

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



MUHAS RESEARCH AGENDA

MARCH 2021

List of Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AMR	Antimicrobial Resistance
AMU	Antimicrobial Use
ART	Anti-Retroviral Therapy
HIV	Human Immunodeficiency Virus
HSSP	Health Sector Strategic Plan
M.TB	<i>Mycobacterium Tuberculosis</i>
MDR – TB	Multi Drug Resistance Tuberculosis
MMR	Maternal Mortality Rates
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MSM	Men Sex with Men
MUHAS	Muhimbili University of Health and Allied Sciences
PLHIV	People Living with HIV
RMNCA	Reproductive, Maternal, New-born, Child and Adolescent Health
SDGS	Sustainable Development Goals
TBT	TB Preventive Therapy
THIS	Tanzania HIV Impact Survey
TMDA	Tanzania Medicines and Medical Devices Authority
UNAIDS	United Nations Programme on HIV/AIDS
WHO	World Health Organization

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Executive Summary

The Muhimbili University of Health and Allied Sciences (MUHAS) trains the largest number of human resources for health in Tanzania, a responsibility it has shouldered for almost sixty years. Apart from training health and allied personnel MUHAS, has carried out a number of researches that have been instrumental in informing policy in the areas of HIV and AIDS, Tuberculosis, malaria, reproductive health, nutrition, health financing and other areas. These priority and key research areas engaged by the MUHAS community for almost the past 10 years were guided by the enacted research agenda. Given the update of the National Research Agenda and the rapidly changing patterns of diseases/health conditions, there is great need and reason for having a new and up to date MUHAS Research Agenda.

The University has taken a conscious effort to align itself with national initiatives for development including Vision 2025, the National Strategy for Growth and Reduction of Poverty and the implementation of the health-related Sustainable Development Goals (SDGs). In this respect the University has identified strategic areas of research that will be engaged by its faculty for the next 10 years to address the need for generating results that will inform policy and therefore contribute to national development initiatives. Through a consultative effort, the University has identified eighteen (18) research themes to which it shall direct resources and efforts to ensure tangible outputs for informing policy and for solving important national health challenges. The research themes include:

Theme 1	HIV and AIDS
Theme 2	Tuberculosis
Theme3	Malaria and Neglected Tropical Diseases
Theme 4	Reproductive, Maternal, New-born, Child and Adolescent Health
Theme 5	Non-Communicable Diseases (NCD)
Theme6	Health Systems Research
Theme7	Social Determinants and Social Conditions of Health
Theme8	Injuries
Theme9	Emerging and Re-Emerging Infections
Theme 10	Oral Health
Theme 11	Mental Health
Theme12	Pharmacovigilance and Rational use of Medicines
Theme 13	Occupational Health and Safety
Theme 14	Haematological Disorders
Theme15	Traditional Medicines and Natural Products Development
Theme 16	Bioethics
Theme 17	Drug Discovery and Formulation
Theme 18	Knowledge Management and Informatics

Introduction

The strengthening of the educational and health systems has been considered very vital in attaining the development and are incorporated in such vision. Pertinent to the health systems, the 2025 development vision for instance aims to attain some of the following targets; reducing the child and maternal mortality rates, prevalence of HIV/AIDS among pregnant women and promoting knowledge-based care among health workers. As to implement the same vision, the revamping the education sector/systems is considered of paramount importance as the rapidly changing contemporary era is in high demand for innovative and highly technological and scientific solutions. Thus, the Tanzania's development agenda is guided by aspirations that are articulated in the development vision.

The dynamics in health challenges encountered in everyday practices emanate from the fact that, health conditions also evolve every now and then. This would then imply that, there is growing need for researches that will address these unprecedented situations and furthermore, the health professionals should possess necessary research skills as well as be updated by the results from different researches. Revamping of the health sector especially the higher learning institutions is necessary for the expected outputs; highly skilled researchers with high quality researches. In this context, the need for the Muhimbili University of Health and Allied Sciences (MUHAS) to strengthen her engagement in essential health research is of paramount importance in order to identify evidence-based solutions to priority health problems, generate new knowledge, develop innovative and cost-effective interventions for these problems and provide objective information for guiding implementation of control and prevention strategies. In this way, MUHAS will be in position to contribute to the reduction of non-income poverty that arises from poor health.

The country is committed to her development vision as well as to other regional and international vision and / or strategies including; The Health Sector Strategic Plan; Sustainable Development Goals (SDGs) and Development Vision 2025 among others. The University understands that, to achieve the health targets spelt out in these policies, vision and strategies, there is a need to make concerted efforts and initiate activities which are informed by research. In this way, the university may carry on providing and contributing meaningful generated knowledge only if, some research areas are prioritized by coming up with a revised/ updated and implementable MUHAS research agenda. The revision of the outdated agenda is line with the vision of the University to become a centre of excellence for training health professionals, quality research and public service

MUHAS as a higher learning institution has the responsibility to contribute to the creation and generation of knowledge through research. The number of research projects conducted by the institution increases every year reflecting the dynamism of the MUHAS community, the efforts invested by the institution and the local, regional and international links the institution and her community are engaged in. The University occupies a unique position in the Tanzanian society. The MUHAS outputs over the last half century have offered distinguished services to Tanzania and beyond. Research results emanating from research by MUHAS staff are used to formulate many of the health policies.

Impact of MUHAS Research on Policy

MUHAS is the first and the main health professionals training institution in Tanzania, and currently it is responsible for an output of about 70% of health professionals each year. Over the years of MUHAS existence, its faculty has been the pillars for informing health policy in Tanzania and has made contributions in many areas of health and allied sciences. Some of its recent contributions has been notable in informing policy for Malaria and Neglected Tropical Diseases, HIV, Tuberculosis, Non-Communicable Diseases, Nutrition, Immunization and Vaccine Development, Injuries and trauma, among others. Such evidence generated from MUHAS have also impacted global health, guidelines and policies.

Rationale

A research agenda is a time-bound plan and a focus on issues and ideas in a subset of a defined field, which clearly defines specific identified research goals and the organizing principles around which to work to achieve these goals.

The rationale for having a research agenda is to create a linkage among stakeholders, both internal and external, in addressing research questions of priority to societal needs and in so doing to achieve a focused and guided growth and development. The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) has released the updated version of National Health Research Agenda and by this, researchers are required to engage in researches of national interest. This has necessitated the need for revising the already outdated MUHAS Research Agenda and thus ensuring all research activities conducted by the institution are guided with a well-defined research agenda.

Objectives of The Research Agenda

1. To create centres of excellence that address critical health issues in Tanzania.
2. To build and manage multidisciplinary research consortia comprising MUHAS faculty, students, and collaborators that address specific defined strategic research goals.
3. To enhance communication and collaboration among stakeholders.
4. To inform and educate health research communities of the research needs and elicit collaboration where appropriate.
5. To synthesize evidence-based knowledge products from health research for policy development and decision making.
6. To stimulate the development of implementation plans that would identify resources available and propose desirable sequencing and timing of research support activities.

Stakeholders

Stakeholders and beneficiaries of the MUHAS research agenda include policy

makers, Ministry of Health, Community Development, Gender, Elderly and Children, Ministry of Education, Science and Technology, internal and external funding agencies, research collaborators, students as well as researchers. The relationships that the research agenda has with such stakeholders include the following:

1. This Research Agenda will be useful in guiding policy makers in implementing the National Research Policy and formulating future policies.
2. MUHAS' research agenda therefore among other things is expected to assist the Ministry of Health Community Development Gender Elderly and Children and other line ministries in addressing health problems in the country.
3. The Ministry of Education, Science and Technology oversees the conduct of cost effective and appropriate research. MUHAS research agenda will be an important document in guiding allocation of research resources to research and in particular for public research institutions.
4. A considerable proportion of the current research conducted at MUHAS is collaborative research. MUHAS research agenda therefore gives appropriate information to prospective external researchers who would like to do research in collaboration with MUHAS researchers.
5. MUHAS conducts research in line with the national and international needs. While the MUHAS research agenda has taken the national research priorities in it, a number of research themes are of global importance, that will ultimately be of national importance with MUHAS involvement.

MUHAS Research Governance

MUHAS has a research dedicated Directorate of Research and Publications for managing research and all sponsored programmes. The main function of the Directorate is to provide a conducive environment for conducting research, ensure responsible conduct of research, and provide pre-award and post-award support to faculty, students and collaborators.

Under the directorate, there are two functional committees whose members are appointed by the University Senate; Institution Intellectual Property Right Management Committee (IIPRMC) and University Senate Research and Publications Committee (SRPC). The latter is responsible for advising the Director of Research and Publications (DRP) on all the research and dissemination activities at MUHAS. This directorate has a dedicated Intellectual Property Right Unit (IPR) that oversees the innovation and property rights of the innovators and scientists at MUHAS and is governed by the IIPRMC.

Other research/projects functional units in the directorate include; Research Development unit (RDU), Institution Review Board (IRB) and Office of Sponsored Projects (OSP). Altogether and in collaboration with other units and the committees oversee all research/projects development and grants acquisition activities through; conducting trainings, symposia and conference, providing ethical guidance and monitoring while managing both pre and post awards for research projects.

Schools and Institutes have their respective Research and Publications Committees and focal persons. These committees are responsible for coordinating research and dissemination of research results at the unit levels. The focal persons of the schools and institutes Research and Publications Committees are members of the University SRPC and are therefore responsible for reporting implementation and progress of the Schools` and Institutes` research activities to the University SRPC.

The operationalization of research at MUHAS is guided by a Research Policy. Complementing these documents are a number of specific policies and guidelines including, the IPR policy and guidelines, Research Chairs Policy, Policy on the use of animals for research, Efforts compensation policy and guidelines, MUHAS Research and Ethics Committee Standard Operating Procedures, Institution overhead policy, conflict of interest policy, among others.

Methodological Approach

The Deputy Vice Chancellor-Academic Research and Consultancy appointed a five-member team to formulate the University Research Agenda. The team prepared a structured questionnaire which explored previous research done at MUHAS, research gaps, and the suggested future research areas which were administered to all principal investigators and University units. Presentations were made from prominent MUHAS researchers and research themes were identified. A draft research agenda was then developed and circulated to stakeholders at MUHAS for inputs. Comments and inputs were consolidated into the first draft that was discussed by the Senate Research and Publications Committee, Committee of Deans and Directors, and recommended to the Senate for discussion and recommendation to the University Council.

Research Themes

A total of eighteen research themes have been identified and will be discussed in this document as the future MUHAS research themes. These are:

1. Theme 1: HIV and AIDS
2. Theme 2: Tuberculosis
3. Theme 3: Malaria and Neglected Tropical Diseases
4. Theme 4: Reproductive, Maternal, New-born, Child and Adolescent Health
5. Theme 5: Non-Communicable Diseases (NCD)
6. Theme 6: Health Systems Research
7. Theme 7: Social Determinants and Social Conditions of Health
8. Theme 8: Injuries
9. Theme 9: Emerging and Re-Emerging Infections
10. Theme 10: Oral Health
11. Theme 11: Mental Health
12. Theme 12: Pharmacovigilance and Rational use of Medicines
13. Theme 13: Occupational Health and Safety

14. Theme 14: Haematological Disorders
15. Theme 15: Traditional Medicines and Natural Products Development
16. Theme 16: Bioethics
17. Theme 17: Drug Discovery and Formulation
18. Theme 18: Knowledge Management and Informatics

Theme 1: HIV and AIDS

Background

The MUHAS HIV research seeks to contribute to the national, regional and international response to the HIV epidemic by performing high quality science of international standards. This agenda comes a time when a number of new developments have occurred in the field:

- In 2014, the Joint United Nations Programme on HIV/AIDS (UNAIDS) and partners launched the 90–90–90 targets; the aim was to diagnose 90% of all HIV-positive persons, provide antiretroviral therapy (ART) for 90% of those diagnosed, and achieve viral suppression for 90% of those treated by 2020
- In 2015, the MoHCDGEC embarked on Health Sector Strategic Plan IV (HSSP IV) (2015-2020) that is driven by Sustainable Development Goals (SDGs)
- In late 2015, based on new scientific findings, the World Health Organization (WHO) recommended that everyone with HIV be offered ART as soon as they are diagnosed.
- Recently UNAIDS has announced its-new fast-track strategy to end the AIDS epidemic by 2030 by upgrading the three 90 targets to 95–95–95 targets.

These developments necessitate MUHAS, which is leading academic, research and consultancy institution in the medical field, to refocus its strategies in providing technical assistance to the government and its stakeholders, to providing universal access to quality ART services to all citizens in need.

Situation analysis

Results of The Tanzania HIV Impact Survey (THIS), a household based national survey, conducted between October 2016 and August show the annual incidence of HIV among adults ages 15 to 64 years to be 0.29 percent (0.40 percent among females and 0.17 percent among males), which corresponds to approximately 81,000 new cases of HIV annually among adults aged 15 to 64 years in Tanzania.

