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The objective of this Bulletin is to disseminate international news about health and medicine, developments, activities in medical and health research in DMR. The Bulletin is published monthly and delivered to township hospitals.

The Editorial Committee, therefore, invites contributions concerning information about research activities and findings in the field of medicine and health.

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Highlights on Useful Research Findings Applicable to Health

Role of Immunofluorescence in Detecting HER2/*neu* Status in Breast Carcinoma

Cancer rates are expected to grow worldwide in recent years and breast carcinoma becomes the third most common female cancer in Myanmar accounting for 11.8% of all cancer cases. HER2/*neu*, one of the prognostic markers of breast carcinoma, is a member of human epidermal growth factor family and it triggers cell proliferation, differentiation and inhibits apoptosis and is associated with worse prognosis. Targeted therapy against HER2/*neu*, trastuzumab (Herceptin), significantly increases disease-free intervals and overall survivals in both early stage and metastatic breast carcinoma. And so, an appropriate HER2/*neu* evaluation becomes important for the proper identification of patients eligible for treatment with anti-HER2 targeted therapies. The present study was aimed to study HER2/*neu* status in (94) Myanmar breast carcinoma patients by immunofluorescence and its expression was compared with immunohistochemistry (IHC) which is routinely used in most pathology laboratories in Myanmar to determine the accuracy of immunofluorescence.

The mean age of the patients was 52.23±11.82 years and 60% of cases were B-R grade2 (moderately differentiated) according to the Bloom-Richardson System. HER2/*neu* expression was compared between two different methods. One case, 13 cases, 51 cases and 29 cases were determined as score 0, +1, +2 and +3, respectively by IHC. Immunofluorescence also detected 1 case, 16 cases, 32 cases and 45 cases as score 0, +1, +2 and +3, respectively. Immunofluorescence detected higher expressionof HER2/*neu* in score +1 and score +3 but less expression in score +2. There was significant statistical association between HER2/*neu* positivity and histological grade of breast carcinoma (*p* value=0.000) in both methods and sensitivity of immunofluorescence was 91.25% and specificity was 71.43%. Positive predictive value was 94.81% and negative predictive value was 58.82%. Concordance rate between IHC method and immunofluorescence was 88.3% (95% CI).

The present study showed that the evaluation of HER2/*neu* expression by IHC method and immunofluorescence offered a highly reproducible and very robust method with good concordance. The results highlight the accurate assessment of HER2/*neu* status is a critical issue in selecting breast carcinoma patients that might benefit from targeted therapy, trastuzumab.

ရင်သားကင်ဆာရောဂါရှင်များ၌ HER2/**neu** ကို **Immunofluorescence** နည်းပညာဖြင့်ရှာဖွေခြင်း

ကမ္ဘာအနှံ့ အပြားတွင် ကင်ဆာရောဂါဖြစ်ပွားမှုနှုန်းမှာ နှစ်စဉ်မြင့်တက်လျက်ရှိပါသည်။

ရင်သားကင်ဆာရောဂါသည် မြန်မာနိုင်ငံတွင် ဖြစ်ပွားမှုနှုန်း တတိယအများဆုံး ကင်ဆာရောဂါဖြစ်ပြီး ဖြစ်ပွားမှုနှုန်းမှာ ကင်ဆာဝေဒနာရှင် စုစုပေါင်း၏ ၁၁.၈ ရာခိုင်နှုန်းရှိပါသည်။

ရင်သားကင်ဆာရောဂါအား နည်းမျိုးစုံဖြင့် ကုသလျက်ရှိရာ targeted therapy ဖြစ်သည့် Trastuzumab (Herceptin) သည် HER2/*neu* ရှိသော ရင်သားကင်ဆာအတွက် ထိရောက်သောကုသမှုကိုပေးနိုင်ပါသည်။

ထိုသို့ ထိရောက်သော ကုသမှုခံယူနိုင်ရန် တိကျမှန်ကန်သောနည်းပညာဖြင့် HER2/*neu* status အား ရှာဖွေရန်လိုအပ်ပါသည်။

ဤသုတေသနတွင် ရင်သားကင်ဆာရောဂါလူနာစုစုပေါင်း ၉၄ ဦး ပါဝင်ပြီး HER2/*neu* status ကို Immunofluorescence နည်းပညာဖြင့်ရှာဖွေရာတွင် မြန်မာနိုင်ငံရှိ Pathology laboratories များတွင်အသုံးပြုလျက်ရှိသော Immunohistochemistry(IHC) နည်းပညာဖြင့် နှိုင်းယှဉ်လေ့လာမည်ဖြစ်ပါသည်။

