Towards the 2030 Schistosomiasis Control and Elimination Goals – Successes and Challenges

Executive Summary

On the 17th and 18th of June 2024 the Global Schistosomiasis Alliance (GSA) and Regional Network for Asian Schistosomiasis and other Helminth Zoonosis (RNAS+) co-hosted a schistosomiasis focused meeting at the 7th Symposium on Surveillance-Response Systems Leading to Tropical Diseases Elimination (7th SRS). The aim of this meeting was to share progress on, and innovations in, schistosomiasis elimination as we work towards the 2030 WHO goals.

The 7th SRS was an ideal opportunity for the GSA, RNAS+ and the Institution-based Network on China-Africa Cooperation for Schistosomiasis Elimination (INCAS) to collaborate and share lessons learnt and progress made to eliminate schistosomiasis and reach the WHO 2030 targets.

The meeting was opened by Prof David Rollinson (GSA), Dr Shizhu Li (NIPD, China CDC) and Dr Virak Khieu (MoH Cambodia) who welcomed all participants and introduced the purpose and objectives of the session and outlined the programme.

In the first session, on **Progress Reports and Lessons Learnt**, Dr Amadou Garba (WHO) presented the current global situation of schistosomiasis, the new WHO policies and recommendations and highlighted work on a new SCH M&E framework, implementation handbook and NTD Research & Development blueprint. Following this global overview participants heard presentations on schistosomiasis status and progress in four endemic countries in the Western Pacific and South-East Asian Regions; Dr Somphou Sayasone (Lao TPHI) spoke about *Schistosoma mekongi* in Laos and Cambodia emphasizing the One Health/EcoHealth approach to tackle infections in people and dogs and reduce transmission through CL-SWASH and health education interventions to reach interruption of schistosomiasis. Dr Helena Ullyartha (NRIA, Indonesia) presented *Schistosoma japonicum* in Indonesia and the use of independent community movement to control the intermediate host snails *Oncomelania hupensis lindoensis* and the importance of cluster spatial analysis techniques for schistosomiasis surveillance. Dr Lydia Leonardo (University of Philippines Manila) shared the challenges of *Schistosoma japonicum* elimination in the Philippines, harnessing a One Health and multi-disease elimination plan and developing a surveillance system to monitor schistosome infections in human, snails and other animals.

Dr Pauline Mwinzi (WHO AFRO) presented on the WHO Expanded Special Project for Elimination of NTD (ESPEN) in the African Region, highlighting work done for schistosomiasis elimination in African countries, covering the Schistosomiasis Community Data Analysis Tool and workbooks for endemic countries, the key challenges and gaps and the key priorities to 2025. Prof Jing Xu (NIPD, China CDC) described the achievements and progress made to schistosomiasis elimination in China, applying a comprehensive strategy to control the source of infection, treat and manage cases, effective snail control, health education and promotion and a strong surveillance and response system with ongoing capacity building, with the plan to confirm interruption of transmission for 5 consecutive years. Dr Suzy Ossipow (QIMRB, Australia) shared the challenges for schistosomiasis elimination as a public health problem and the three programmatic decisions that need to be made when EPHP is reached, i.e. Reduce MDA or Maintain MDA or Intensify activities towards IOT. Dr Ossipow highlighted the need and challenges around integration with other NTDs, intensifying WASH, vector control & One Health interventions, revised & rigorous MDA guidance to moving beyond schisto-specific morbidity control to comprehensive infectious disease "primordial prevention".

The final talk of Day 1 was from Hayato Urabe (GHIT Fund) highlighting the Africa-Japan cooperation, coordination & investments for NTDs, focusing on forming strategic partnerships, R&D investment and strengthening Access & Delivery. Key schistosomiasis investments highlighted include the Paediatric Praziquantel formulation now in the registration and access stage and a new diagnostic for schistosome infections in product development stage.

Day 2 started with a focus on **Collaborations and Cooperations**, starting with an overview of the Regional Network for Asian Schistosomiasis and Other Helminthic Zoonosis (RNAS+) presented by Professor Xiaonong Zhou (China CDC), followed by an overview on the Global Schistosomiasis Alliance (GSA) shared by Dr Anouk Gouvras. This meeting was the first collaboration of the RNAS+ and GSA, both organisations expressed a keen desire to continue the partnership and seize opportunities to work together. Participants heard about the Institutional based Network for China-Africa (INCAS) from Dr Yingjun Qian (NIPD, China CDC), including the collaborative project in Zimbabwe, which highlighted how collaboration, knowledge sharing, capacity building & adapting to local context can yield promising results in elimination efforts. Prof Sung-Tae Hong, shared insights on the SUKO project, working on control & mapping schistosomiasis & intestinal helminths in Sudan, including challenges such as the low MDA coverage, dependence of external donors, community disengagement due to competing priorities & political instability. Dr Ricardo Riccio (FIOCRUZ Bahia, Brazil), presented the advances & persistent challenges of schistosomiasis in Brazil, using surveys & mapping in endemic areas & localities, improved diagnostics, investment in sustainable WASH, modernising information systems, and an improved MDA strategy. Prof Jing Xu (NIPD, China CDC) shared their work on the China-Swiss elimination of schistosomiasis project in Laos and Cambodia, part of the South-South Cooperation Assistance Fund.

