9th DiMiMED conference – Abstracts

Low Incidence of COVID-19 in Sub-Saharan, Africa – Myth or Reality?

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INTRODUCTION

1. The end of 2019 witnessed the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in Wuhan China and its rapid global spread elevated it to a pandemic status with the resultant significant morbidity and mortality worldwide (1). In addition to the burden placed on healthcare systems worldwide, the spread of COVID-19 has also negatively impacted on the global economy and disturbed the normal pattern of social and cultural practices, resetting the world system and forcing people to adopt the "new normal" way of life (1,2).

2. Early in the pandemic, it was expected that low- and middle-income countries would be particularly devastated because of already strained healthcare systems and minimal ventilator capacity. In addition, the poor socioeconomic status of many countries in Africa, as well as the widespread malnutrition, fragile healthcare systems, endemic tropical infections, poverty, and close contact social practices render it one of the most vulnerable regions in the world to COVID-19 infection (2,3). However, despite this fear, confirmed COVID-19 cases are limited to sub-tropical and temperate zones, with equatorial and tropical zone countries recording surprisingly low incidences of COVID-19 (2,3,4). Many public health experts are surprised that the Case Fatality Rate (CFR) in the region has not soared, given the high burden of HIV/AIDS, tuberculosis, malaria and other infections, and other underlying conditions such as malnutrition and high population density in the urban informal settlements with poor hygiene and sanitation (5).

INCIDENCE OF COVID19 IN AFRICA

3. As of May 11, 2021(2), the number of confirmed COVID-19 cases in Africa amounted to 4,690,288 which represented around 2.9 percent of the infections around the world (4,5). By the same

date, coronavirus cases globally were over 160.3 million, causing nearly 3.33 million deaths, while approximately 139 million people recovered from the disease. As of October 19, approximately 242 million infection has been confirmed worldwide with 4.9 million deaths. The African region reported 8.39 million confirmed cases with 21,853 deaths representing 3.4% of infections around the world.

HYOPETHESIS ON LOW INCIDENCE OF COVID-19 IN SUB-SAHARAN AFRICA

4. What could account for the low incidence of Covid-19 in Sub-Saharan Africa inspite of their poor health infrastructure, endemic poverty, diseases and unpreparedness for any pandemic? As the pandemic unfolded, several reasons were proposed for the low incidence of COVID-19 in the sub-Saharan Africa. The hypotheses included low seeding rate, effective mitigation measures, population that is more youthful, favorable weather, and possible preexisting immunity due to prior exposure to other coronaviruses (5). A particularly interesting hypothesis is that protection against infection could be provided by long-term use of antimalarial medication (2, 5). Records show that three of the African countries most affected by COVID-19 on 4 June 2020 are South Africa (37 525 cases and 792 deaths), Algeria (9733 cases and 673 deaths) and Egypt (28 615 cases and 1088 deaths) and these countries belong to the countries less affected by malaria (52, 53). In 2002, the WHO recommended the use of artemisinin-based combination therapy (ACT) in the treatment of uncomplicated malaria in Africa. The ACTs, evaluated at plasma concentrations expected after oral uptake at the recommended doses used in uncomplicated malaria treatment, showed an in vitro inhibition of SARS-CoV-2 replication that ranged from 30% to 70% [54]. The combination mefloquine-artesunate was found to be the most effective in vitro against SARS-CoV-2.

5.Researchers also investigated the possibility of shared immunogenicity between *P. falciparum* and SARS-CoV-2 proteins and first identified a range of antibody binding sites (or epitopes) common in both *P. falciparum* and SARS-CoV-2 (2,60-62). In particular, significant similarities were observed between immunodominant epitopes from the nucleocapsid (N) protein from SARS-CoV-2 and the TRAP (thrombospondin-related anonymous protein) from *P. falciparum*, as well as between the spike (S) protein of SARS-CoV-2 and SSP-2 (sporozoite surface protein 2) from *P. falciparum(60-65)*. Arising from findings of these research works, some researchers have suggested a link between endemicity of malaria infection (in particular *Plasmodium falciparum*) and low case numbers of COVID-19 infection as the countries in Africa with a low incidence of COVID-19 also have a high burden–high incidence (HBHI) of malaria infections(2).