၎င်းရောဂါလူနာများ၏ ပျမ်းမျှအသက်မှာ ၅၂.၂၃±၁၁.၈၂ နှစ်ဖြစ်ပြီး ၆၀ ရာခိုင်နှုန်းမှာ Bloom-Richardson Scoring System အရ အဆင့် ၂ (Moderately differentiated) ဖြစ်ပါသည်။ HER2/*neu* status ကို Immunofluorescence နှင့် IHC နည်းပညာများဖြင့် နှိုင်းယှဉ်လေ့လာခဲ့ရာတွင် IHC နည်းဖြင့် score သုည (၁) ဦး၊ score+၁ (၁၃) ဦး၊ score+၂ (၅၁) ဦး နှင့် score+၃ (၂၉) ဦး တို့ ကိုတွေ့ ရှိနိုင်ခဲ့ပြီး Immunofluorescence နည်းဖြင့် score သုည (၁) ဦး၊ score+၁ (၁၆) ဦး၊ score+၂ (၃၂) ဦးနှင့် score+၃ (၄၅) ဦး အသီးသီးတို့ ကိုတွေ့ ရှိခဲ့ပါသည်။

၎င်းတွေ့ ရှိချက်များအရ Immunofluorescence နည်းပညာသည် IHC နည်းပညာထက်သာလွန်ကောင်းမွန်သည်ကိုတွေ့ ရှိရပြီး sensitivity of Immunofluorescence နည်းပညာမှာ ၉၁.၂၅ ရာခိုင်နှုန်းနှင့် specificity မှာ ၇၁.၄၃ ရာခိုင်နှုန်းဖြစ်ပါသည်။

Concordance rate မှာ ၈၈.၃ ရာခိုင်နှုန်း (၉၅ ရာခိုင်နှုန်းCI) ဖြစ်ပါသည်။

သို့ ဖြစ်ပါ၍ Immunofluorescence နည်းပညာသည် ရင်သားကင်ဆာရောဂါတွင် HER2/*neu* status အား ရှာဖွေရန်အတွက် ထိရောက်ကောင်းမွန်သော နည်းပညာတစ်ခုဖြစ်ပါသည်။

Reference: Ohn Mar Kyaw, Aye Aye Lwin, Swe Zin Myint, et al. The 46th Myanmar Health Research Congress Programme & Abstracts: 59.(Second Prize for Applied Research)

Abstract of Research Paper Published or Read Abroad by DMR Scientists

Larvicidal, Ovicidal and Repellent Effect of *Citrus hystrix* DC (Kaffir lime) Fruit, Peel andInternal Materials Extracts on *Aedes aegypti* Mosquitoes

The present study aimed to evaluate the larvicidal, ovicidal and repellent activity of ethanol extracts of dry fruit, peels and internal fruit materials of *Citrus hystrix* DC against *Aedes aegypti*. *Aedes aegypti* larvae were collected from Thanbyuzayat Township, Mon State and 50 each 3rd and 4th instar larvae were exposed for 24 hours in various concentrations of ethanol extracts of different parts of the *Citrus hystrix* fruit, done 5 replicates.

The dry fruit and peels extracts resulted in significantly higher 100% mortality ($p<0.05$) when compared to the mortality (86.8%) caused by internal material of *Citrus hystrix* fruit at the concentration of 0.1gm/ 100mlagainst *Aedes* larvae.

The dose 0.0125g/100 ml of *Citrus hystrix* fruit extract was found to be 100% protection from oviposition of gravid *Aedes aegypti* mosquitoes in laboratory.

The LC_{50} and LC_{90} values were 0.0138, 0.0142 and 0.0276, and 0.0515, 0.0522 and 0.1045 g for fruit extract, peel and internal material.

The highest repellency activity of complete protection time of *Citrus hystrix* DC dose 0.0002g/cm^2 was found dry fruit extract followed by peel extract and lowest activity was found internal fruit materials extracts.

These three extracts provided 100%, 97.52% and 92.15% protection from bite for 30min and 96.72%, 86.25% and 80.25% protection for 60 min and 88.52%, 80.1% and 73.52% protection for 90 min, against adult *Aedes aegypti*.