In the second session on Day 2 talks and discussion focused on **Targeted Interventions and Elimination**, starting with Prof Nicholas Midzi (NIHR, Zimbabwe) about the Zimbabwe Cooperation for schistosomiasis elimination pilot study, part of the China-Africa cooperation Initiative for Schistosomiasis Elimination. Prof Nicholas Midzi discussed challenges such as COVID-19 impact on services, donation targeting school-aged children (SAC), leaving out adults & pre-school-aged children, decreased WASH and not prioritising snail and environmental management strategies. Dr Kun Yang (Jiangsu IPD, China) spoke about a cooperative study in Zanzibar applying integrated control strategies combining: baseline surveillance using GPS and spatial technology information management, snail control using niclosamide, human treatment using both MDA and door to door approaches, health education interventions at the school and community level. Dr Yang highlighted future plans

for infection source control, AI identifications systems, diagnostics capacity building, including pathogen, immunology & molecular, as well as continued multi-party cooperation. Dr Catherine Gordon (QIMRB, Australia) presented on the final push to eliminating *Schistosoma mekongi*, and covered research to develop new diagnostics and environmental monitoring tools and piloting an integrated control programme that includes WASH, environmental monitoring, treatment with praziquantel and health education. Prof Louis-Albert Tchuem Tchuenté (University of Yaoundé I) shared the advances in mapping & sub-district implementation in Cameroon for local spraying of niclosamide, identifying households at risk of Female Genital Schistosomiasis, optimising interventions, applying a rationale for drugs & resource use and evaluation of interventions to look at whether MDA or targeted treatment is the preferred approach.

The third session covered **Current and Future risks, integrations and cross-cutting approaches**, starting with Dr Yang Liu (Sichuan IPD) who presented on schistosomiasis in the Sichuan mountainous regions, covering emerging challenges and the need for effective snail control, sensitive & effective detection, monitoring & early-warning systems. Dr Lydia Leonardo (University of Philippines, Manila) presented the Philippines-China Cooperation on engineering for schistosomiasis elimination and the strategies used to mitigate the role of water infrastructure in transmission. These include concrete lined canals and snail settling basins adjacent to irrigation canals. Procedures & protocols are being developed for reproducibility. Ms Ashley Preston (Unlimit Health) highlighted the rationale for integrated prevention services for Female Genital Schistosomiasis (FGS), HIV, cervical cancer and other sexual and reproductive health services and presented on the practicalities of developing an FGS risk-assessment questionnaire for non-invasive diagnosis in low-resource settings. Dr Guojing Yang (National Health Commission, Hainan Medical University) presented on the NTD burden in China from 2005 to 2020, and how with government investment, a One Health strategy and a cross-sectoral collaboration, the total DALYs decreased by 92.24%. Dr Mary Lorraine Mationg (QIMRB, Australia) presented the critical role of behaviour change in NTD intervention strategies and showcased the behaviour change tool Magic Glasses, successfully trialled on soil-transmitted helminthiasis in the Philippines. The Magic Glasses tools are being tailored to *S. mekongi* and *S. japonicum*.

And final session of the meeting focused on **New tools /technology, machine learning, and diagnostics.** Dr Hong You (QIMRB, Australia) highlighted innovative research using CRISPR for improved diagnostic technologies in schistosomes and the use of mRNA for vaccine development for parasitic infections. Dr Pengfei Cai, (QIMRB, Australia) presented their work on developing immunological point-of-care tests for *S. mekongi, S. japonicum and S. mansoni*. Dr Zhaoyu Guo (CDC China) discussed the development and use of diagnosis of molecular diagnostics, medical imaging, radiomics and machine learning to diagnose