CONCLUSION

6. The combination of the above-mentioned factors are likely to have contributed to the low transmission and reduced disease severity of Covid-19 in Africa. In particular, the contrasting trends of the pandemic in countries presented here, and recent studies cited, make the combined effects of warmer weather and youthful population a compelling explanation of the low COVID-19 disease transmission and severity in Africa. The presence of preexisting immunity due to prior exposure to cross-reacting coronaviruses is intriguing but requires further studies. A particularly interesting hypothesis is that protection against infection could be provided by long-term use of antimalarial medication

7. The demonstrated cross-reactivity between *P. falciparum* TRAP and SSP-2 proteins and SARS-CoV-2 N and S proteins could suggest an explanation for the ambiguous and intriguing finding that malaria-endemic regions have the lowest number of COVID-19 infections compared to the rest of the world. Therefore the evidence of shared immunodominance between Plasmodium falciparum and SARS-CoV-2 may explain low COVID-19 incidence in the malaria-endemic belt of Africa, and could highlight SARS-CoV-2's ability to infect red blood cells.

8. The incidence of low Covid-19 infection is real in Sub-Saharan Africa and this could not be attributed to strict adherence of Covid-19 preventive protocol measures as majority of the people were in default and the will to enforce the protocol by various governments were lacking. It couldn't have been due to good health facilities as many African countries were noted to have poor health infrastructure. Apart from the warm weather and youthful population, the evidence of shared immunodominance between Plasmodium falciparum and SARS-CoV-2 and the chronic use of anti-malaria drugs strongly support the incidence of low COVID-19 infection in the malaria-endemic belt of Africa. However, more research should be encouraged to give a proper understanding for the low incidence of Covid 19 infection in Sub-Saharan countries.

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Gunshot Wounds of the Brain

By **Brig (ret) Harjinder S Bhatoe**, Senior Director Neurosurgery, Max Super Specialty Hospital, Mohali (Punjab). India

Craniocerebral missile injuries are a cause of serious concern to a military surgeon operating in battlefield conditions, as well as to his/her civilian counterpart in urban areas or rural hinterland. Successive wars all over the world have witnessed increasing lethality of the missiles, whether bullets or shrapnel, due to their increased accuracy, and higher velocity. Outcome in low velocity missile injuries, as well in those injuries with good Glasgow Coma score has been uniformly good. Injuries due to high velocity injuries on the

other hand carry grave prognosis inspite of improved care at the forward echelons, better evacuation facilities and availability of neuroimaging. Neuroimaging and critical care facilities have brought a change in the approach to these injuries. Patients with these injuries can now be selected and operated upon with precision and with a brain-conserving attitude. A less aggressive approach (in comparison to what was being advocated till the seventies) is now a universally followed principle. Predictably, this has led to controversies about the exposure(craniotomy or craniectomy), extent of debridement, attitude towards retained intracranial fragments, and surgery of sequelae, like hydrocephalus, cerebrospinal fluid rhinorrhea, cerebral abscess, etc. Role of critical care and medical management (antibiotics, cerebral decongestants, anticonvulsants, etc) assumes equal importance with operative management. Patients with retained intracranial splinters need long-term follow-up to detect migration, suppurative complications, hydrocephalus, etc.

Therapy and verification of poisoning by organophosphorus compounds

By **Prof. Dr. Horst Thiermann**, Bundeswehr Institute of Pharmacology and Toxicology

In recent years poisoning by organophosphorus compounds made the headlines. To prevent harm from medical personnel in the first line, detection of nerve agents on the skin of patients is of crucial importance. The detection of low but clinically relevant amounts of persisting nerve agents is not possible with the detection devices typically used by military forces. To close this gap, an easy to use test kit was developed and will be commercially available at the end of this year. Moreover, early clinical diagnosis is highly recommended to allow adequate medical treatment of poisoned persons. A laboratory test system enables an optimal and patient oriented therapy with oximes in clinical settings, even in field hospitals. In addition, the detection of nerve agent exposure is of special importance. Sophisticated laboratory methods performed by first class specialists are necessary for the unambiguous identification of poison.

In conclusion, equipment and training with these new devices and methods are necessary to enable state of the art protection, diagnosis and treatment. High end laboratories performing research at highest scientific level are necessary to elucidate unusual poisonings with nerve agents.

Tunisian Deployment and missions during the COVID-19 pandemic

By **Col Maj Prof Dr Mohamed Ben Moussa** (and Samah Khairallah, Lobna Sebei, Achref Ben Salah, Susann Zschornack, Manual Diehl, Stefanie Bauer, Simone Eckstein, Kilian Stoecker, Roman Woelfel)

A key part of the German government's Enable and Enhance Initiative in Tunisia was the delivery of a mobile laboratory in 2017 and the extensive training of a Tunisian rapid response team in the same and the following years.