The prevalence of HIV among adults aged 15 to 64 years in Tanzania was approximately 5.0 percent (6.5 percent among females and 3.5 percent among

males), corresponding to approximately 1.4 million people living with HIV (PLHIV) in the age group 15 to 64 years. Tanzania is a home to 5.8% of global adolescents living with HIV. Prevalence of viral load suppression (VLS) among HIV-positive adults ages 15 to 64 years in Tanzania was 52.0 percent (57.5 percent among females and 41.2 percent among males).

With regards to PMTCT, although the percentage of pregnant women enrolled in services reached 92% in 2019, poor retention rates among pregnant and lactating mothers (67% and 83% respectively) remain a challenge, contributing towards the mother-to-child HIV infection rate of 11% in 2019 against the global target of 5%. Early infant diagnosis uptake is also low (47%), and the paediatric antiretroviral therapy (ART) coverage of 66% in 2019 lags behind the national target of achieving 90% coverage by 2022.

Gaps

Existing gaps include; data on short- and long-term effects of Dolutex and ART particularly among clients of reproductive age; data on factors associated with and effective strategies for increasing access, uptake and retention to HIV services especially among vulnerable population; rising prevalence of pre-treatment and acquired HIV drug resistance; stigma and discrimination particularly of HIV positive key populations; timely diagnosis, referral and treatment for HIV among infants and young children. Other identified gaps include; poor coordination of various HIV services and their integration into other programs including NCDs; evidence based management of HIV in comorbid with NCDs; novel HIV treatment and prevention strategies including effective vaccines; reliable reporting mechanisms of the progress towards attainment of the global 95-95-95 HIV global targets; low human resource for HIV services and poor quality of HIV services particularly HIV testing that comply with testing standards. Poor uptake of ART by children; ANC package and HIV test by adolescents and retention in PMTCT programs.

Priority Research Areas

General

Research areas; exploring the best strategies for; achieving UNAIDS 95-95-95 targets in Tanzania by 2030; increase access to a comprehensive package of quality health and social services to the key and vulnerable populations in order to significantly minimize the transmission of HIV and to reduce HIV-related mortality, morbidity, stigma and discrimination; enhance screening, surveillance and monitoring of Non-communicable diseases among PLHIV.

Other areas include; strengthening local HIV policies, guidelines and programs using operational research; explore the costs and benefits of adopting new HIV treatment guidelines.

Specific research areas:

HIV testing

Areas including: the best interventions to ensure timely linkage between HIV diagnosis, treatment and care, especially for infants and children; community-based interventions or strategies to improve access to HIV services; factors which enable or hinder linkage to care and timely HIV services, including initiation of ART; entry points other than antenatal care for identifying undiagnosed HIV-positive infants and children in different epidemic settings; strategies or interventions to improve access to and uptake of HIV testing services for key and vulnerable populations; time and method of disclosure of HIV test results to paediatric and adolescent patients; and how can we enhance the success rate of community-based referral system in linking HIV positive people with treatment centres.

Treatment

Areas including: mechanisms are novel and cost effective in determining safety, efficacy, acceptability, pharmacokinetics and optimal dosing of existing and new antiretroviral drugs and formulations; the long- and short-term effects of Dolutex among women of reproductive age; strategies or interventions should be employed to improve uptake and adherence to ART programme; strategies for prevention and clinical management of co- infections, particularly enhancing effective tuberculosis screening in Care and Treatment centres; optimal Approaches to Screening and Treating Co- morbidities and Malnutrition; Impact of HIV infection and ART on short- and long- term outcomes, in particular non-communicable disease; research on point-of-care diagnostic kits should be used for determining HIV drug resistance to prevent and limit the spread of HIV drug resistance and improve treatment outcomes; How to reduce the short and long-term ART-associated complications and its impact on adherence and ARV resistance; barriers to ART access in Paediatric and Adolescents and Young Women (AGYW) populations and adolescents; short-term and Long-term effects of *in utero* ART Exposure on HIV-infected Infants, Children and Adolescents; reasons for lost to follow-up among patients on antiretroviral treatment; the challenges faced by parents and feasible solution with regard to administering ARVs to children (children <5yrs); factors facilitate uptake, retention and adherence and minimize treatment failure among children with HIV; how to ensure resources for monitoring ART be optimized, e.g., use of targeted viral load.

Prevention

Areas including: the opportunities and challenges of HIV self-testing in achieving UNAIDS 95-95-95 targets particularly among Adolescents Girls and Young Women (AGYW) in Tanzania by 2030; operational, social cultural and behaviour barriers to increasing access and scale up of evidence based preventive interventions such as Voluntary Medical Male Circumcision (VMMC), PrEP and PEP; the best and cost-effective strategies of increasing Early infant diagnosis and reducing Lost to follow up in PMTCT settings; Prevention of MTCT using Oral Nevirapine among Breast Fed infants of HIV positive mothers; and feasible and cost-effective strategies to improve access and retention in PMTCT and entire breastfeeding period.

Theme 2: Tuberculosis

Background

Tuberculosis (TB) is the leading single infection killer worldwide and thus form one of the targeted diseases in the Sustainable Development Goals (SDG). In the year 2018 alone, ten million people were estimated to have TB disease and 1.5 million succumbed to the disease. More than 80% of the global burden of tuberculosis is concentrated in 30 countries, namely, high TB burden countries, Tanzania inclusive. To date, there is no effective vaccine to prevent occurrence of TB disease. The only vaccine available, Bacillus Calmette-Guérin (BCG) was discovered in 1921 and provides protection only against severe forms of TB such as childhood TB meningitis. In response to reducing the disease burden SDG3 and the END-TB strategy 2015 – 2035 has set some policies and milestones.

Situation analysis

Tanzania is one of the 30 high TB burden country with TB prevalence rate of 253/100,000 population and is believed to be among the top ten causes of deaths in Tanzania. In the year 2019, Tanzania notified more than 80,000 cases corresponding to 59% of the estimated annual TB cases. Despite high burden of TB in Tanzania, it is estimated that the prevalence of Multi Drug resistant (MDR) TB is less 1%. A larger portion of TB in mainly contributed by HIV co-infection which accounts for about 28% of all TB cases notified in 2018². The growing burden of non-communicable diseases particularly Diabetes Mellitus, malignancies as well as immunosuppressive therapies present a new challenge to the current TB control initiatives in place. Furthermore, Tanzania's formal and informal mining industry poses a risk of reversal of achieved milestones particularly for recurrent TB³. Other country specific context includes smoking and use of drugs of addiction that affect adherence to TB treatment which consequently may threaten TB control in Tanzania. A large proportion of pediatric TB cases remain undetected, or not reported because of limited diagnostic ability, which pauses a challenge in this population.

In line with the Pillar three (3) of the END-TB strategy 2015 – 2035, intensified research and innovation; MUHAS Tuberculosis Research Agenda seeks to contribute to the national, regional and international response to Ending Tuberculosis epidemic through innovative and high-quality scientific work of international standards in line with national and international policies and strategies such as:

- END-TB strategy 2015 – 2035.
- Accelerated plan to find TB cases “2018 Find all treat all #EndTB”.
- Ministry of Health Community Development Gender Elderly and Children (MoHCDGEC) Health Sector Strategic Plan IV (HSSP IV) 2015-2020.
- Ministry of Health Community Development Gender Elderly and Children (MoHCDGEC) Health Sector Strategic Plan IV (HSSP V) 2020 -2025 (under development).
- Ministry of Health Community Development Gender Elderly and Children (MoHCDGEC) The National Health Research Agenda 2019 – 2024.

Gaps

Identified gaps; screening programmes for animals TB (to minimize potential for zoonosis TB) asymptomatic TB infected individuals, and factors associated with missed or delayed diagnosis particularly among children; poor understanding on factors associated with poor TB treatment particularly MDR TB; understanding on contribution of one heal and test and slaughter for animals (cattle/buffaloes) to minimize the potential for zoonotic tuberculosis; understanding of epidemiology and short and long term TB (including MDR) and Non-Tuberculous mycobacterium treatment health and non-health outcomes.

Other gaps; optimizing attention to nutrition (micro and macro) in management of TB; optimizing TB management in special populations (mining industries, DM, elderly patients); cost-effective diagnostic strategies for paediatric MDR and extrapulmonary TB; access to drug susceptibility testing among patients on TB treatment; data on patients' related TB diagnostic and treatment costs for tracking one pillar of END TB strategy, catastrophic patients costs; unavailable effective TB treatment and/ or preventive vaccines; local evidence the effectiveness, acceptability and sustainability of the newer TB preventive therapies (TPT) other than isoniazid; local evidence on the effect of genetic composition to the disposition to allow optimization of new antituberculosis drugs, Bedaquiline and Delamanid.

Priority Research Areas

General

Exploring the current epidemiological and social determinants for development of active tuberculosis disease.

Specific Research Areas

Diagnosis: Areas including; Development and evaluation of new diagnostic tools utilizing specimens other than sputum; determination of susceptibility and resistance to anti TB drugs using molecular techniques; exploring factors for delayed/missed TB diagnosis and developing mechanisms for early detection of TB sequalae and TB among children.

Optimizing TB treatment and care: Areas including; development and evaluation of treatment and preventive vaccines, existing and new drugs for TB (including those targeting MDR-TB) and accompanying lung disease their pharmacogenomics, pharmacodynamics and pharmacokinetics and determining factors associated with their interaction with other drugs; surveillance and management of TB sequalae, TB in children and those with concomitant NCDs comorbidities or at risk for occupational exposure; establishing the association between Host Directed Therapies (HDT), nutritional deficiencies and TB treatment outcomes; and assessment and management of Malnutrition Inflammation Syndrome (MIS) among patients treated for TB.

Prevention: Areas including; Operational research on newer TB prevention therapies (TPT) among different at-risk populations; cost-effective mechanisms for preventing TB and/or its recurrence among at-risk populations (including healthcare workers); effective strategies to explore and overcome challenges of initiating INH and following up new-born of sputum positive mothers.

Theme 3: Malaria and Neglected tropical diseases

Background

Setting priorities for health research is essential to maximize utilization of the meagre resources allocated to health sector and is regarded as a key factor in an effort to strengthen national health research systems.

This agenda comes at a time when a number of new developments have occurred in the field:

- In 2015, the MoHCDGEC embarked on HSSP IV (2015-2020) that is driven by Sustainable Development Goals (SDGs)
- Roll Back Malaria (RBM) Partnership's second-generation global malaria action plan, Action and Investment to Defeat Malaria (AIM) 2016-2030:
- Malaria-Free World and the World Health Organization's (WHO's) updated Global Technical Strategy: 2016-2030
- The World Health Organization (WHO), issued Third Edition Guidelines for the Treatment of Malaria, Geneva, Switzerland: WHO Press (2015)
- WHO Strategic plan, 2000, for Halting transmission of Lymphatic filariasis and other neglected tropical diseases by the 2020

The MUHAS Malaria research seeks to contribute to the national, regional and international response to the Malaria epidemic by performing high quality science of international standards ensuring universal access to good quality malaria services to Tanzanians.

Situation analysis

Malaria can easily be treated if patients seek services promptly and receive both a test and treatment with recommended antimalarial. Although the 2017 Tanzania Malaria Indicator Survey showed that three quarters of children with fever sought advice or treatment, a smaller proportion (about 40%) sought treatment promptly (within 24 hours) and were tested for malaria. The current map of NTDs in Tanzania, show that the larger part of the country is in pre- to elimination of specific NTDs, however, transmission continues in "hot spots". Tanzania is also witnessing global warming and climate change with consequences on the dynamics of malaria and dengue vectors.

Gaps

Identified gaps include; limited evidence on; safety and quality of readily available antimalarial drugs, and malaria treatment outcomes particularly to individuals with comorbidities; providing guidance on Mass Drug Administration (MDA) use in moderate or high transmission settings; optimal strategies for blocking transmission of schistosomiasis, lymphatic filariasis and trachoma, optimal antimalarial dosing and alternative malaria prevention intervention (other than SP) in pregnant women;

treatment failures, and effective malaria treatment and prevention vaccine; selection of new technologies into interventions programs. There is paucity of data on the influence of climatic factors on the dynamics of malaria and dengue vectors. Gaps also exist in the drivers of continuity of transmission of both malaria and NTDs, innovative diagnostics for monitoring continuity of transmission, and the best ways to target interventions in the face of changing malaria and NTD epidemiology.

Other gaps; translation of research into practice and support evidence based and sustainable policy decisions; burden and effects of non-falciparum malaria and emergency of resistant malarial parasites; weakly established bioequivalence lab for ascertaining drug bioavailability in patients; new and appropriate vector control tools to create an evidence-base for scale up; poor performance of conventional tools to detect malaria infections in pre-elimination settings.