advanced schistosomiasis. Turning to malacology Dr Qin Liu, (NIPD, CDC China) shared their work on the chromosome-level genome assembly of *Oncomelania hupensis*, the intermediate snail host of *S. japonicum*. Dr Amadou Garba gave an overview of a WHO tool in development – the WHO Snail Identification App which utilizes machine learning to support non-experts identify snails that could act as the intermediate host snail of schistosomes. The web version is now live, and work is being done to evaluate and improve it https://who-snail-api.aicrowd.com. Prof Lee Willingham (United Arab Emirates University) presented the project to confirm interruption of transmission on the island of St Lucia, using environmental DNA surveillance methods and mapping the presence and distribution of the intermediate snail host. Prof Robert Berquist (Swiss PH) described the potential role of Artificial Intelligence in the surveillance of zoonotic diseases & Climate Change. Dr Mingxin Qian (Tongli Biomedical, China) shared the journey of 40 years of Levo-praziquantel research and development, and what the future could hold for drug development in schistosomiasis elimination. Dr Johannes Waltz (Merck Global) shared the investments made by Merck working through partnerships and collaborations and highlighted the need to diversify the treatment portfolio to eliminate schistosomiasis.

The final talk of the day was given by Mr Kalkidan Meketa Begashaw (The END Fund) who presented the work of the Deworming Innovation Fund (DIF) aimed to progress towards eliminating parasitic worms, including schistosomiasis in Ethiopia, Kenya, Rwanda and Zimbabwe, using high coverage treatment rounds expanded to all age groups, focalised behaviour change, WASH-NTD coordination, vector and environmental management and self-directed test and treat strategies, combined with detailed monitoring and evaluation strategies for infections and snails, and focusing on sustainability and cross-cutting approaches. The aim is to collect all the learnings from the DIF and share this with the wider sector to strengthen decision-making and enable reaching interruption of transmission.

The meeting concluded with closing remarks from Dr David Rollinson, Dr Virak Khieu and Prof Shizhu Li.

Special Thanks
We would like to thank our hosts at the National Institute of Parasitic Diseases and a special thanks to Suying Guo, Shizhen Li, Zhaoyu Guo and all the students and early career researchers who supported us with the running of the meeting.

Meeting Programme*

**The programme was subject to change due to travel disruptions and parallel sessions.*

Day 1 - 17 June 2024 Afternoon

Time (CST)	Topic	Speaker
13:15	**Meeting welcome**	
13:15 - 13:20	Welcome and Housekeeping	Shizhu Li National Institute of Parasitic Diseases, China CDC
13:20-13:30	Schistosomiasis Control and Elimination Goals – Successes and Challenges	David Rollinson Global Schistosomiasis Alliance
Progress Reports and Lessons Learnt Chair: David Rollinson (GSA) and Virak Khieu (MoH Cambodia)		
13:30 - 14:00	Updates on global status of schistosomiasis elimination efforts.	Amadou Djirmay Garba World Health Organization
14:00 – 14:15	Impact on Schistosomiasis Snail Control and Spatial Cluster Change in Indonesia.	Helena Ullyartha National Research and Innovation Agency, Indonesia
14:15 - 14:30	Challenges in Elimination of Schistosomiasis in the Philippines	Lydia Leonardo University of the Philippines Manila
14:30 - 14:45	*S. mekongi* epidemiology status update (Cambodia and Laos)	Somphou Sayasone Lao Tropical and Public Health Institute
14:45 – 15:00	Innovative Strategies in Surveillance-Response for Eliminating Schistosomiasis in the Africa Region	Pauline Mwinzi World Health Organization
15:00 - 15:15	**Tea Break**	
15:15 - 15:30	Achievement in transmission interruption of schistosomiasis in China: Ready for elimination in 2028	Shizhu Li National Institute of Parasitic Diseases, China CDC

15:30 - 15:45	Schistosomiasis in Brazil: Advances and Persistent Challenges	Ricardo Riccio FIOCRUZ Bahia, Brazil
15:45 - 16:00	Africa-Japan cooperation, coordination and investments for NTDs	Hayato Urabe Global Health Innovative Technology Fund
16:00 - 16:30	Round table discussion • Suspected outbreaks - new challenges • Confirmation surveys - emergence • Standardization of methods - surveillance (*S. japonicum*, *S. mekongi* - humans and animals) • Challenge of implementation of treatments	
16:30 – 16:40	End of Day 1 wrap up	

Day 2 - 18 June 2024

Time (CST)	Topic	Speaker
8:30 - 8:45	Welcome Coffee and Teas	
8:45 - 8:50	Summary of Day 1	David Rollinson Global Schistosomiasis Alliance
Collaborations and Cooperations Chair: Lydia Leonardo (UPM) and Amadou Garba (WHO)		
08:50 - 09:05	Regional Network for Asian Schistosomiasis and Other Helminthic Zoonosis (RNAS+)	Xiaonong Zhou Chinese Center for Disease Control and Prevention
09:05 - 09:20	Global Schistosomiasis Alliance - Working Together To Eliminate Schistosomiasis	Anouk Gouvras Global Schistosomiasis Alliance