In two simulated outbreak scenarios in Tunisia and Burkina Faso, the Tunisian rapid response team analyzed samples of various matrices, like blood, urine, oral swabs, feces, breast milk or semen for the presence hemorrhagic pathogens with an accuracy rate of 97.8 %. During these trainings, the rapid response team evaluated and optimized several critical points regarding the usage of the mobile laboratory equipment, as well as the human resources needed to run the molecular diagnostics.

In 2019, a new human pathogen called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), causing the disease COVID-19, emerged. Since the methods used in the diagnostic of the fictional pathogens could be easily adapted for the diagnostic of SARS-CoV-2, we had already implemented standardized procedures for SARS-CoV-2 diagnosis at the Military Hospital of Tunis and in the mobile laboratory in February 2020. In spring 2020, when the first SARS-CoV-2 infections were officially confirmed in Tunisia, the mobile laboratory was immediately deployed to regions in Tunisia that did not have laboratories for the diagnosis of SARS-CoV-2. The scope of these missions was to support the national effort in the diagnosis of SARS-CoV-2 and to bring the diagnosis closer to the scene of the epidemic. Since then, the rapid response team has successfully carried out 10 missions in various remote regions in Tunisia: three times to Kebili and once to Sfax, Siliana, Tataouine, Gabes, Sidi Bouzid, Kasserine, and Kairouan, respectively. During these missions, two teams of four persons operated the mobile laboratory in two shifts and analyzed over 200 patient samples per day, with a total analysis number of over 30.000 patient samples up to today. This makes the mobile laboratory and the rapid response team a vital pillar in the management of the COVID-19 pandemic by the Tunisian Ministry of Health.

The promise of new vaccine platforms

By **LTC Marie Mura**, MD, PhD [1,2] and **Brigadier Jean-Nicolas Tournier**, MD, PhD [1,2,3].

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Vaccination has made an enormous contribution to global health. From the practice of variolation by E. Jenner in 1796 to the recently approved mRNA and viral-vectored vaccines to protect against Covid19, new technologies have revolutionized and accelerated the process of vaccine development. Going through the different technologies helps to understand the promise of these new vaccine platforms, especially for the development of vaccines for biothreat and emerging infectious diseases. This evolution is of great importance for the protection of soldiers, exposed as frontline workers, and may also open opportunities to reduce the heavy military vaccine schedule in the future. However, efficient technologies do not replace basic research that is necessary to identify correlates of protection for a rational use of these vaccine platforms.

UK Armed Forces Vaccination Policy in response to COVID

By **LTC Dr Nagpal Hoysal**

The UK Armed Forces policy on vaccination for COVID-19 very closely follows the national programme and the recommendations of the Joint Committee on Vaccinations and Immunisations. Where there was an operational need, some discretion could be applied. The vaccination roll out has been very successful and has achieved a very high level of uptake. The clear benefits of being vaccinated versus not being vaccinated have been realised. There were situations in some operational settings that were difficult given the logistic constraints of and emerging knowledge about safety and efficacy of the vaccines; however we were able to rise to those challenges and deliver positive effects. The key principle of our approach is that we didn't leave anyone behind and ensured that no individual suffered a disadvantage because of their service.

Immunisation schedule of the Polish Armed Forces

By **LTC Przemek Romelczyk** and **LTC Lukas Krzowski** (and Colonel Tadeusz Nierebinski MD, Head of Sanitary Inspection, Department of Military Health Service, Polish Ministry of Defence, Warsaw, Poland)

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In the past century, vaccination has contributed immensely to public health by preventing several

infectious diseases. Attenuated, inactivated, recombinant, virus-vectored or subunit vaccines are employed to stimulate the protective immune responses for prevention, enhancement, or treatment of infectious diseases.

From a military point of view, the most important task to be carried out by the military health system in the field of force health protection (FHP) activities is to protect, improve, conserve, and restore the mental and physical well-being of soldiers across the range of military activities and operations. The delivery of vaccinations is one of the most important elements of preventive measures in order to ensure readiness to perform tasks and protect the service members health.

To carry out the inoculation among the Polish Armed Forces (PAF) was issued on February 3, 2014 by the ordinance of the Minister of National Defence on the preventive vaccination Program for professional soldiers and the manner of registration of those vaccinations. In accordance with the provisions of the Act on Military Service, immunisations for professional soldiers are provided free of charge.

The vaccination program of professional soldiers consists of:

I. Schedule of preventive vaccinations for professional soldiers exposed to specific pathogens and performed for epidemiological reasons,

II. Supplementary information.

Preventive vaccinations are a standard practice in the Polish armed forces and, in accordance with legal provisions, cover a wide range of available pharmacological products. Their use depends on the

exposure factors and the epidemiological situation in the area of operations and daily military service.

