine War Kyaw MBBS, MMedSc (Microbiology) (UM 2)
	…	Dr. Nwe Nwe Tun MBBS, MMedSc(Rehabilitation Medicine)(UMM)
Laboratory Incharge	…	Daw Mie Mie Lwin BSc (Botany) (MU)
Research Assistant (2)	…	Daw Chaw Su BSc, MSc(Chemistry) (MU)
	…	Daw Tin Zar Aye BSc, MSc(Microbiology) (YU)
	…	Daw Cherry Kyaw Win BSc, MSc(Microbiology) (MU)
Research Assistant (3)	…	Daw San San Shwe BSc(Chemistry) (UDE)
	…	Daw Lai Yin Win BSc(Physics) (MU)
	…	Daw Phyo Mon Oo BSc(Zoology) (MU)
Laboratory Attendant	…	Daw Wai Wai Oo BA (Myanmar Sar) (UDE)

Bacteriology Research Division has been actively engaged in conducting a number of research projects in areas of infectious diseases. The division provides academic services and collaborates to postgraduate students attending other universities.

RESEARCH PROJECTS

1. COMMUNICABLE DISEASES

1.1 RESPIRATORY TRACT INFECTION

1.1.1 Bacteriological study and their antibiotic sensitivity pattern among tonsillitis patients attending selected clinics in Pyin Oo Lwin Township during 2016-2017

Tonsillitis is an infection of the tonsils that causes inflammation. Tonsillitis is inflammation of the tonsils most commonly caused by viral or bacterial infection. When caused by a bacterium belonging to the group A streptococcus, it is typically referred to as sore throat. A total of 400 participants at Pyin Oo Lwin Township during 2016 were enrolled in this study and analyzed the data. In this study, 283(70.3%) patients out of 400 participants revealed infected with *group A alpha haemolytic Streptococci* according to their throat swab culture result. Two patients (0.5%) out of 400 participants revealed infected with *group A beta haemolytic Streptococci* according to their throat swab culture result. Forty-two patients (10.5%) out of 400 participants revealed infected with *Strep Pneumoniae* according to their throat swab culture result. The remaining 73 cases (18.3%) revealed no growth on culture. Commonest age group suffering tonsillitis during the study period was under 12 years age group, 379 cases (94.75%) out of total 400 participants. The common symptoms included sore throat 393 cases (98.3%),pain while swallowing 391 cases (97.8%), coughing 367 (91.8%), headache 339 cases(84.8%), chills 399 cases (99.8%), malaise 387 cases (96.8%) and the commonest signs included red swollen tonsil 398 cases (99.5%) and fever 400 cases (100%) ranged from 99ºF to 102ºF. Antibiotic sensitivity pattern showed resistant to Cotrimoxazole (86.5%) and sensitive to erythromycin (75%), amoxicillin (88%), ceftriaxone (97%), penicillin G (88%), co-amoxyclav (90%) and amikacin (88%). In this study, the most of the tonsillitis patients were caused by group A alpha haemolytic streptococci and antibiotic resistance pattern is very low.

2. NON COMMUNICABLE DISEASES

2.1 CERVICAL CANCER

2.1.1 Cervical cancer screening among married women in Pyin Oo Lwin Township during 2016

Cervical cancer is an important health problem and it is one of the most common malignancies among Myanmar women. It is also one of the most preventable cancers and easiest female cancer to prevent because a precancerous condition can be identified early through the Conventional Cytology, Papanicolaou (Pap) screening test, Liquid-based cytology, Human Papilloma Virus DNA testing and Visual methods (Visual Inspection with acetic acid, VIA and Visual Inspection with Lugol's Iodine, VILI) which can also detect changes in cervical cells that suggest cancer may develop in the future. Most patients with abnormal cervical pathology live asymptomatic and the pathology can only be determined by the pap smear investigation. Cervical smear screening programme is an effective and economic way of early detection of abnormalities of the cervix. A good correlation was found between mass screening activities and reduced incidence as well as mortality rates of cervical cancer. In Myanmar, the prevalence of abnormal cervical pathology among reproductive aged women is still high. This community and laboratory-based cross-sectional descriptive study was done at Pyin Oo Lwin Township to detect cervical cancer for considering of screening service among married women in Pyin Oo Lwin Township, to demonstrate the various cytological pattern of cervical smear and to detect abnormal cytological pattern of cervical smear at early stage. This study was performed during 2016 and a total of 510 participants were enrolled and analyzed. This study recognized the prevalence of the abnormal cervical smear pattern among participants. In this study, 100 patients (19.6%) out of 510 participants revealed inflammatory smear, 10 patients (1.96%) revealed metaplastic squamous cell and 3 patients (0.58%) revealed Cervical Intraepithelial Neoplasia (CIN I)/ Low-grade Squamous Intraepithelial lesion (LSIL) in their cervical smear pattern respectively. This study recognized the high prevalence of the inflammatory conditions among the asymptomatic women.

SERVICES PROVIDED

LABORATORY

Sr. No.	Laboratory Tests	Tested samples
1.	Sub-acute toxicity activity (Histopathology)	7 samples
2.	Antibacterial activity (ချင်းနှံနှံ)	2 samples