These extracts did not cause dermal irritation when applied to animal skins.

The findings of the present study revealed that the ethanol extract of the fruit of *Citrus hystrix* DC has strong larvicidal, ovicidal and repellent properties on *Aedes*mosquitoes as a good source of preparations for mosquito control.

Reference: Maung Maung Mya, Zar Zar Aung, Chit Thet Nwe, et al. Journal of Biological Engineering Research & Review 2017; 4(1): 34-43.

News about Medicine & Health

Patients with Drug-resistant Malaria Cured by Plant Therapy

When the standard malaria medications failed to help 18 critically ill patients, the attending physician in a Congo clinic acted under the 'compassionate use' doctrine and prescribed a not-yet-approved malaria therapy made only from the dried leaves of the Artemisia annua plant. In just five days, all 18 people fully recovered. This is a small but stunningly successful trial.

The report documents the experiences of 18 patients in the North Kivu province of the Democratic Republic of Congo who showed symptoms of malaria and were originally treated with the recommended medication: artemisinin-based combination therapy (ACT), which blends artemisinin, a chemical extract from *Artemisia annua*, with one or more other drugs that attack the malaria parasite in different ways.

The 18 patients, ranging in age from 14 months to 60 years, did not respond to the standard ACT treatment, and all lapsed into severe malaria, defined by symptoms that can include loss of consciousness, respiratory distress, convulsions, and pulmonary edema. One patient, a five-year-old child, became comatose. All were then treated with intravenously administered artesunate, the frontline medication for severe malaria,but again they showed no improvement.

As a last resort, doctors turned to dried-leaf Artemisia (DLA), a therapy developed and extensively studied by Weathers and her team at WPI. After five days of treatment with tablets made from only the dried and powered leaves of Artemisia, all 18 patients fully recovered. Laboratory tests showed they had no parasites remaining in their blood. *Artemisia annua*, which is classified as a generally regarded as safe (GRAS) herb, has been consumed by humans and used as an herbal therapy for thousands of years, often in the form of a tea. The dried plant was used rather than just a chemical extract, as a malaria treatment because that dried leaves of the *Artemisia annua* plant delivers 40 times more artemisinin to the blood than does the drug based on the chemical extract of the plant.

The WPI researchers showed that not only does DLA have antimalarial properties, it is more effective in knocking out the parasite and reduced the level of parasite infection more completely in mice. They say the superior performance of DLA kills drug-resistant parasites and avoid the resistance trap, itself, is likely due to the synergistic effects of a complex array of phytochemicals contained in the plant's leaves, several of which are also known to have antimalarial properties and others of which may act both to enhance the absorption of artemisinin into the bloodstream and bolster its effectiveness against malaria.In effect, the dried leaves constitute a robust natural combination therapy, one whose benefits far surpass those of ACT and other combination drugs.

Another advantage of DLA over conventional malaria treatments is its low cost and the relative simplicity of its manufacture, Weathers said. While the processes for manufacturing ACT is costlier and requires a higher degree of expertise, producing DLA tablets can be accomplished with simpler equipment and a modest amount of training. Growing *Artemisia annua* and while their leaves are dried, pulverized, and homogenized, where the powder is compacted into tablets, and producing and testing them, are ideal local business that can provide jobs in impoverished areas and greatly expand access to antimalarial therapy.

Source: https://www.sciencedaily.com.
Contributed by Parasitology Research Division

New Guidelines for Diagnosing Recent Zika Virus Infection in Pregnant Women

Because antibodies of the immunoglobulin M (IgM) class are generally relatively short lived in the circulation, their presence, as opposed to that of immunoglobulin G antibodies, is often considered an indication of recent or intercurrent infection.

In the case of Zika virus infection, which exhibits its most damaging pathophysiology on the developing fetus, establishing whether the pregnant woman has been recently infected or is currently infected is of utmost importance.Recent studies have determined that Zika virus IgM antibodies can persist for more than 12 weeks in a subset of patients, and in some cases may still be present at 4 months. Similar persistence has been shown for other flaviviruses, such as dengue and West Nile viruses. Furthermore, there may be confounding cross reactivity among the IgM responses to the flaviviruses. Results of nucleic acid amplification testing (NAAT) for Zika RNA may be positive for many weeks or, conversely, may be falsely negative later in infection.Therefore, the CDC has issued the following newguidelines for testing asymptomatic women who have visited or who dwell in Zika-endemic areas:

- Screen pregnant women for exposure history.