Vaccinations are most often performed before going on a mission, engaging in international initiatives (NRF) or deployment a foreign country, and their type largely depends on the risk of exposure to diseases endemic in particular regions. After returning to the country, it is recommended to continue booster vaccinations.

Registration of the vaccinations. The designed purpose of registering vaccinations is to determine the level of immunization of an individual soldier and the entire armed forces of the Republic of Poland, thus maintaining readiness to perform tasks in various operational circumstances and climatic zones.

The health service provider performing protective immunisations of professional soldiers is documented implementation of vaccination by recording them in the medical records kept in the vaccination point and in the International Vaccination Booklet (WHO International Certificate of Vaccination – Yellow Card/Book) in accordance with the model specified in the regulations issued on the basis of art. 19 paragraph 10 of the Act of December 5 2008 on preventing and combating infections and infectious diseases in humans. In addition, those who perform inoculations of soldiers provide information on the implementation of vaccinations to the organizational unit of the military health service designated by the Director of the department of Military Health Service. Data on vaccinations of professional soldiers is collected in the Central Register of Vaccination of Professional Soldiers, which is kept in the Military Record System "SEW on-line".

Regulations relevant to SARS-CoV-2 inoculation.

The first group vaccinated at the beginning of 2021 were soldiers of the medical corps and directly involved in various types of crisis support activities for the civilian community. Currently, 80.5% of soldiers and 66.5% of civilian military personnel are fully vaccinated in the Polish Armed Forces. The main preparations used in the armed forces were vaccines from Johnson & Johnson, Moderna and Pfizer & BioNTech.

Bearing in mind the need to limit the development of COVID-19 outbreaks, candidates called up for military exercises (military training) and for preparatory and territorial military service are required to have a vaccination certificate against COVID-19 or should be vaccinated with at least one dose of the vaccine. For the same reason, it was also decided to qualify only vaccinated soldiers for specialist,

officer, and NCO courses. This requirement also applies to soldiers before going on missions or appointment abroad.

Health Security Threats and NATO Interoperability

By **Lt Col Chelsea B Payne**, USAF, MC, FS, Command Preventive Medicine Physician, HQ US AFRICOM, Health Security Threats and NATO Interoperability

Global health engagements enable NATO allies and partner nations to strengthen security cooperation and build medical interoperability. Engagements can range from delivering aid to providing technical training or hosting key leader discussions. The COVID-19 pandemic has impacted in-person health engagement, yet new opportunities have emerged with the expansion of virtual collaboration. This presentation will discuss benefits and risks associated with virtual and in-person health engagement as well as key indicators to guide the development of programming during the pandemic. Additionally, force health protection, in the context of deployment readiness, will be reviewed along with history of COVID-19 diagnosis as a deployment limiting medical condition. Specific multilateral health engagements, including the Africa Malaria Task Force (AMTF) and African Partner Outbreak Response Alliance (APORA), will be highlighted. Expanding opportunities to collaborate on health initiatives that relate to lifestyle and performance medicine, as well as the Women, Peace and Security Agenda, will be discussed. Global health engagements enable NATO allies and partner nations to respond to shared health security threats through collaboration and alignment of best medical practices.

Point of Injury Care in the Post COVID-19 World

By **PhD Aebhric O'Kelly**

The initial Point-of-Injury assessment and management of the combat casualty is challenging in a normal operation environment but Covid is adding additional difficulties for the combat medic. This presentation will discuss the latest research and publications focusing on Covid complications whilst assessing the combat casualty.

Nerve Agent Incident in Salisbury

By **Dr Paul Russel**, Microbiology Department, Salisbury NHS Foundation Trust, Odstock Road, Salisbury, Wiltshire SP2 8BJ

Six individuals were exposed to a choline-esterase inhibitor latterly identified as a *Novichok* class of the so-called "nerve agents" developed for chemical warfare. Five of these individuals required admission to the Intensive Care Unit (ICU), with the sixth individual treated as an outpatient for a localised, principally, ocular exposure. Pharmacological intervention involved dampening down the cholinergic drive by inhibiting central and autonomic muscarinic receptors with glycopyrrolate, hyoscine and atropine; restoring and recovering choline esterase with pralidoxime and protecting central nervous function with propafol and benzodiazepines. The response to pralidoxime was a dramatic stabilisation of the patients' physiology although no apparent immediate recovery of choline-esterase activity. There were concerns that this lack of enzyme recovery may have been due to a persisting agent "depot", and indeed, the agent was detected at significant levels on areas of likely exposure. Although no formal decontamination was performed on admission, decontamination using Reactive Skin Decontamination Lotion (RSDL) was carried out in the ICU. While decontamination did reduce the amount of agent, the contribution to enzyme recovery is less clear. Five individuals made good physical recovery, although one had persisting vocal cord palsy and one patient died 8 days following exposure.