Priority research Areas

General

Areas including; the prevalence and interaction of non-falciparum malaria (*P. ovale*, *P. malaria*) with *P. falciparum*; effect of different disease conditions on uncomplicated malaria treatment; malaria operational research programmes for strengthening local malaria policies, guidelines and programmes; approaches to accelerate translation and adoption of research findings into policies. The other important area is identification and characterization of “hot spots” of malaria and NTDs transmission, operational research to inform programs on the best ways to target interventions for these diseases in pre- to elimination settings, coupled with field trial of innovative diagnostics for monitoring and surveillance of malaria and NTD in elimination settings.

Specific Research Areas

Prevention: Areas including; development and evaluation of existing and/or new preventive and control measures like; mosquito vector control measures (ecology manipulation included); combination preventive strategies both biomedical and multipurpose prevention technologies; malaria vaccines; role of micro-nutrient supplementation in malaria prevention among children. Other areas include; potential for trial of RTS, S vaccine in children; exploring the utility of Health Technologies Assessments (HTA) in selection of new antimalaria intervention. For NTDs, studies are required to exploit the role of integrating vectors and environmental control with preventive chemotherapy as a means of interrupting transmission.

Malaria and NTD testing: Areas including; evaluate the performance of innovative diagnostics for NTDs/malaria detection and its differentials; exploring the effect of pfrp2 gene deletion on the performance of rapid malaria test (mRDTs); exploring genetic and epigenetic contributions to severity of malaria.

Malaria and NTD Control: Potential research areas; develop and implement cost-effective mechanisms for evaluating pharmacokinetics, pharmacodynamics and acceptability of novel and existing antimalarial drugs and formulation including artemisinin-based drugs used in Intermittent Preventive Treatment in Pregnancy

(IPTp); evaluate and optimize the effectiveness of MDA in moderate and high transmission settings and in eradication of NTD; determining optimal dose of antimalarial for the treatment of malaria in pregnancy; explore best therapeutic alternative to replace sulfadoxine-pyrimethamine (SP) for intermittent preventive treatment of malaria in pregnancy; explore the potentials of; using multiple first line drugs in combating drug resistance malaria; Health technologies assessments (HTA) in the selection of new antimalarial interventions. Other potential research areas include; strategies to improve uptake and adherence to artemisinin-based combination therapy (ACT) programmes; evaluate costs and benefits of adopting new malaria treatment guidelines.

Theme 4: Reproductive, Maternal, New-born, Child and Adolescent Health

Background

Reproductive, Maternal, New-born, Child, and Adolescent (RMNCHA) Health is central to the development of any country in terms of increasing equity and reducing poverty and building social capital. The survival and well-being of mothers and children are not only important in their own right but are also central to addressing large broader, economic, social, and developmental challenges. The government of Tanzania developed a National Road Map Strategic Plan to Improve Reproductive, Maternal, New-born, Child, and Adolescent Health in Tanzania (2016–2020): One Plan II. This mainly targets at reducing

1. MMR from 410 to 292 deaths per 100,000 live births
2. Neonatal mortality rate from 21 to 16 deaths per 1000 live births
3. Infant mortality rate from 45 to 25 deaths per 1000 live births and
4. Under-five mortality rate from 54 to 40 deaths per 1000 live births. The overall goal is to accelerate reduction of preventable maternal, new-born, child and adolescent morbidity and mortality in line with the National Developmental Vision 2025.

The institutional research agenda under RMNCHA theme will be geared towards achieving this goal. Although the high-impact interventions needed to prevent maternal and child deaths have been known for some time, they fail to be implemented at the necessary scale for global mortality reductions. The RMNCAH interventions should be guided by evidenced-based intervention which is effective, acceptable to families and communities, and affordable and sustainable to use limited resources efficiently. Subsequently, research in RMNCAH will contribute towards achievement of national strategies.

Situation analysis

The burden of reproductive health (RH) cancers in Tanzania is showing an upward trend as reported by International Agency for Research on Cancer (IARC) that cervical cancer with incidence rate (ASR) is 54.0 cases per 100,000 women.

Mortality rate due to cervical cancer is 32.4 per 100,000, breast cancer is 9.7 per 100,000 for women and prostate cancer, 27.9 per 100,000.

While there was a 47% reduction of the maternal mortality ratio (MMR) between 1990 and 2010 (870 and 454 deaths per 100,000 live births respectively), Tanzania did not make sufficient progress to attain its Millennium Development Goal (MDG) 5 of reducing MMR to 193 per 100,000 live births. There are broad gaps in births assisted by skilled health professionals in rural and urban areas (55% and 87% respectively). Male involvement in RMNCAH programs is low e.g., in Prevention of mother-to-child transmission (PMTCT) program the data shows only 30% do come for couple counselling with their partners.

The Tanzanian population is mostly young, the country is home to 12 million adolescents (10-19 years), an age group expected to reach 30 million by 2050. Adolescent sexual and reproductive healthcare is inadequate. Adolescents and young people are vulnerable to unintended pregnancy, sexually transmitted infections (STIs) including HIV. The percentage of women who have given birth or are pregnant with their first child by the age of 18 has increased from 23% in 2010 to 27% in 2015. Teens and young people report that confidentiality is often not respected, and services are expensive and not youth-friendly. Medication is also in short supply.

The mortality rates for under-fives, infants and neonates are at 53, 36 and 20 per 1,000 live births, respectively. Although there has been a significant reduction more cost-effective interventions are required to achieve The Sustainable Development Goal (SDG) 3.2.1 to end preventable deaths of new-borns and under-5 children by 2030. Neonatal deaths alone account for 40% of all deaths among children under age of 5 years. Malaria, pneumonia, diarrhoea, malnutrition, HIV and neonatal conditions (Prematurity, Birth asphyxia and neonatal sepsis) account for 80% of all childhood deaths, while these deaths are mostly due to preventable causes.

Gaps

Gaps were identified in the following areas; Maternal Nutrition including underweight, overweight, and anaemia; early marriage, childbearing and gender-based violence and sexual abuse; adolescent gynaecology, user friendly adolescent reproductive health services; exclusive breast feeding in the 1st 6months and satisfaction with quality of antenatal and postnatal health services; transport and referral system; drugs and supplies; access to insurance schemes and informal payments; adequacy of WASH provisions; utilization of quality improvement (QI) models for RMNCAH and male involvement in RMNCAH and HIV health services; maternal and neonatal mortality and persistent preventable and/ or treatable diseases such as malaria, pneumonia, diarrhoea, HIV and neonatal conditions and efforts coordination against these situations/conditions; implementation of maternal and perinatal death surveillance and response (MPDSR) approaches; coverage of; basic emergency obstetric and new-born care services; antenatal corticosteroids among mothers delivering preterm infants; HIV early infant diagnosis and interventions to reduce neonatal mortality.

Other identified gaps include; evidence for age specific sexual and reproductive health services; innovation research for new treatments and diagnostic procedures in

reproductive health; fecundity and contraception: fertility, foetal losses, their causes, prevention, contraception methods and use

Research Areas

Maternal and New-born health: Priority areas include; improving maternal and neonatal outcomes through utilizing perinatal death audits; harnessing community structures and practices, male involvement into care and enhancing development and accessibility of quality care that encompasses; feasible interventions against neonatal sepsis prevention and treatment; scaling up and timely uptake of; corticosteroids by mothers in preterm labour; immediate kangaroo mother care, early continuous positive airway pressure (CPAP) and surfactant therapy. Importantly there is a growing emphasis of addressing maternal and new-born nutrition especially in the first 1000 days of life. Other areas include; cost-effective strategies to improve adherence to ANC package; sustain partograph use for labour management; strategies for reducing overall neonatal mortality and mortality at Neonatal Intensive Care Unit (NICU). Areas to also consider include; strategies to improve referral systems; pre-referral management of maternal and neonatal conditions; improving early initiation of exclusive breastfeed; pain assessment and management in new-born; exploring impacts of midwives on quality of care; readiness of government and private facilities to provide quality EMONC Services.

Child health: Specific areas include; major social economic determinants of under-five survival and effective strategies to improve their survival in the community and facility settings; enhancing clinical and public health competencies in child care and developing strategies to deliver lifesaving interventions including Integrated Management of Childhood Illnesses (IMCI), immunization etc.; develop and evaluate strategies to prevent and manage childhood diarrhoea, malnutrition, low birth weight infants and their associated short and long term complications; enhancing accessibility to ICU; evaluate long term outcomes of chronic diseases diagnosed at infancy. Other specific research areas include; addressing the child nutritional challenges including under nutrition, micronutrient deficiencies, and the growing burden of overweight and obesity and their roles in the development and cognitive functioning, early NCDs onset, and economic and social development.

Adolescent health: Potential areas include; develop and implementing community and/ or school-based health programs for STI & HIV counselling and testing, HPV vaccination, sex education and adolescent nutrition including obesity/overweight prevention, anemia, and other micronutrients challenges; harnessing the potential found in new technologies and systems in providing physical and virtual information, treatment and referral; develop strategies to promote accessibility to family planning, TB/HIV diagnostic and treatment services; develop and evaluate the capacity of Primary health Care (PHC) workers in providing friendly adolescents care in accordance to their age and education level; developing indicators for evaluating the quality of adolescents care.

Reproductive health: Specific areas include; developing cost-effective strategies to improve; coordination of efforts by different partners and sectors; documentation and data accuracy in RMNCAH; gynaecological cancer screening; the use of modern contraceptives, antenatal care, skilled birth attendants, PMTCT and postnatal care particularly among vulnerable individuals; ensuring the incorporation of syphilis

testing and treatment in SRH and maternal services is optimized. Integrating reproductive health and other health services such as nutrition, community health interventions, immunization, management of other infectious diseases such as TB, HIV, cancers, and mental health services.

Theme 5: Non-Communicable Diseases (NCD)

Background

Non-communicable diseases (NCDs) are the leading cause of global mortality and morbidity accounting for 70% of Disease Adjusted Life Years (DALYs) in 2019 with ischemic heart diseases and stroke leading. Whereas compared to 1990's there is global increase in the magnitude of NCD, there is also shift of the burden more to the developing countries. In 2019, 80% of the premature death had occurred in sub-Saharan Africa. Intriguing is the fact that 70% of the NCDs associated deaths could be preventable by controlling tobacco use, hazardous alcohol intake, health diets, physical activities and environmental pollution. Due to this emergency situation, there has been a call to action for controlling non-communicable diseases. Furthermore, 8.4% of DALYs due to NCD are contributed by infectious diseases such as *H.pylori*, human papilloma virus, hepatitis B and C viruses and post-streptococcal disease; Central and Sub-Saharan Africa ranking second in the burden of infectious causes of NCD.

Situation analysis

Tanzania has been greatly affected by the NCDs with an upward trend since 1990s. The landmark key study in Tanzania reported alarming figures for community burden of NCDs as well as risk factors. More than a quarter (26%) of the respondent in the STEP study were either overweight and obesity. It is disheartening to see that the malnutrition trends start early in schools. A recent study revealed the prevalence of overweight (13.5%) and obesity (4.4%) to be 17.9% among secondary school students who should otherwise be active in sports. The major drivers of obesity and overweight have been reported to be physical inactivity worse in urban than in rural areas. There seem to be a gender disparity in overweight and nutrition without well-established determinants. On the other side, under nutrition is a recognized problem in Tanzania both for under-five children as well as the elderly population segment. Furthermore, nutritional needs of people living with HIV, those with chronic diseases and disabilities, elderly and in infection such as TB have not been fully studied. In sync with lifestyle changes, there has been a sharp increase in obesity and sedentary life related diseases, such as Diabetes Mellitus (9%), hypertension (26%), sleep related disorders and arthritis.

In the recent years Tanzania has also seen an increase life expectancy to 65 years in 2020. Consequently, there has been a corresponding increase of diseases associated with aging such as Alzheimer's and other memory related diseases, chronic neurological, musculoskeletal and respiratory diseases. On the other hand, stroke has also been on the increase along with End Stage kidney disease requiring renal replacement services. These services, are evolving there is need to optimize the service as well as increase access. Research must seek to responds to such needs.

There are many opportunity MUHAS research can tap into as its contribution to the National Research agenda and health and well-being of Tanzanians; such as creating evidence of cost effective and locally applicable interventions early diagnosis, management and prevention of Non-communicable diseases. It is in this spirit MUHAS research agenda for NCD is written.

Gaps

Areas needing attention; NCDs surveillance, interventions monitoring and burden assessment, systems and approaches; NCDs diagnostic, management and monitoring capacity of the health system; pathophogenesis of NCDs, their complications and timely management of both; risk factors and outcomes of NCDs (including Albinism), NCDs' complications and their respective treatment/management approaches; determinants of NCDs such as micro and macro nutritional disorders; impact of nutritional interventions among vulnerable populations segments with chronic disease. Significant issues were also identified in the following; multilevel, multisectoral and multispecialty cost-effective NCDs prevention and management strategies; evidenced based optimized treatment and long-term outcomes organs and tissues among transplant patients; drugs discovery and evaluation; NCDs medicine regulations; financing for NCDs' services.