- Promptly test using NAAT if any symptoms arise or if partner is Zika positive.
- Repeat NAAT each trimester unless earlier test is positive.
- Consider NAAT on amniocentesis specimens if this procedure is done.
- Repeat counseling about test limitations each trimester.
- Consider IgM testing preconception.
- Testing for IgM antibodies or Zika nucleic acid may not be sufficient to define recent infection.

The key information in these guidelines is that, in pregnancy management, the timing of Zika infection cannot, by itself, be reliably established by the presence of ZikaIgM antibodies. Increased emphasis on NAAT is suggested.

Source: https://emergency.cdc.gov.
Contributed by Molecular Technology Applications Division

New Epigenomic Strategies in the Clinical Management of Cancer of Unknown Primary

The invention of the EPICUP® epigenetic test last year allowed physicians to elucidate what type of primary tumor had metastasized in patients with Cancer of Unknown Primary (CUP). Today, an article published in Nature Reviews Clinical Oncology by Dr. Manel Esteller, coordinator of the Epigenetics and Cancer Biology Program of the Bellvitge Biomedical Research Institute (IDIBELL), ICREA Researcher and Professor of Genetics at the University of Barcelona, explains how this test is being transferred to the clinical practice and the new advances that can develop from it. “Traditional methods can only detect the primary tumor in 30% of cases of metastases of unknown origin. Some molecular methods could increase this percentage, but they are often expensive and use the RNA molecule (ribonucleic acid), which is very fragile and is often easily broken down in the samples available in the pathological anatomy services of hospitals," Dr. Manel Esteller explains. "The EPICUP® test, on the other hand, is based on the DNA molecule, which is very stable, so it can be sent from the hospital where the patient is to the analysis laboratory in a simpler way.

The results can be obtained in a week “adds the researcher. Cancer of Unknown Primary (CUP) represents 10% of those human tumors in which metastasis are detected, but the primary tumor cannot be located despite several exploratory tests. Since the tumor type is not known, the survival of these patients is very low; the implementation of the EPICUP® test will lead to the development of more specific treatments in the future, according to the results presented in Nature Reviews Clinical Oncology: "Prospective trials are now needed to determine how these CUP patients, now correctly diagnosed, can benefit from more specific and less aggressive treatments for their disease" Dr. Esteller concludes.

Source: https://www.sciencedaily.com.
Contributed by Scientific Group on Cancer Research

Improved Vaccine that Protects against Nine Types of HPV is Highly Effective

Cervical cancer is the second most common cause of cancer-related death worldwide, with almost 300,000 deaths occurring each year. More than 80 percent of these deaths occur in developing nations. The advent of human papillomavirus (HPV) vaccines has significantly reduced the number of those who develop and die from cervical cancer. And thanks to an international effort to improve the vaccine, the medical community is one step closer to preventing more HPV-associated diseases.

The researchers, including those from Moffitt Cancer Center, published the final results of a study showing the newest vaccine is highly effective at preventing HPV infection and disease.HPV is an extremely common virus. It is estimated that by age 50, four out of five women have been infected with the virus at one point throughout their lifetimes. HPV causes ailments such as genital and anal warts and, in some instances, continued infection can lead to the development of benign or cancerous growths of the cervix, vulva, vagina, anus, penis, tonsils, and base of the tongue. There are more than 100 types of HPV, but only approximately 13 types are associated with cancer development. HPV 16 and 18 alone are estimated to cause 70 percent of all cervical cancers.

Two existing HPV vaccines, Cervarix and Gardasil, are effective at preventing disease caused by HPV types 16 and 18, while Gardasil also protects against genital warts caused by HPV 6 and 11. However, these vaccines do not protect against all HPV types that are associated with cancer. Scientists developed an improved vaccine called 9vHPV that targets HPV 16, 18, 6, and 11, and an additional 5 HPV types that are the next most commonly associated with cervical cancer (HPV 31, 33, 45, 52 and 58). Researchers from 18 countries and 105 study sites conducted a phase 3 study to compare the activity of the new 9vHPV vaccine against the older vaccine that protected against four HPV types (Gardasil). The study randomized 14,215 women 16 to 26 years of age to either 9vHPV or Gardasil, and the study participants were medically followed for 6 years after vaccination.