The unusual nature and circumstances of this incident highlighted the difficulty in discriminating "routine" emergency healthcare problems from a CBRN incident within the civilian healthcare sector, with the potential for serious consequences to the staff and other patients. The identity of one of patients was the key to recognising the true nature of this incident and the rapid assembly and input of a number of agencies was the key to a safe and successful outcome.

Why and How Health & Wellbeing must be on every CHOD's Agenda?

by **Gen Dr Erwin Dhondt**

Within the BEL Defence Forces, I have the honour to lead, guide and inspire since more than two years now a directorate general Health and Wellbeing, immediately subordinated to the CHOD.

In my position of the Director General Health and Well-being in the Defence Staff, or the Chief

Wellness Officer of our Company, I am acting as the advisor to the Chief of Defence on preventive health and wellbeing matters and policy and occupational health and safety in particular. In this way, I saw it as my job to develop and shape a joint integrated health and wellbeing policy for the entire Defence Forces with a contemporary and holistic vision on positive health, from both a mental and physical angle and as far as the application is concerned, based on our own structural "Integrated Fitness"-model and with attention to principles of so-called 'integrative medicine', for a stronger link between well-being and health and counting on the responsibility of the individual to take control of his/her health.

My lecture, on how inside the BEL Military, we have conceived the experience of Health and Wellbeing and structured the service and advice to our clients, which are the servicemen and – women of the intervention forces and beyond, incl. occupational health and safety, integrated soldiers fitness (mental, physical and environmental), health promotion, etc.

Tackling Trauma with Technology: 3MDR for Military Members and Veterans with PTSD

By **Dr Chelsea Jones**

The efficacy, effectiveness, acceptance, and feasibility of Multi-modal Motion-assisted Memory Desensitization and Reconsolidation therapy (3MDR) is currently being studied in Europe and North America for use with trauma affected populations (TAPs) including military personnel, veterans, and, most recently, first responders. This intervention has demonstrated promise for reducing symptoms of treatment resistant (TR) post-traumatic stress disorder (PTSD) and moral injury which includes improving emotional regulation and facilitating a mental shift away from maladaptive cognitions regarding the index trauma. Although 3MDR has demonstrated preliminary successes, the COVID-19 pandemic has created some barriers to ongoing research with restrictions that have, temporarily, reduced the accessibility of the intervention. The purpose of this presentation is to discuss: (1) the recent results of 3MDR studies, and; (2) the possibilities of 3MDR and tailored virtual reality immersion to become more accessible, feasible, and portable in times of global conflicts, natural disaster and pandemics.

Is the Existing Disaster Mental Health Knowledge Base Applicable to COVID-19?

By **Prof Dr Michel Dückers**

The COVID-19 pandemic is one of the largest threats to global health since WW2. Societies across the world have been challenged for almost two years to manage waves of infections and mental health risks linked to virus, mitigation measures, vaccination programmes and uncertainty. The focus of this contribution is on the question whether the current disaster mental health knowledge base, benefitting from research and practical lessons from the response to disasters in the last decades, is applicable to a creeping crises such as COVID-19. The contribution consists of two parts. The first part deals with findings from epidemiological research on disaster mental health consequences and risks. Also, the quality and contents of leading mental health and

psychosocial support guidelines is discussed. In the second part an emphasis is placed on the mental health dimension of the COVID-19 pandemic. What do we know about the impact and the response? What was done in terms of measures and interventions? What can we learn about the effectiveness from evaluations? The answer to these and other questions is followed by a reflection on the applicability of the knowledge base in the context of the pandemic.

Grief Leadership and COVID GPCAPT

By **Joshua Morganstein**

"The global COVID-19 pandemic has created extraordinary challenges for military readiness, who are

a part of and apart from the rest of society. Pandemics and other public health emergencies, pull at the fault lines of our communities, amplifying divisions, whereby the behaviors of leaders become increasingly significant in protecting community health. This presentation will briefly review the range of mental health effects of COVID-19 and other disasters on individuals and communities, review aspects of risk and protective factors, and highlight principles and practices of leadership during times of crisis, such as grief leadership and others, that are important to protect wellbeing and enhance operational sustainment."