Priority Research Areas

General Research Areas

Target areas include; to evaluate the effectiveness of the health systems in prevention, timely detection and/ or referral, management and surveillance of NCDs; establish the involvement of MUHAS and government in development and evaluation of drugs and vaccines; establish the association between epidemiological, environmental, socio-cultural as well as behavioural factors and development of NCDs. In the context of Tanzania, nutritional transition with regards to NCDs also will be an emphasis to ensure identification of the burden and risk factors of nutritional disorders, interventions to address poor feeding practices and other modifiable risk factors such as physical activities, salt intakes, fruits and vegetable consumptions, early and timely diagnosis, and management thereof. Apart from the WHO best buys for NCDs, efforts will be geared to identify Tanzanian's best buys that can address the NCDs burden.

Specific Research Areas

Diagnosis: Specific areas include; develop and evaluate cost-effective interventions for screening, timely diagnosis and referral of patients with non-communicable diseases including congenital diseases; explore the role of local and international collaboration and specialists in establishing in-depth understanding of the risk factors, aetiopathogenesis and burden of the various NCDs including Hypertensive Heart Diseases, Diabetes Mellitus, Kidney Diseases, Congenital diseases, Cardiovascular Diseases including stroke, Neoplasms, Chronic Respiratory Diseases, and their related complications.

Treatment and monitoring: Potential areas include; formulate programs to monitor and evaluate short-term and long-term outcomes (including on reproductive health

and quality of life in general) of both childhood and adulthood NCDs (malignancies included) and their related management including transplantation, dialysis, surgery, medications, rehabilitation etc.; develop and evaluate novel and existing interventions against; micro and macro nutrient interventions among at risk population segments (children, disabled, elderly); observed and reported NCDs and their management related outcomes. Other potential research areas include; discovery of novel drugs and therapies against NCDs and evaluate their pharmacokinetics and pharmacodynamics, acceptability and overall efficacy against the standard treatment.

Prevention: Target research areas include; develop and evaluate feasible and cost-effective intervention programs against the commonest NCDs risk factors such as smoking, unhealthy alcohol and diet consumption and physical inactivity; formulate strategies to address factors associated with nutritional disease including (but not limited to) those associated with gender disparities; implement and scaling up cost-effective screening programs against infections associated with NCDs such as *H. pylori*, human papilloma virus, Hepatitis B and C viruses and streptococcal infection.

Theme 6: Health systems research

Background

For extended period of time, the concept of universal health coverage (UHC) has surfaced on the global health agenda. The latter aims at leaving no one behind in quest of access to quality health care services. To realize UHC it is prudent that countries have in place resilient, responsive and inclusive health systems that are accessible to all, irrespective of socio-economic or legal status, health condition or any other factors. In its National Health Policy 2017, Tanzania aims to reach all households with essential health services attaining the needs of the population, adhering to objective quality standards and applying evidence-informed interventions through resilient systems for health. However, Tanzania as for most of the Low-Middle-Income Countries (LMICs) succumb sub-optimal performance of its health systems enshrined in weak governance systems, shortage of adequately deployed and retained health workforce, weak health care financing systems and fragmented health information systems. Altogether affect the supplies of medicines, vaccines and technologies and thus impinge the health care services delivery and subsequently rendering the responsiveness and resilience of the health system in Tanzania at verge.

To ensure the responsiveness and resilience of the health system in Tanzania, strategies that address the chronic health workforce problems, weak health systems governance, weak health information system and the chronic health care financing challenges are needed. Therefore evidence-based interventions are needed now than ever. In its development vision 2025, Tanzania advocates for quality livelihood for all its people.

Situation Analysis

Post implementation reports of: The National Health Policy 2007, Health Sector Strategic Plan III July 2009–June 2015, Health Sector Strategic Plan July 2015–June 2020 as documented by a series of Demographic Health Surveys (DHS) carried out in Tanzania and other studies indicate existence of a weak health system in Tanzania. The latter is explained by the low rate in improvement of the health indicators than expected.

The latter indicators are attributed to chronic shortage of health workforce due to low capacity of training, employing and retaining their workforce; fragmented health care financing strategies that do not warrant financial protection to vulnerable populations due to low coverage of pre-payment schemes, multiple unintegrated prepayment schemes, out of pocket cost sharing and reliance on tax-based funded health systems in countries that have low taxation base; weak health system governance due to weak health system management capacity at all levels from national to district level: and the existence of weak health management information systems attributed to the existence of many unintegrated health information systems, limited skills in uptake and use of digital health information systems and paper-based health information system mind-set oriented health workers.

Gaps

Areas that are yet to be addressed adequately in the health systems include; strategies to strengthening Health System governance, the role of community-based health systems, approaches for strengthening health care financing systems through alternative financing strategies to protect vulnerable populations, evidence-based strategies in deployment, performance and retention of health workforce in rural and remote areas, integration of the health information systems at all levels, strengthening the logistic chain management system to ensure availability of adequate, safe and of quality supplies at all levels.

Priority Research Areas

Health care financing: Specific research areas include; analysis of the effect of the different financing mechanisms on services delivery (DHFF, basket fund etc), Determine the effects of direct health facility financing coverage on realization of universal health coverage, exploring and determining of contributors for low enrolment of community members to insurance schemes, identification of strategies to increase health insurance coverage to those population in the informal sector, exploring alternative funding strategies for ensuring sustained health care financing in Tanzania.

Health System governance: Specific research areas include; identification of evidence-informed approaches on strengthening health system governance at all levels, analyzing the role of public-private partnership in enhancing equity, access and quality of health service provision, assessing the accountability mechanisms in strengthening the health system governance, capacity building approaches in strengthening health system management at all levels of the health system, identify cost-effective approaches for strengthening health system governance at the district level, and strengthening health system governance in gender mainstreaming and health care equity.

Health workforce: Specific research areas include; identification of evidence-informed strategies for retention of human resources for health at the rural and remote areas, analyze the role of task-sharing on addressing human resources for crisis in Tanzania, explore strategies for improving health workforce performance at all levels, analysis of the quality of health workforce training across all levels of the health system, determine the adequacy of financial and non-financial incentives in motivation and satisfaction of health workforce at all levels, explore evidence-informed strategies for planning health workforce training and recruitment at all levels and identifying approaches for the strengthening health workforce management by ensuring availability of a robust health workforce database.

Health Information System: Specific research areas include; exploring the role of digital technology in strengthening training, deployment and retention of human resources for health, analyzing the role of digital technology in strengthening health care financing strategies for improved health insurance coverage, exploring the feasible mechanisms for integration of health information systems, analyze how the digital health strategy can be used in improving health system governance and accountability, the role of digital technology strategies in ensuring availability of real time health workforce and health care services delivery data and analyzing the contribution of health information system in the availability of medicine, supplies and technologies.

Community-based health systems: Specific research areas include; exploring the role of community-based health systems in promoting health systems responsiveness and resilience, assess the role of community health system in health promotion and disease prevention, exploring the mechanisms for strengthening the integration of community health systems to the health care delivery system, analyze the implementation of Community Based Health Workers (CBHC) policy guidelines, device contextually feasible incentives to the community health workers and analyze the role of stakeholders towards strengthening the community based health systems.

Cross-cutting issues: Specific Research areas include; Analysis of equity and equity issues in health care services provision in Tanzania, analysis of access of health care services to vulnerable and marginalized groups and analysis of the quality of health care services quality from multiple lens approach.

Theme 7: Social Determinants and Social Conditions of Health

Background

For an extended period, the Bio-medical model concept has remained dominant in the understanding of diseases. Most diseases have been conceptualised as an outcome of the interaction between human beings and microorganisms like bacteria, parasites, viruses etc. This concept was consolidated with the discovery of antibiotics: sulpha and penicillin. The discovery of antibiotics, which came to be known as miracle bullets to hit microorganisms, literally deleted from all main stream health related literature the role of nonbacterial, nonparasitic etc., factors in the causation of diseases. In the course of time, however, as the source of infectious diseases got minimized through lesser human contact with microorganisms by improved hygiene and better sanitation etc., ill-health and diseases are still prevalent. The biomedical model, therefore, has been turned upside down and it is walking on its head. It is incompetent in explaining contemporarily widespread degenerative diseases like diabetes, renal diseases etc. It cannot explain hypertension or cancers. As MacKeon reasoned early on in the 19th century a return to the environment is key in the understanding of diseases. This return is best represented by the Devi circle. This circle posits that the source of all diseases and ill-health is the social and natural environment i.e., the origin of diseases and ill-health is social determinants – contaminated water; poor sanitation; cigarette smoking; substance abuse; alcoholism; unbalanced diet; poor housing; life style etc.

Situation Analysis

Situation Analysis as regards Social Determinants and Social Conditions of Health: as factors in diseases and ill-health: Representative examples are: NCDs, Life style, Oral health, Eye health, and Parasitic diseases.

NCDs

Tanzania has an increasing trend of non-communicable diseases (NCDs) characterizing an evident epidemiological transition. The burden of diabetes and cardiovascular diseases such as hypertension are high in Tanzania. The prevalence of diabetes in urban areas has increased from 5% in 2007 to 9% in 2012, while in 2012 a survey showed that the prevalence of hypertension was 26%. These diseases are driven by lifestyle related risk factors, types of foods and eating, habits using tobacco and tobacco products and alcohol consumption. It is evident that patients from cancer, diabetes and cardiovascular and mental diseases that require health services are increasing. Social determinants underlying these diseases include limited public awareness, promotion, prevention and curative services. This is aggravated by inadequate NCD experts, rehabilitative services, community involvement in home-based care and palliative care for patients. Habits of healthy eating and physical activities, especially among at-risk communities are worsening. Early detection through regular medical examinations promotion efforts is limited. Also, there is limited diagnosis of NCDs and interventions related to screening in new-born and elderly, and enrolment into comprehensive care services. Independent NCD clinics have not been well integrated into the health care system to enhance accessibility and affordability. Increasing socio economic hardships may increase the magnitude of mental ill health.

Life Style

Life style as a social determinant: Increasing misuse of alcohol is one of the significant public health problems that often begins early in adult life and is associated with a range of non-communicable health conditions. It is a major cause of intentional and unintentional injuries; have adverse negative effects on the foetus, increasing risk of development of certain types of cancer, physical and sexual violence and increase in road accidents and injuries in Tanzania in recent years.

The number of people who develop cancer has been increasing among others because of increased unhealthy life style habits, such as tobacco smoking and alcohol intake. At present about 35,000 people develop cancer each year, and recent forecasts suggested that by 2020 this number would increase by 50%. This will cause increasing strain on already stretched health systems and resources. Tobacco smoking is a major risk factor in developing cancer and the prevalence of tobacco use is rising in Tanzania. From 2008 to 2012 the prevalence of tobacco smoking jumped from 7.9% to 14.1%, and according to the latest data 28% of males are smoking. About 80-90% of cancer patients are unable to access diagnostic and treatment facilities and when they seek hospital care, about 75-80% of the patients have cancer in advanced stages that cannot be cured.

Oral health

Dental diseases have increased due to changes in the system of life-style of people; changes in food and drinks and low awareness of oral health issues in the community due to lack of dentists. Furthermore, the services provided do not meet the needs due to shortage of human resources and related commodity and in addition, the few available are not accessible to many people particularly those residing in the rural areas. There is limited community involvement and oral health researches.

Sight and Social conditions

Majority of eye conditions causing blindness or visual impairment can either be prevented or treated. However, eye health services are not available to a significant proportion of the population, with the rural far more affected than urban. Eye diseases are on the increase and hence triggering a burden to the health care system. There have been limited availability of eye health commodities, skilled human resource, equipment and infrastructure for provision of eye health services.

Parasitic diseases and Social conditions

Intestinal parasites such as Hookworm, Ascaris, Pinworms, Tapeworms are widespread. About 60% of OPD diagnosis has been associated with poor sanitation and hygiene practices. Water, sanitation, hygiene and food safety problems, which are social determinants-remain of big concern in the country. Use of improved toilets

at household level is 35% only. 10.8% of the households still practice open defecation.

Moreover, only 44% of health care facilities have a functioning toilet while 96% of schools lack standard sanitary facilities. Only 35% of households perform water treatment and about 32% of all health facilities have unsafe water supply. This has partly been due to inadequate community-based enforcement and overlapping of various laws and regulations; weak coordination among stakeholders dealing with sanitation and hygiene issues. In urban areas only 50% of waste generated is effectively managed leading to breeding grounds for mosquitos and hence the widespread malaria. Involvement of community in disease surveillance has been limited and inadequate.

Emergencies and epidemic outbreaks and Social determinants

Tanzania is still faced with inadequate hazards mitigation and preparedness, response and recovery plans and strategies at all levels, comprehensive multi-hazard preparedness, emergency capacity in terms of human and financial resources, and lack of pre-hospital Emergency Medical Services (EMS).