The study found that the 9vHPV vaccine has long-term activity against HPV infection and disease. The 9vHPV vaccine reduced the risk of developing HPV 31/33/45/52/58-relatedcervical,vulvar, and vaginal disease by 97.7 percent when compared to Gardasil, and the two vaccines had similar activity at preventing HPV 6/11/16/18-associated disease. The 9vHPV vaccine was also highly effective at reducing the risk of having HPV 31/33/45/52/58-associated cervical cell abnormalities, biopsies, and definitive therapies. 9vHPV, known as Gardasil 9, became available in 2015 to protect females and males ages 9 through 26 years against HPV-associated cancers and genital warts. Scientists hope its continued use will greatly reduce the incidence and mortality of HPV-associated diseases.

Source: https://www.sciencedaily.com.
Contributed by Technology Development Division

Nanoscience Advances in Biology

Nanoscience is the study of matter at molecular scales. That has been defined as manipulation of matter between the nanometer (nm) and micrometer (um) scale. For the purposes of biology, nanoscience is an approach that makes use of materials, devices, and systems that are applicable on a nanometer scale. Most of the mechanisms of life fall at least partially into that size range. Some examples of natural biological entities that measure in the nanometer range are:the DNA double helix has a 2 nm diameter, cell membranes are about 10 nm thick and eukaryotic cells have a diameter of about 10 um.

Similarly, artificial nanostructures can be constructed at those same dimensions. Some examples of these are nanopores with openings of about 2 nm, nanowires of 10 nm diameter, and nanoparticles of 10 to 100 nanometers in diameter. The chemistry and physics of nanomaterials can unique and surprising, and have led to some important innovations in biological science.

Nanoscale pores can be used to separate molecules by size and biochemical properties. Ion channels are one example of a natural structure than discriminate molecules based on size. An ion channel has a selectivity in the angstrom range, or around one tenth of a nanometer.Researchers have theorized that the same mechanism can be used to uncoil and separate DNA for sequencing of its nucleotides. In one experiment, a modified natural protein pore, α-hemolysin, was inserted into a somewhat larger synthetic nanopore. The hybrid pore showed an increased selectivity and sensitivity compared to the natural pore, but was more mechanically stable.

Another measurement device that has been created basedon nanotechnology is a carbon nanotube sensor for reactive oxygen species (ROS). It had single-molecule resolution based on optical fluorescence quenching. The sensor was able to identify transient “hot spots” of high ROS concentration near the cell membrane.

Microfluidics is a nanoscale technology for manipulating liquids in droplets of around 1 picoliter, or about 10 um in diameter. The advantage is that effective concentration of reagents is increased at those volumes, while diffusion distance is decreased. This enables greater efficiency for high throughput assays. Nanoscale materials are useful in clinical diagnostics because their greater surface area can be used to capture biomarkers. Researchers have developed a device for analysis of blood using microfluidic chips with a patterned matrix that uses DNA linkers to bind antibodies. The antibodies detect biomarkers that correlate with cytokine, growth factor, and antigen expression.

Nanotechnology has been used to develop needles that can deliver substances through cell walls without destroying the cell or through human skin less invasively than a hypodermic needle. A patterned array of silicon nanowires of about 50 nm in diameter and 1 um in height were used to deliver molecular agents into cells to promote the growth of neurons, siRNA knockdown, and inhibition of apoptosis in experiments. They also targeted proteins to organelles. Another type of nano-needle array was used to deliver drugs to a controlled depth in the skin. The microneedles degrade quickly, leaving no trace.

*Source:*https://www.nano.gov/you/nanotechnology-benefits
Contributed by Scientific Group on Snake Bite Research

New Way to Fight HIV Transmission

Scientists at the University of Waterloo have developed a new tool to protect women from HIV infection. Scientists at the University of Waterloo have developed a new tool to protect women from HIV infection. The tool, a vaginal implant, decreases the number of cells that the HIV virus can target in a woman's genital tract. Unlike conventional methods of HIV prevention, such as condoms or anti-HIV drugs, the implant takes advantage of some people's natural immunity to the virus. HIV infects the body by corrupting T cells that are mobilized by the immune system when the virus enters a person's body. When the T cells stay resting and do not attempt to fight the virus they are not infected and the HIV virus is not transmitted between people. When the T cells stay resting, it's referred to as being immune quiescent.