Time (CST)	Topic	Speaker
09:20 - 09:35	Institutional based Network for the China-Africa Schistosomiasis Elimination (INCAS)	Yingjun Qian National Institute of Parasitic Diseases, China CDC
09:35 - 09:45	South Korea - Supporting schistosomiasis programmes in Sudan and Eastern Africa countries.	Sung-Tae Hong Seoul National University
09:45 - 10:00	Programmatic challenges for schistosomiasis elimination and integration with other NTDs	Suzy Ossipow Queensland Institute of Medical Research
10:05 - 10:20	Introduction to China-Swiss elimination of schistosomiasis in Laos and Cambodia.	Jing Xu National Institute of Parasitic Diseases, China CDC
10:20 - 10:35	Discussion	
10:35 - 10:45	Morning Coffee and Tea Break	
Targeted interventions and elimination Chair: Shizhu Li (NIPD) and Johannes Waltz (Merck)		
10:45 – 11:00	Zimbabwe Cooperation for schistosomiasis Elimination pilot study: Towards China Africa cooperation Initiative for Schistosomiasis Elimination	Nicholas Midzi National Institute of Health Research, Zimbabwe
11:00 - 11:15	Cooperative study on schistosomiasis control and demonstration application in Zanzibar	Kun Yang Jiangsu Institute of Parasitic Diseases
11:15 – 11:30	Eliminating *S. mekongi* – the final push	Catherine Gordon Queensland Institute of Medical Research
11:30 - 11:45	Cameroon - mapping & sub-district implementation	Louis-Albert Tchuem-Tchuenté University of Yaoundé I
11:45 - 12:00	Moving beyond SCH and STH EPHP, IOT proof of concept: Ethiopia, Kenya, Rwanda, and Zimbabwe	Kalkidan Mekete Begashaw The END Fund

Time (CST)	Topic	Speaker
12:00 – 12:15	Discussion	
12:15 - 13:15	**Lunch**	
Current and Future risks, integrations and cross-cutting approaches Chair: Suzy Ossipow (QIMR) and Anouk Gouvras (GSA)		
13:15 - 13:30	Elimination of schistosomiasis in Sichuan mountainous regions and emerging challenges	Yang Liu Sichuan Institute of Parasitic Diseases
13:30 - 13:45	Philippines - China cooperation on engineering for the elimination of schistosomiasis	Lydia Leonardo University of the Philippines Manila
13:45 - 14:00	Female Genital Schistosomiasis burden, prevention and integration with sexual and reproductive health services	Ashley Preston Unlimit Health
14:00 - 14:15	Crises and opportunities intertwined in time and space: the burden of Neglected Tropical Diseases in China from 2005 to 2020	Guojing Yang National Health Commission; Hainan Medical University
14:15 - 14:30	Behaviour change and WASH - Magic Glasses for schistosomiasis - successes with STH in Philippines	Mary Lorraine Mationg Queensland Institute of Medical Research
14:30 - 14:45	Discussion	
14:45 -15:00	Afternoon Coffee and Tea	
New tools /technology, machine learning, diagnostics Chair: Shan Lv (NIPD) and Xiaonong Zhou (China CDC)		
15:00 - 15:15	CRISPR technologies in schistosomes	Hong You Queensland Institute of Medical Research
15:15 - 15:30	POC diagnostics for schistosomiasis	Pengfei Cai Queensland Institute of Medical Research
15:30 - 15:45	Machine Learning and Diagnosis of Schistosomiasis Japonica	Zhaoyu Guo Chinese Center for Disease

Time (CST)	Topic	Speaker
		Control and Prevention
15:45 - 16:00	Chromosome-level genome assembly of *Oncomelania hupensis*: the intermediate snail host of Schistosoma japonicum	Qin Liu National Institute of Parasitic Diseases, China CDC
16:00 - 16:15	WHO Snails Identification App	Amadou Garba World Health Organization
16:15 - 16:30	Environmental DNA Surveillance: Confirming interruption of schistosomiasis transmission in the Caribbean	Lee Willingham United Arab Emirates University
16:30 - 16:45	Surveillance of zoonotic diseases and climate change: possible role of artificial Intelligence	Robert Berquist Swiss Tropical and Public Health Institute
16:45 - 17:00	Levo-praziquantel-40 Years of Research and Development	Mingxin Qian Tongli Biomedical Co., Suzhou, China
17:00 - 17:15	Medicines - Drugs/Preclinical studies	Johannes Waltz Merck Schistosomiasis Elimination Program
17:15 - 17:45	Round table discussion	
17:45 - 18:00	Wrap up and close of meeting	Shizhu Li & David Rollinson National Institute of Parasitic Diseases, China CDC and Global Schistosomiasis Alliance