Nutrition and Social determinants

Tanzania is facing a triple burden of nutritional disorders. The commonly affected populations include children under the age of five, women of reproductive age, elderly, adolescents, and those with chronic diseases. Such conditions include undernutrition, micronutrients deficiencies, and overweight and obesity. Nutrition disorders span from social demographic disadvantages and challenges. Studies on social determinants of health and interventions thereof can help addressing the burden of undernutrition, micronutrients deficiency and overweight/obesity in various sub-populations.

Gaps

Gaps have been identified in; awareness on contribution of social determinants in diseases development; inclusion of social determinants component in health science training; utilizing available services in carrying out frequent medical examinations; motivation, policies and infrastructure for physical exercises; preparedness for epidemics and emergencies.

Priority Research Area

Specific research areas include; implement targeted intervention programs among policy makers and general population to promote lifestyle modification and awareness on social determinants of health; increase emphasis on developing competent health professionals who understand the context of health conditions and can manage them holistically while addressing the social determinants of health in the care and management of diseases.

Theme 8: Injuries

Background

Injuries have been becoming an important contributor to the national disease burden due to rapidly transforming socioeconomically from rural-agrarian to urban-industrial and commercial economy. As injuries occur on regular basis in the day-to-day activities, two important categories of injury must be recognized. One has been *intentional incidents* like attempted or actual suicide in which the former leads to injuries while the latter causes actual deaths. The second group which has been broader in perspective has been *unintentional injuries* resulting from motor traffic accidents, occupational causes, sporting activities, domestic activities and violence, criminal violence and related causes. In this regard, injuries have been differentiated from emergency disasters which occur incidentally from the changing economic activities.

Situation Analysis

Tanzania has seen tremendous rise in motor traffic accidents lately. Major causes being pedestrians against vehicles, passengers of conventional vehicles like buses, three wheeled vehicles (Bajaji) and above all, two wheeled motorcycles (Bodaboda).

Road traffic injuries in Tanzania are an important public health problem, predominantly in adult males. Road traffic accidents are now the leading cause of permanent disability and mortality among those aged 10 to 50 years. A study of mortuary based fatal injuries surveillance (FIS) system in rural and urban hospitals in Tanzania (2010-2015) revealed that out of 2387 deaths, two-thirds, 1222 (68%) were from unintentional courses, majority (51%) being due to road traffic injuries (RTI), whereas suffocation from hanging has been the main mechanism in intentional injuries. Guns and blunt objects were the weapons involved for the majority homicide deaths.

Provision of health care services to people injured has been effective in most of health facilities although there are some deviances. Pre-hospital care has been almost non-existent and health care service deliveries at the health facilities have been inadequate. Furthermore, the requirement of case notification to police station before a victim is sent to hospital delays patients further and defeat the concept of golden hour in emergency management of trauma patient. It has been logical to believe therefore, that significant proportion of patients with severe injuries is dying without medical care in Tanzania. There are limited capacities for both pre-hospital and health care facilities to manage accidents.

Gaps

Challenges identified lie in the following; approaching intentional/unintentional injuries as disease entities; effective and integrated national injuries prevention, rescuing and surveillance systems; adequacy integration into the referral system of pre-hospital injuries management; injuries care and rehabilitation services; competencies of health care providers particularly at PHC in triaging, assessing and management of injuries. Furthermore, evidence on risk factors for injuries and road traffic accidents needs to be evaluated. These include state of mental health,

substance abuse, associations with chronic diseases and nutrition, poverty and other social economic disadvantages.

Priority Research Areas

Target research areas include; research that geared to formulate proper management of intentional and unintentional injuries and promote the recognition of these conditions as true disease entities; enhance respectively the efficiency and competencies of health systems and health care providers at all levels (primary to national) in proper injuries management (including rehabilitation); strengthen pre-referral management of injuries; establish efficient and effective joint local (village to region) and national injuries prevention systems and surveillance. Moreover, research is needed on understanding the contexts where injuries and road traffic accidents occurs including individual risk factors such as demographic characteristics, mental health challenges, family, societal, and population-wide constructs. Interventions are also necessary to ensure those affected are re-integrated to economic activities to cut-down life-long suffering and dependency.

Theme 9: Emerging and Re-Emerging Infections

Background

Emerging diseases are those whose incidence in humans has increased in the past two decades while re-emergence is the reappearance of a known disease after a significant decline in incidence. The magnitude of the problem is illustrated by the appearance of several new pathogens causing disease of marked severity, such as the human immunodeficiency virus (HIV) and other retroviruses, the Ebola virus and currently, the Corona virus. Old pathogens such as cholera, dengue, hemorrhagic fever etc., have re-emerged and are having considerable impact in many communities and countries. The “highways” on which these infections travel at supersonic speed traverse the world which has become globalized. The vehicle is person-to-person transmission or vectors contact between animals and humans as championed by One Health.

Situation Analysis

Emerging and re-emerging infections are a reality in Tanzania. These include for example cholera, HIV/AIDS, Rift valley fever and currently COVI-19. The latest outbreak of cholera was from 15 August 2015 through 7 January 2018, 33 421 cases including 542 deaths were reported in all the 26 regions of the United Republic of Tanzania. Children under five years old accounted for 11.4% of cases. The HIV/AIDS outbreak occurred in the early 1980s and currently its prevalence is 5%. It infects adults and children although adults are infected more. Rift valley fever has been sporadic but there has been effective control. The latest of these emerging diseases is the current COVID-19. Documentation of the later in Tanzania is poor. Occasional deaths have been reported. Worldwide, however, it has affected all countries. The most affected countries include the USA, Brazil, India, USSR and Britain. The WHO estimates that 100,000 people are dying every week in the world. To-date over two million people have died worldwide from COVID-19.

The emerging and re-emerging infections management under ideal situations requires:

1. Strengthened infectious disease surveillance and response.
2. Improved methods for gathering and evaluating surveillance data.
3. Ensured use of surveillance data to inform public health practice and medical treatment.
4. Strengthened local and global capacity to monitor and respond to emerging infectious diseases in addressing specific problems and in implementing measures for the prevention and control of emerging and re-emerging infections.
5. Basic infrastructure in place where the surveillance is being done besides the capacity to systematically collect, analyse, interpret and disseminate the collected data.

6. Established national and regional infrastructures for early warning and rapid response to infectious disease threats through laboratory enhancement and multidisciplinary training programs.
7. Promoting further development of applied research in the areas of rapid diagnosis, epidemiology and prevention.
8. Strengthened regional collaboration for effective implementation of prevention and control strategies.

Existing Gaps

Among areas that demand close attention include; effective and decentralized surveillance systems; health system and government preparedness particularly in absence of development partners; understanding on the importance of effective and collective communication approaches with communities during outbreaks; necessary human and laboratory capacity; regional collaboration, multisectoral and multidisciplinary approach in outbreaks research and management; understanding the influence of globalization and changing national ecology to emerging and re-emerging infections.

Priority Research Areas

Specific research areas include; establish the role of national ecology, risk factors, nature, and contexts on emerging and re-emerging infections; develop and evaluate novel and existing emerging and re-emerging infections surveillance systems; formulate strategies to strengthen national capacity to manage emerging and re-emerging infections; enhance effective and efficient communications, reporting and referral systems between the community and respective authorities during outbreaks of emerging and/ or re-emerging infections.

Theme 10: Oral Health

Background

The World Health Organization - Regional Oral Health strategy 2016-2025 advocates for Common Risk factor approach to managing oral disease and conditions. The strategy aims to reduce the NCD burden and risk factors so as to effectively prevent oral disease. The Tanzania NCD strategic plan 2016-20, incorporated oral health as an NCD, to strengthen preventive efforts through a common risk factor approach. The WHO guides countries to periodically conduct national oral health surveys in order have data required for planning oral health services, monitor oral disease trends and allow comparability across the nations.

The first (1982), second (2010) and third national surveys yielded findings that formed a basis for: producing the national plan for oral health 1988-2002 and the national policy guidelines for oral health 2002 leading to formulation of plan for the rehabilitation and equipping dental clinics at all hospital levels in Tanzania; drafting the Tanzania oral health strategic rolling plan for 2010-2015; addressing psychosocial aspects of oral health whereby it was realized that half of the participants had at least one oral impact, and distance as well as cost of treatment hindered many Tanzanians to access dental services. These findings led to the intensification of dental task shifting; whereby clinical officers were trained to render emergency oral care at health centres and strategically placed dispensaries. Likewise, village health workers, primary school teachers and reproductive and child health workers were trained to be able to give oral health education.

Situation analysis

The Tanzania national oral health surveys as well as research conducted in the country revealed that:

Dental caries:Dental caries experience among Tanzanian pre-schoolers is reported being at higher levels than the school going children with average number of decayed teeth ranging from 0.95 to 2.4 and prevalence ranging from 3.7 to 49.6% and the experience increases exponentially with age. There is scarce information regarding prevalence of dental caries among Tanzanian adults, few studies retrieved indicate average score of decayed-missing and filled teeth ranging from 1.8 -3.8 also increasing with age. Dental caries is the main reason for teeth loss and majority of patients stay with untreated dental caries. It is more prevalent among urban dwellers, well-off families and females.

Periodontal disease:Gingivitis is the commonest periodontal disease but limited progression to periodontal pockets. Oral hygiene is largely unsatisfactory. Risk factors for such diseases include age, sex, education, residence, plaque and calculus. Tobacco smoking is also known to be associated with periodontal diseases.

Malocclusion:Prevalence ranges from 26.9 % among 3-5year olds to 62-97.6 % among 12-15 years (42–44). It has a significant impact on oral Health Related Quality of Life. With advances in dental technology a lot is desired to be done to attain aesthetically functional occlusion.

Dental fluorosis: Dental fluorosis affects almost everybody (92-100%) in fluoride endemic areas. The concern is not only the mottling of teeth which impacts on aesthetics, it also makes teeth brittle and fracture. Dental fluorosis intervention is almost an untouched area in Tanzania. Given the number of people affected, the ministry of health requires data for planning interventions at both community and clinic level.

Dental trauma: This is prevalent in Tanzania and most individuals walk with untreated traumatized teeth. There is increase in motor traffic accidents, fractures of skull and facial bones account for more than 40% of head and neck injuries.

Oral cancers: The prevalence of oral tumours is low with 12% being comprised of tumours of odontogenic origin, with ameloblastomas being the most commonly seen odontogenic tumours (incidence rate of 0.68 per million). Kaposi's Sarcoma of orofacial region are common due to HIV association.

Cleft-lip and palate: Hospital data shows incidence of 17 per 100,000 – 1:2000. Enhancing oral health in school is a public health measure.

Gaps

Oral diseases are among the most common non-communicable diseases (NCDs) that impact populations' quality of life. Infectious diseases that manifest in oral cavity are also prevalent and they affect people throughout their lifetime. Studies conducted in Tanzania indicate a gradual increase of oral impacts from early childhood to elderly. Reported prevalence of impacts is reported in 32.5% of the studied toddlers, 28-48% among school children, 51% among young adults, and among the elderly, the prevalence ranges from 51.2% - 62.1%. Putting all age groups together; the previous national pathfinder survey found a prevalence of 49.1% indicating significant suffering among Tanzanians due to poor oral health. Treatment of oral diseases causes a considerable economic burden on individuals, communities and countries. On the same note there is unequal distribution of oral health professionals causing most of the oral diseases to remain untreated in the remote areas. MUHAS as a public institution, having the appropriate facilities for research and hosting health professionals who are capable of conducting innovative research, is in the right position to contribute to the reduction of oral disease burden.

Priority Research Areas

General

Potential research areas include; evaluate the costs and impacts of adopting Basic Package of Oral Care; develop and evaluate cost-effective programs needed to strengthen local oral health policies, guidelines and programs; formulate effective strategies to increase accessibility to quality comprehensive oral health package.

Specific Research Areas

Diagnosis: Specific research areas include; explore novel approaches for diagnosing malignant oral lesions; establish cost-effective community-based interventions/strategies to improve access to oral health services; evaluate best entry points for diagnosing oral lesions.

Treatment: Potential areas include; formulate cost-effective strategies or interventions for preventing, screening and treating oral diseases including the oral manifestations of systemic diseases; deploy best strategies or interventions to improve preventive dental visiting behaviour.

Delivery of Quality Services: Target research areas include; deploy cost-effective strategies to improve accessibility to oral health services and factors impacting their success; implement best strategies or interventions in providing and integrating oral health care with other NCD programs; formulate and implement optimal strategies or interventions to improve oral health outcomes in adolescents.

Prevention (Community Dentistry): Specific research areas include; formulate and evaluate strategies to introduce and promote uptake of comprehensive oral health preventive package; establish the efficacy, feasibility, and acceptability of Silver Diamine Fluoride (SDF) for prevention of early childhood.