"We know that some drugs taken orally never make it to the vaginal tract, so this implant could provide a more reliable way to encourage T cells not to respond to infection and therefore more reliably and cheaply prevent transmission," said Emmanuel Ho, a professor in the School of Pharmacy at Waterloo. "What we don't know yet is if this can be a stand-alone option for preventing HIV transmission or if it might be best used in conjunction with other prevention strategies.

We aim to answer these questions with future research." Ho's implant was inspired by previous research involving sex workers in Kenya. In Kenya, Ho and research partner Keith Fowke of the University of Manitoba, observed that many of these women who had sex with HIV positive clients but did not contract the virus. They later found the women possessed T cells that were naturally immune quiescent.

"Observing this, we asked ourselves if it was possible to pharmacologically induce immune quiescence with medication that was better assured of reaching the point of infection," said Ho. "By delivering the medication exactly where it's needed, we hoped to increase the chances of inducing immune quiescence." The implant is composed of a hollow tube and two pliable arms to hold it in place.

It contains hydroxychloroquine (HCQ) which is disseminated slowly through the porous material of the tube and absorbed by the walls of the vaginal tract. The implants were tested in an animal model and the team observed a significant reduction in T cell activation, meaning that the vaginal tract was demonstrating an immune quiescent state.

Source: https://www.sciencedaily.com.
Contributed by Bacteriology Research Division

Recent Arrivals at Central Biomedical Library (http://www.dmrlibrary.org)

1. ACP Annals of Coloproctology. 2018 February; 34(1).
2. Circulation Journal. 2018 April; 82(4).
3. Emerging Infectious Diseases. 2018 April; 24(4).
4. Hiroshima Journal of Medical Sciences. 2017 September; 66(3).
5. Hiroshima Journal of Medical Sciences. 2017 December; 66(4).
6. Myanmar Medical Journal. 2018 March; 60(1).
7. WHO Technical Report Series 1007: Evaluation of Certain Food Additives. 2017.
8. World Malaria Report 2017. Geneva: WHO; 2017.
9. မြတ်ထွဋ်ညွန့်၊ ဒေါက်တာ။ သုတေသနနည်းပညာနှင့်အခြေခံစာရင်းအင်းပညာ။ ရန်ကုန်၊ ဇေရတနာစာပေ၊ ၂၀၁၈။

ဆေးသုတေသနဦးစီးဌာန၏လုပ်ငန်းဆောင်ရွက်နေမှုများကို ပြည်သူများပိုမိုသိရှိလာစေရန်၊ ပြည်တွင်းရှိဌာနဆိုင်ရာအဖွဲ့ အစည်းများ ပြင်ပအဖွဲ့ အစည်းများနှင့် ဆက်သွယ်ဆောင်ရွက်ရာ၌ ပိုမိုလွယ်ကူစေရန်၊ ပြည်ပနိုင်ငံများရှိတက္ကသိုလ်များ၊ အဖွဲ့ အစည်းများနှင့် ပူးပေါင်းဆောင်ရွက်ခြင်းကိုလွယ်ကူစေရန်နှင့်နိုင်ငံတော်တွင်တိုးတက်ဖြစ်ပေါ်လာမည့်ဆက်သွယ်ရေးကွန်ရက် အခြေခံအဆောက်အဦ (Network Infrastructure) အား အသုံးပြု၍ e-government ဆိုင်ရာလုပ်ငန်းများကို တိုးမြှင့်ဆောင်ရွက်သွားနိုင်ရန် ရည်ရွယ်လျက် လွှင့်ထူထားသော အောက်ဖော်ပြပါ Website များကို သုတေသီပညာရှင်များ၊ ကျန်းမာရေးဝန်ထမ်းများနှင့် စိတ်ပါဝင်စားသူများ လေ့လာနိုင်ပါသည်။

၁။www.dmrlm.gov.mm(Official Website)

၂။www.ercdmrlm.org(Ethical Website)

၃။www.dmrlibrary.org(Central Biomedical Library Website)

၄။www.dmr-um.gov.mm(Pyin Oo Lwin Branch Website)

၅။www.myanmarhsrj.com(Myanmar Health Sciences Research Journal Website)

၆။www.mhrr-mohs.com(Myanmar Health Research Registry Website)

သို့

ကျန်းမာရေးနှင့်အားကစားဝန်ကြီးဌာနမှဝန်ထမ်းများအားဖြန့် ဝေပေးပါရန်မေတ္တာရပ်ခံအပ်ပါသည်။