Theme 11: Mental Health

Background

Tanzania has experienced increased prevalence of mental illness which often have onset in young adulthood. It is estimated that at least 1% of the population suffer from a mental illness at any given time. Common mental illnesses are often not diagnosed or treated which have implications for lost productivity of both patients and the extended family while seeking healing for prolonged time. Persistence of the AIDS epidemic and its psychosocial ramifications, and increasing socio economic hardships may increase the magnitude of mental ill health.

Tanzania, being one among the developing countries in the world, has an astonishing shortage in mental healthcare. Access to mental health services is restricted and this restriction, comes from a variety of factors, from limited healthcare facilities providing integrated mental health services, lack of mental health care providers (both non-specialized and specialized), limited infrastructure for mental health services including space, frequent stock-out of antipsychotic drugs, and inadequate health management information systems that allow for documentation of mental disorders. While these factors may in part be a result of lack of funding; human resource challenges may limit abilities to develop adequate district and regional mental health service plans, effectively excluding such services from budgetary requests. Furthermore, stigma towards mental disorders, those affected and their caregivers, may effectively marginalize people with mental and substance use disorders. Mental disorders include: depression, bipolar affective disorder, schizophrenia and other psychoses, dementia, intellectual disabilities, personality disorders, substance use disorders and developmental disorders including autism. Mental health services and clinical research has the potential to inform development and strengthening of existing packages for mental health services and care, and in this way save lives, relieve significant distress and improve quality of life. Mental health promotive and preventive research may also benefit the whole of our society by generating psychosocial and economic benefits that contribute to thriving communities built upon resilience, reduced levels of mental ill-health and less stigma and discrimination.

Gaps: Gaps were identified in the following areas; accessibility of mental care at community, primary-tertiary levels; integration of mental health services into primary and secondary levels; mental health training for both specialized and non-specialized health care workers; adequacy of human resource (including age specific i.e., children, adolescents, adults, elderly) for specialized mental health care teams e.g., psychiatric nurses, social workers, occupational therapists, clinical psychologists etc; supportive treatment/rehabilitative facilities/infrastructure in health facilities and rehabilitative centres; evidenced based treatment and rehabilitative practices e.g., occupational and psychological therapies in improving the quality of life.

Research Areas: Potential research areas include; burden of suicide and common mental disorders among adolescents and adults in the community and primary levels of care; establishing biopsychosocial determinants, protective and risk factors of common and severe mental disorders in Tanzania; cost effective strategies for integrating mental health services in the assessments and plan of care of clients

(including those with chronic illnesses like DM, CKD, HIV/AIDs, Stroke etc.) that are attended at OPD and RCH in all levels, primary to tertiary levels; characterize the preparedness, mental health and resilience of children and uneducated individuals in coping with developmental challenges in the society. Other research areas include; design and implement impactful multilevel interventions against gender based violence; harmonizing quality and nature of mental health care packages delivered at different levels of care, from community to national levels; formulate cost-effective and feasible diagnostic and treatment models/interventions against common mental; strategies to strengthen the capacity for mental health services clinical practice and research; evaluate and scale up measures against illicit and narcotics drugs in Tanzania.

Theme 12: Pharmacovigilance and Rational use of Medicines

Background

The World Health Organization (WHO) has defined Pharmacovigilance (PV) as “the science and activities relating to the detection, assessment, understanding, and prevention of adverse effects or any other possible drug-related problems.”¹ The aim of the PV system is to protect the public from medicines-related harm. Currently few low- and middle-income countries have a well-functioning PV system to support the timely identification, collection, and assessment of medicine-related adverse events. On the other hand, rational use of medicines is the role of all health worker cadres and is under the mandate of National and Hospital Therapeutic committees.

Situation Analysis

The PV system in Tanzania was introduced in 1989. The major purpose was to monitor and provide relevant information about the safety of medicines. Since its establishment, there have been a lot of interventions conducted to strengthen the system such as development of tools like electronic reporting systems, sensitization and training, establishment of PV zonal centres and active safety monitoring for some selected medicines. The Pharmacovigilance regulations were also developed and endorsed by the Minister responsible for Health, Community Development, Gender, Elderly and Children (MoHCDGEC) in the year 2018. The regulations require for mandatory reporting of all suspected adverse drug reaction by the Marketing Authorization Holders, healthcare workers and consumers.

Despite all these efforts, the PV system in Tanzania did not achieve all of its planned goals due to inefficient functional regulatory and organizational structures, limited funds, unclear roles and responsibilities of all stakeholders on ensuring medicinal safety, ineffective active surveillance of Adverse Drug Reactions (ADRs), disconnected databases, lack of sufficient Human Resources as well as lack of PV relevant skills and competence among stakeholders

On the other hand, irrational prescribing and dispensing of medicines contributes to poor treatment outcomes. Engaging a check and balance mechanisms for medicines prescribed and dispensed is the role of clinicians and Pharmacists and the 2 must work collaboratively to the quality management of patients. In most health facilities there is reluctance to initially check culture sensitive or check existence of parasites before an antibiotic or antimalarial drug is prescribed. This has led to overuse of antibiotics and antimalarial drugs hence creating drug pressure that eventually leads to drug resistance.

Gaps: Inadequacies were observed in the following areas; collaborative approaches between clinicians and pharmacists in for addressing medical errors; integration of various PV teams e.g., MDR TB PV team and general hospital PV team; PV trained staff turnover and knowledge sharing from them; commitment by health facilities leadership (e.g. hospital drugs and therapeutic committees) and HCWs in reporting adverse drug reactions; performance of hospital therapeutic committees; linkage between the TMDA and the potential PV stakeholders e.g., healthcare workers and

professionals, Public Health Programmes (PHPs), Marketing Authorization Holders (MAHs); linkage of institutional and TMDA ADR databases.

A number of gaps were also identified in the following areas; promoting prescription of medications (particularly antimalarials and antibiotics) after culture results or confirmation of parasites; capacity to analyse aggregated safety information like Periodic Safety Update Reports (PSUR) from MAH; PV curriculum or standalone training in medical schools; inadequate awareness on PV among HCWs and management; defined system for ADR risk management; units and focal persons at MAH and health facilities for coordinating activities and liaising with TMDA; STG and NHIF medication list related consequences information.

Priority Research Areas: Specific research areas include; institute effective tools and training modules/curricula for PV particularly in training institutions; strategies to strengthen; Hospital and National Therapeutic Committees; ADR reporting systems and regulatory framework for PV; quality of adverse event reports transmitted to TMDA, quality of information transmitted to Uppsala Drug safety Monitoring centre; quality of patients' care irrespective of the discrepancies reflected on STG and NHIF medications lists; the linkage between TMDA and various PV stakeholders and pharmacists and clinicians the magnitude of overprescribing and dispensing of injections and antibiotics, the economical and health impact of polypharmacy

Theme 13: Occupational Health and Safety

Background

Workers represent half of the world population and are the major contributors to economic and social development. Most of them work under difficult and hazardous conditions. In low- and middle-income countries, the number of workers who contract occupational diseases and injuries is particularly high, with significant societal consequences. However, most of these diseases and injuries could be prevented through improved knowledge and education. Effective interventions can prevent and avoid occupational hazards and protect workers' health. While industrial activity is increasing dramatically in Tanzania, knowledge about Occupational Health (OH) is poor. In addition, only a small minority of the workforce has access to occupational health services, and the growing informal economy is often associated with hazardous working conditions.

Situation Analysis

The Global plan of action 2008-2017” by World Health Organization concluded that “All workers should be able to enjoy the highest attainable standard of physical and mental health and favourable working conditions. The workplace should not be detrimental to health and wellbeing. Primary prevention of occupational health hazards should be given priority. According to information from the International Labour Organization, more than 2.3 million people die of work-related accidents and diseases every year and 317 million accidents occur due to workplace hazards annually. Worldwide, occupational diseases continue to be the leading cause of work-related deaths. According to ILO estimates, out of 2.34 million occupational fatalities every year, only 321,000 are due to accidents. The remaining 2.02 million deaths are caused by various types of work-related diseases, which correspond to a daily average of more than 5,500 deaths. This is an unacceptable number. “Every 15 seconds, a worker dies from a work-related accident or disease”, ILO states. The inadequate prevention of occupational diseases has profound negative effects not only on workers and their families but also on society at large due to the tremendous costs that it generates; particularly, in terms of loss of productivity and burdening of social security systems.

In many developing countries, death rates among workers are five to six times those in industrialized countries and work-related injuries and diseases are largely undocumented. Global competition, growing labour market and rapid change in all aspects of work creates an increasing need for labour protection, especially in developing countries. MUHAS should take concrete steps to enhance capacity towards preventing occupational diseases.

Gaps: Pitfalls have been observed in such areas as; adequacy and competency of HRH for OSHA and WCF scaleup; estimating magnitude of occupational exposures and diseases; establishing the clear relationship between exposures and diseases; developing, implementing and evaluating effective interventions for workplaces related health issues; studies on occupational exposures related to chronic respiratory diseases.

Priority Research Areas: Specific research areas include: characterizing health workers' exposure to chemicals (cleaning agents, disinfectants, natural rubber latex, dust, pesticides) and infectious agents (TB, viral infections) as well as assessment of the associated health effects; investigating the magnitude and risk factors for burnout and other work-related psychosocial disorders; determining the appropriate reference values for the interpretation of lung function data in the Tanzanian population; characterising risk factors for low lung volumes in the Tanzanian population; characterising workers exposure and associated adverse health effects in various sectors such as artisanal and small-scale mining, agriculture, coffee processing, cement production, ceramic and textile industries; quantitative exposure measurements and biological monitoring of hazardous chemicals such as polychlorinated pesticides (PCPs), biphenyls (PCBs) and persistent organic pollutants (POP).

Other research specific areas include; design, implementation and evaluation of novel and existing cost-effective strategies for reducing or controlling occupational exposures and their associated health and non-health impacts; develop and evaluate cost-effective diagnostic, treatment and rehabilitative models for work-related diseases.

Theme 14: Haematological Disorders

Background

Haematological conditions are common in Tanzania and affect individuals across the age spectrum. The range of haematological conditions described in the country is wide, encompassing acute and chronic as well as benign and malignant conditions. Notable burden includes haemoglobinopathies such as Sickle Cell Disease (SCD), disorders of haematopoiesis such as aplastic anaemia, nutritional and other forms of anaemia, coagulation abnormalities such as haemophilia and malignancies such as multiple myeloma, leukaemia and lymphomas.

Over the years, MUHAS has taken lead in advancing the basic, clinical, translational and public health research on these diseases. Insights from these studies have informed the magnitude, determinants of disease severity, treatment outcomes and associated factors for select diseases. Currently, substantial progress is being made in the country in the areas of diagnosis, curative and monitoring services for haematological disorders, including enhancement of zonal blood transfusion services as well as use of clotting factors and monoclonal antibodies for the treatment of bleeding disorders and leukaemia, respectively. Preparations are also under way for introduction of bone marrow transplant and gene therapy. As clinical care for these diseases advances at both public and private healthcare settings in the country, MUHAS needs to continue to be at the leading age of research intended to inform these advancements.

Situation analysis

Sickle Cell Disease

SCD is one of the more extensively described haematological disorders in the country. Currently, about 11,000 babies are estimated to be born with the condition each year in Tanzania, ranking 5th globally (*Piel F et al., PLOS Medicine, 2013*). Mortality due to SCD in Tanzania is high, especially during childhood where the disease contributes 7% of all-cause mortality among children below 5 years of age (*Makani J et al., Trop Med Int Health, 2015*). Over the past decade, concerted efforts have been invested in research and care for SCD in Tanzania with significant input from MUHAS. These have included development of an online SCD registry, paving way for cohort studies and implementation research; training of healthcare workers and researchers on SCD; development of the National SCD Management Guidelines; inclusion of Hydroxyurea in the National Essential Drugs List, implying coverage by the National Health Insurance Fund and pilot in-country compounding of Hydroxyurea. Through intended for all infants in the country, the introduction of pneumococcal conjugate vaccine-13 (PCV-13) through the National Programme on Immunization since 2013 has had a particular benefit to individuals with SCD.

Aplastic Anaemia and Paroxysmal Nocturnal Haemoglobinuria

Aplastic anaemia (AA) is a rare disorder, and paroxysmal nocturnal haemoglobinuria (PNH) is an ultra-rare disorder. The essence of AA is bone marrow failure (BMF): it may be caused by a specific genetic abnormality, as in Fanconi anaemia; or it may be acquired, mostly as a result of a T cell-mediated auto-immune process causing

damage to the haematopoietic stem cells (HSC). PNH is closely related to AA because, when the target of the auto-immune attack is the glycosyl-phosphatidylinositol (GPI) molecule, as it often is, then HSCs with a *PIGA* mutation that lack GPI will have a selective advantage and will repopulate the bone marrow: thus, AA can evolve to PNH.

In spite of its rarity, AA is well recognized at the Muhimbili National Hospital, with 30-40 new cases diagnosed each year. We have provided evidence that the incidence of AA may be higher in Tanzania than in Europe. We also have at least 5 cases of PNH on record.

Haemophilia and other coagulation disorders

The congenital bleeding disorders haemophilia A and B are estimated to affect between 1 in 10,000 (*Merritt A.D et al, Publishing science group,1976*) and 1 in 30,000 (*Rosendaal F.R et al, Thromb Haemostasis journal,1990*) males. The complications of haemophilia, including severe, debilitating chronic joint disease and infectious diseases transmitted through blood products, create large demands on health care resources. However, little is known about the size and distribution of the East African haemophilia population and even less is known about the rate of complications from the disease or its treatment.

Haemophilia A (HA) is an X-linked recessive bleeding disorder caused by any of a large number of mutations in the factor VIII (F8) gene encoding the coagulation factor VIII (FVIII) protein (*Goodeve A et al, SeminThrombHemost journal, 2008*). This is required for propagation of the intrinsic coagulation pathway and is the only gene known to be associated with HA (*Renault N et al, European journal of Human Genetics, 2007*). HA is the most common inherited bleeding disorder (after von Willebrand disease) and in many populations its frequency in males is approximately 1:5000 to 1:10,000 (*Scriver CR et al, McGraw-Hill, New York Publisher,1995*). According to the residual FVIII activity, HA is classified as severe (<1% FVIII activity; <0.01 IU/mL), moderate (1%–5% FVIII activity; 0.01–0.05 IU/mL) or mild (5%–40% FVIII activity; 0.05–0.40 IU/mL) (*Goodeve A et al, SeminThrombHemost journal, 2008*).

In Sub-Saharan African countries, data on genetics, inhibitors, prevalence and causal haemophilia variants are scarce and this includes East African countries, Tanzania being one of them whereby there is no any published studies evaluating the prevalence of Haemophilia A, Factor 8 genetic mutations among patients with HA, presence of FVIII inhibitors against infused factor concentrates and associated risk factors.

Multiple Myeloma, Leukaemia and Lymphoma

Lymphoma is a cancer resulting from malignant transformation of lymphoid cells, and is the 3rd most common malignancy in children after acute leukaemia and central nervous system (CNS) tumours. Non-Hodgkin's Lymphoma is the most common haematological malignancy in Tanzania with a median age at diagnosis of 54 years. The most common childhood malignancy in Sub-Saharan Africa is Burkitt's lymphoma. In Tanzania, Burkitt's lymphoma constitutes 42% of all childhood

cancers (*Kristin Schroeder et al, American Society of Clinical Oncology Journal, 2017*).

Multiple Myeloma is a malignancy of the plasma cell and represents the second most common haematological malignancy world-wide. Globally there are about 86,000 new cases diagnosed annually (*Kazandijan D., Seminars in Oncology, 2016*). In Tanzania, approximately 30 patients are diagnosed with Multiple Myeloma every year. This is probably an under-estimate as there are existing limitations with availability and accessibility of diagnostic facilities as well as sub-optimal awareness in the general public as is common for the vast majority of cancers. Multiple Myeloma patients in Tanzania present at a relatively younger age – median age of 57 years compared to patients in the developed countries, where the median age is 70 years. About 16% of patients are less than 45 years of age (*Leak S.A et al., PLoS One, 2020*).

Leukaemia is a term used to define cancer of the blood and bone marrow. It is broadly subdivided into acute leukaemia and chronic leukaemia based on the maturity level of the blood cells involved with further subdivisions based on the type of cells involved. Leukaemia is the second most common haematological malignancy constituting 27% of all haematological malignancies in Tanzania (*Leak S.A et al., PLoS One, 2020*). Acute Myeloid Leukaemia (AML) is the most common acute leukaemia in adults, whilst acute lymphoblastic leukaemia (ALL) is most common in children. The Paediatric Oncology Network in Tanzania, in collaboration with the Non-Governmental Organization 'Tumaini La Maisha (TLM) has made significant progress in research on acute leukaemia in children. Approximately 72% of all acute leukaemia cases in children constitute ALL (*Kersten E et al. Pediatric Blood and Cancer, 2013*). The Chronic Myeloid Leukaemia clinic at Ocean Road Cancer Institute (ORCI) attends an average of 40 patients with confirmed CML every week with the median age of 45 years – a much younger age compared to patients in developed countries where the median age is 60 years. Imatinib, used for treatment of CML, is freely available in Tanzania under sponsorship of Glivec International Patient Assistance Programme since 2004. However, 75% of patients treated with Glivec in Tanzania have a sub-optimal response. The median age of CLL in Tanzania is 67 years, with a predominant male pre-ponderance (ratio 4:1) (*Nasser A. et al, Blood Advances, 2021*)

Gaps

Sickle Cell Disease

Deficiencies were observed in the following areas; awareness of SCD among HCWs and community; national New-born Screening (NBS) policy; understanding of the basic mechanisms (genetic, proteomic) that influence expression of haemoglobin F, vaccine reactivity and susceptibility to infection and end-organ damage in patients with SCD in Tanzania; coverage of health insurance for patients with SCD, resources for SCD care at health facilities; on oral/dental manifestation of SCD and/or its treatment; guidelines on oral/dental management of patients with SCD; data on the availability and acceptability of Hydroxyurea, folic acid, penicillin prophylaxis and the various pain medications in SCD; appropriate recommendation for malaria chemoprophylaxis in patients with SCD.

Other identified gaps include; studies on the incidence and determinants of end-organ damage in SCD; availability of advanced transfusion services (exchange transfusion, extended cross-matching, cryoprecipitates); data on acceptability (community and HCWs' perception, costs) and preparedness for advanced therapy for SCD

Aplastic Anaemia and Paroxysmal Nocturnal Haemoglobinuria

Regarding AA, our main gaps are not in diagnosis but in management. Most of our patients have severe AA, and the current recommended therapeutic options are either (a) intensive immunosuppressive treatment (IST) or (b) allogeneic bone marrow transplantation (BMT). While steps are being taken for instituting BMT, both options have requirements in common; provision of platelets by platelet apheresis; improved microbiology support (prompt reports of cultures, diagnostic tests for viruses); a broader spectrum of antibiotics; leukocyte retention filters when giving blood products; supply of anti-thymocyte globulin (ATG)

For PNH we also need; panel of 3-4 antibodies for flow cytometry; exploration of access to eculizumab; entering patients into clinical trials of new complement blockers.

Haemophilia and other coagulation disorders

The identified gaps are in such areas as; awareness on bleeding disorders among health care workers, policy makers and the community; data on disease epidemiology among African countries and Tanzania; diagnostic capacity and resources in various health facility levels; accessibility to standard of care treatment (e.g., Factor concentrates & Bypassing agents); supply of blood and blood products for the management of bleeding disorders; national screening policy and registry; data on the treatment outcomes with the available therapeutic agents; parents support groups and educators (Psychologist/social worker); information on the genetic risk factors of Tanzanian patients with bleeding disorders, community social economic status and insurance coverage for patients with bleeding disorders.

Multiple myeloma, leukaemia and lymphomas

Identified areas with unaddressed/ partially addressed challenges include; awareness of health care workers, policy makers and the community on blood cancers; data on disease epidemiology; diagnostic capacity, screening and early detection resources; accessibility to standard of care treatment; supply of blood and blood products for the management of blood cancers; information on the genetic risk factors and genetic landscape of Tanzanian patients with blood cancer; data on the treatment outcomes with the available therapeutic agents.

Priority Research Areas

Sickle Cell Disease and other haemoglobinopathies

Basic and clinical sciences

Research specific areas; exploration on the molecular mechanisms that influence expression of haemoglobin F, vaccine reactivity and susceptibility to infection and

end-organ damage in patients with SCD in Tanzania; incidence and risk factors for end-organ damage in SCD (renal failure, avascular necrosis, chronic ulcers, visual impairment, cardiomyopathy, hepatopathy stroke)

Public health, health systems, sustainability

Potential research areas; explore and influence the preparedness of the healthy systems, patient communities and healthcare workers for the introduction of advanced therapies for SCD in Tanzania; developing feasible and cost-effective strategies that could influence public-private partnerships towards investment in care for SCD at healthcare facilities; design, implement and evaluate approaches for enhancing and sustaining knowledge and awareness on SCD among communities and healthcare workers.

Aplastic Anaemia and Paroxysmal Nocturnal Haemoglobinuria

Basic and clinical sciences

Specific research areas; Characterization of clonal haematopoiesis in AA and PNH; establish in patients with AA; long term outcomes (e.g., propensity to evolve to PNH or AML) and their proper preventive and treatment models/interventions.

Public health, health systems, sustainability

Potential research areas; socio-economic background of patients with AA; strengthen doctor/patient education to facilitate spotting AA in peripheral hospitals in patients receiving recurrent blood transfusion; exploring provision of new therapeutic agents, particularly eltrombopag

Haemophilia and other coagulation disorders

Basic and clinical sciences

Specific research areas; Haemophilia related clinical phenotypes, genetic mutations and complications among patients in Tanzania; FVIII inhibitors associated prevalence, genetic and non-genetic factors for their development.

Public health, health systems, sustainability

Potential research areas; burden of bleeding disorders in Tanzania; feasible and cost-effective advocacy strategies for sustaining diagnostic services and increases awareness among healthcare workers and general public on bleeding disorders.

Multiple myeloma, leukaemia and lymphomas

Basic and clinical sciences

Target research areas; the genetic and mutation profiles of patients with blood cancers; design, implement and evaluate clinical trials to validate newer diagnostic approaches suitable in the low resource setting; genome Wide Association Studies for blood cancer in the African population; haematological and genetic response to therapeutic agents used for treatment of blood cancers.

Public health, health systems, sustainability

Target research areas; the incidence and burden of blood cancers in Tanzania; effective intervention programs to create and sustain awareness in the general public and among health care workers; apply and evaluate the role of patient-led versus physician-led patient support groups; acceptable, feasible and effective approaches to understand and influence perception of palliative care among specialists attending to patients with haematological malignancy; effective and efficient strategies to sustain diagnostic services for patients with haematological malignancies.

Theme 15: Traditional Medicines and Natural Products Development

Background

Currently Tanzania imports over 70% of its drug needs, with the major share coming in from India. India has successfully embarked on the production of well-established drugs, and given the advantage of cheap labour as compared to European drug manufacturers, they have managed to supply cheap drugs to many countries around the world. On the other hand, the Chinese are pioneer of formalizing traditional medicine use and it has been prescribed parallel as western medicines in hospitals.

The government declared intention to facilitate local production of traditional medicine through the meeting which was held in July in 2011 in Malabo, Equatorial Guinea, whereby Heads of African states laid up plans to in-cooperate some traditional medicines in the nation essential medicine list by 2020.

There is a growing international demand for new medicines and chemotherapeutic agents from natural products, owing to the failure of synthetic chemists to deal with challenges of new diseases. Some of the new diseases include HIV/AIDS, Human Spongiform Encephalopathy, Ebola and others which do not have cure. The world is also facing re-emergence of old diseases like tuberculosis with organisms being resistant to drugs. The emergence of multidrug resistant parasites is a formidable challenge of our times that demands new and effective solutions. Due to developments in biotechnology such as human genome project, has opened up new areas of research including identification of new drug targets which provide opportunities for the development of new medicines from traditional medicines and

natural products to deal with emerging and re-emerging diseases. The Institute of Traditional Medicine views this as an opportunity to take up the challenge to lead efforts to develop traditional medicines and natural product formulations and channel them to industries for mass production.

Situation Analysis

Tanzania is estimated to have over 75,000 traditional healers with varying specialities. The majority of healers are herbalists using mainly plants and a few animal and mineral products. In addition, there are practices such as bone setting and socio-cultural aspects which contribute to the healing practices of traditional health practitioners. Tanzania has over 12,000 higher plant species, of which at least a quarter have medicinal value. The Institute has so far documented nearly 2600 species with limited preliminary chemical and pharmacological work. It is, indeed, true that some of plants growing in Tanzania are already proven to have medicinal value and have a big market potential worldwide and can be exploited for local drug production.

The Tanzania National Health Policy (2007) stipulates that research in traditional medicines will focus on the identification of traditional remedies, screening of traditional herbal and medicinal materials and assessing the efficacy and safety of the products.

The role of traditional and alternative health care to Tanzanian people is significant. It is estimated that about 60 per cent of the population use traditional and alternative care system for their day-to-day health care. Traditional and alternative healing services and conventional health services are complementary to each other.

Tanzania needs to take advantage of this new window of opportunity in its efforts to build a strong and competitive economy as enshrined in the Development Vision 2025.

Research Areas

HIV and AIDS

Gaps

Lack of effective herbal products in management of HIV/AIDS and associated opportunistic infections; Inadequate nutrition information to support management of HIV/AIDS patients.

Priority research areas

Treatment: Areas including; develop and evaluate novel mechanisms for determining pharmacokinetics, pharmacodynamics and acceptability of ARVs and drugs and formulations for opportunistic infections that originate from traditional medicine and natural products; optimal approaches for management of malnutrition using traditional medicine and natural products.

Prevention: Specific areas include; the potential of traditional medicines and natural products in the formulation of microbicides for prevention of new HIV infections.

Tuberculosis

Gaps

Identified gaps include; unavailability of effective traditional medicines for TB prevention and/or treatment and overwhelming anti TB Drug resistance

Priority research areas

TB treatment and care: The specific areas involve; development and evaluation of the pharmacokinetics, pharmacodynamics and acceptability of traditional medicines based new anti-tuberculosis drugs including formulations that target MDR-TB.

Malaria

Gaps

A number of areas with gaps include; scientific evidence on the safety and efficacy of herbal products traditionally used in the treatment of malaria; emergency of malaria parasites resistant to the currently available antimalarial; potential antimalarial natural products and their mechanism of actions in malaria parasites clearance; effective new and appropriate vector control tools to create an evidence-base for scaling up.

Priority research questions/areas

Prevention: Areas including; development and evaluation of existing and/or new preventive and control measures like; mosquito vector control measures (ecology manipulation included); combination preventive strategies both biomedical and multipurpose prevention technologies.

Malaria Treatment: Areas including; evaluate the pharmacokinetics, pharmacodynamics, efficacy and safety of antimalarial herbal products; potential for developing antimalarial drugs from the bioactive constituents of these herbal products.

Reproductive, Maternal, and Adolescent Health

Gaps

Deficiencies identified include; low rates of exclusive breastfeeding at 6 months and lack of evidence on the role of traditional medicines and natural products in fecundity and contraception

Priority Research Areas

Target areas include; establish the acceptability, safety and efficacy of the existing and new the traditional medicines and natural products for; contraception and management of; infertility; reproductive tract infections including STIs; labor and various pregnancy complications. Other potential areas include; harnessing the potential of integrating various culturally relevant practices with routine reproductive health care to enhance uptake of FP services and institutional deliveries.

Non-Communicable Diseases (NCD)

Gaps: The following were the identified gaps; Inadequate evidence on potential role of traditional medicines and natural products in the prevention and management of NCDs in Tanzania; inadequate regulation on the use of traditional medicines and natural products in preventing and managing NCDs in Tanzania.

Priority research areas

General: Potential areas; streamlined feasible and cost-effective strategies for discovery, development and evaluation of drugs and vaccines.

Specific Research Areas

Treatment: Specific areas; develop and evaluate the acceptability, pharmacokinetics and pharmacodynamics of novel traditional formulation and natural products for management of NCDs.

Prevention: Particular areas; role of nutritional traditional medicines and natural products in management of NCDs in Tanzania

Injuries

Gaps: Underappreciated role of traditional medicines and natural products in pre-hospital injuries management; poorly documented traditional medicines and natural products used in management of injuries

Priority research areas: Specific areas include; the role of traditional medicines and natural products in both pre- hospital and in-hospital management of injuries (bone setting, skin burns).

Emerging and Re-Emerging Infections

Gap: Lack of multidisciplinary approach and capacity that incorporate application of traditional medicine in researching and managing emerging and re-emerging infections

Priority research areas: Specific areas; role of traditional medicines in management of emerging and re-emerging infections.

Documentation of traditional healing practices and Conservation of medicinal plants

Gap: Inadequate documentation and conservation of useful medicinal plants and traditional healing practices

Priority research Areas: Specific areas; indigenous healing practices relevant for the development of traditional medicine; techniques for sustainable conservation of medicinal plants.

Theme 16: Bioethics

Bioethics – Research Oversight

Background

Tanzania is one of the countries in Africa that have managed to have a decentralized research oversight system. Under the system, institutions are able to independently oversee research activities (other than clinical research and research with foreign elements) by their members. Researchers conducting clinical research and research with foreign elements must be assessed and regulated at the national level in addition to the institutional level. Despite having a well-coordinated decentralized oversight system, there is anecdotal information showing that the system needs to be improved both at institutional level and national level.

Situational Analysis

Due to high burden of disease in Africa, there have been an increase in research conducted in the continent. Increase in the researchers conducted has not necessarily been accompanied by improvement in research oversight in Africa. Concerns are up as to the standard of oversight processes in Africa owing to the increase in the number of researches conducted in Africa.

Research Areas

Specific research areas; the pitfalls for research oversight in Tanzania; challenges facing and strategies to improve the operational environment of the national research regulatory authorities in overseeing research; establish and evaluate mechanisms and procedure for protecting vulnerable population/participants in research; feasible mechanisms for returning research results to the community/participants; design and implement ethical framework for reviewing and approving emergency research/drugs.

Bioethics – Clinical Ethics

Background

Ethical issues are common in the clinical care. Tanzania being among the middle-income country faces the shortage of human and medical resources when working with patients. Shortage of Health care providers leads to poor implementation of informed consent, patient centered care and proper privacy and confidentiality of patients. These ethical challenges require institutional support to address them. Ethical challenges that often arise in the patient-provider relationship in their day-to-day work life with patients and families, such as truth-telling, disagreements over treatment plans and patient distrust of local physicians and hospital staff, among others needs to be addressed through hospital ethics committee. Medical team is also going paperless with electronic medical record. Improved technology raises the issue of physician patient relationship and patient confidentiality.

Situational Analysis

Lack of hospital ethics committee in Tanzania results to health care providers and patients to deal with ethical dilemma all alone. There are several ethical challenges including patient autonomy and confidentiality and physician and nurses deals with them on isolated foci leading to moral distress among health care providers.

Gaps: Areas identified to have challenges include; the confidentiality of patients' electronic medical records; availability of hospital ethics committee which could help mitigate ethical issues in hospitals; boundary between individual autonomy and public good when implementing public health interventions; availability of palliative care at the end of the life.

Research Areas

Potential research areas; ethical procedures for sharing patients' electronic medical records; the dynamics and challenges of implementing patient-centred care in Tanzania; extent of moral distress among healthcare providers; mechanisms to balance public good and individual autonomy; enhancing communication within and among families and carers with terminal ill patients/people at the end of their life; exploring and evaluating best ways and timing to offer needed emotional support by patients, carers and families including one-on-one peer support, support groups, and professional counselling; effective strategies for providing impactful training and information to healthcare workers and families towards providing best care to the dying loved ones.

Theme 17: Drug Discovery and Formulation

Background

Recent decisions arrived at the World Trade Organization (WTO) forced developing countries to enter into license agreements with innovator companies to manufacture generic medicines. This means that medicines will be costly and beyond the reach of citizens in developing countries like Tanzania. This creates the need for developing countries to make their medicines. New medicines can be developed from natural sources, chemical synthesis or structural modification of the available medicines.

Drug discovery and formulation are two related specializations that can allow new medicinal products to be discovered and made into a suitable form and dosage for treatment.

Drug discovery is an interdisciplinary approach that may involve the interaction of fields of medicine, biotechnology and pharmacology, pharmacognosy and medicinal chemistry in the process of discovering new candidate medications either by identifying the active ingredient from traditional remedies or by screening large chemical libraries of small synthetic molecules, natural products or extracts which are typically screened in intact cells or whole organisms. The purpose is to identify substances that have a desirable therapeutic effect. It requires scientists with diverse and complementary skills, including medicinal chemistry, computational methods, and expertise in bioscience, structural biology, and biophysics.

With the advance of sequencing technology and release of the human genome, there is rapid cloning and synthesis of large quantities of purified proteins. This practice allows the use of high throughput screening of large compounds libraries against isolated biological targets hypothesized to be disease-modifying in a process known as reverse pharmacology. Hits from these screens are then tested in cells and then in animals for efficacy. In drug discovery, first screening hits are done, medicinal chemistry and optimization of those hits follow to increase the affinity, selectivity (to reduce the potential of side effects), efficacy/potency, metabolic stability (to increase the half-life), and oral bioavailability. Once a compound that fulfils all of these requirements has been identified, the development process can continue, and with sheer luck, clinical trials are planned.

Pharmaceutical formulation is related to drug discovery in pharmaceuticals, a process in which different chemical substances, including the active drug, are combined to produce a final medicinal product. This may include dosage formulation.

Drug formulation and formulations should seek a wide range of academic-industry and clinical partnerships to progress the research.

MUHAS has departments that are responsible for screening natural products and their formulation. In addition, there are experts in medicinal chemistry versed with the screening of chemical hits, while biotechnology and bioinformatics and pharmacology can help identify targets and bioavailability of the medicines.

Gaps: Areas with unaddressed issues include; efforts on and prioritization of vaccines and newer drugs discovery in the era of emerging viral pandemics with high

fatality rates; availability of opportunities for patenting potential natural extracts, chemical hits, or drug targets;

Priority Research Areas: Specific research areas include; screening, evaluation and formulation of known plants with medicinal values; development of food supplement from medicinal plants of medicinal values for some common neglected tropical illnesses; identification of chemical hits from the medicinal library of chemical from local plants; identification of novel biological targets using higher throughputs technologies; strategies to influence development of patentable priority medicines.

Theme 18: Knowledge Management and Informatics

Background Information

Health information is essential for health scientists to create new knowledge and advance evidence-based practice. Health Librarians are led by its association, Association of Health Information Libraries in Africa (AHILA) which was founded with the aim of improving provision of up to date and relevant health information; increase access to knowledge created by health researchers and enhancing information literacy skills among students, faculty and clinicians within health and biomedical institutions. However, studies on the extent to which health sciences librarians are engaged in research are outdated or limited in scope, having been conducted prior to developments in evidence-based librarianship (EBL). Therefore, it was noted that there is a need for the emergence of the information's role of the health sciences librarian, and information scientists which highlights the requirement of appraising and evaluating the available information to be used in enhancing healthcare services delivery; treating patient, using health information databases effectively in supporting treatment and clinical decision making in order to reduce medical errors within the health care settings.

Situation Analysis

In Tanzania, initiatives have been conducted via the Ministry of Health Development Gender, Elderly and Children (MoHCDGEC) in ensuring that information is packaged, accessed, disseminated and utilized through various channels for clinical decision making. In the year 2018 AHILA in collaboration with the MoHCDGEC joined hands with other stakeholders from health (Health Institutions, hospitals, and Non-Governmental Organizations-NGO's) and non-health institutions; Tanzania Library Service Board (TLSB), National Council for Technical Education (NACTE) by developing a curriculum for Health Information Scientists (HIS). The trained HIS professionals are responsible to assist and enable doctors, nurses and clinicians to organize, search, gather and access evidence-based information from their respective health institutions, hospitals, research centers. The idea is to improve the treatment and clinical care services by utilizing the best available evidence-based information in order to reduce medical errors.

Gap:Gaps have been identified in following areas; searching techniques and resources for systematic reviews research; competence skills in searching for health information(Identifying and recognize reputable sources of health information to the public); developing successful search strategies when information is needed; awareness on the available and accessible sources of information including health technology and other technologies for clinical decision making; adequacy of skills in evaluating information sources; competent skills in using information in critical thinking and solving problems (*how to work with information and exploit the results*); fair use of health information ethically and legally (*ethics and responsibilities on the use of information*); skills in writing for publications.

Priority Research Areas:Specific Research areas include; searching techniques and resources for systematic reviews research; access to and use of health information in delivering health care services; information seeking behavior for

students, faculty and clinicians; reliable sources of information to support health care service delivery; researchers/clinicians using health information published by researchers in solving community problems; the use of evidence-based information to support clinical queries when treating patients; library in the 21st Century; librarians assist clinicians and practitioners to access the up to date evidence based information; knowledge researchers are required to disseminate to the community for improving the healthcare services:ethics and responsibilities on the use of information.

STATUS OF RESEARCH AGENDA

This is a revised version of the MUHAS Research Agenda. The original Research Agenda was developed in 2012.

KEY STAKEHOLDERS

- i. MUHAS faculty, Postgraduate students, adjunct faculty, research associates, research chairs, and other MUHAS affiliated personnel
- ii. Associated hospitals (MUHAS Academic Medical Center, Muhimbili National Hospital, Muhimbili Orthopedics Institute, Ocean Road Cancer Institute)
- iii. Development partners
- iv. Funding Organizations
- v. Adjunct staff

APPROVAL DETAILS

The university council shall approve the Research Agenda.

ENDORSEMENT DETAILS

The University Council approved the Research Agenda on the agenda item..... In the minutes of the

Council meeting number on

RELATED LEGISLATION

MUHAS Charter of Incorporation, February 2007;4 (ii), (k), (q)

RELATED POLICIES

- i. Research Policy guidelines (2020)
- ii. Intellectual Property Rights Policy (2018)
- iii. Institutional Animal Care and Use Policy and Procedures (2020)

EFFECTIVE DATE FOR THE RESEARCH AGENDA

Unless otherwise determined by the approving body, the research agenda shall become effective from the

date it is approved by the University Senate.

NEXT REVIEW DATE

Three years after approval and when deemed necessary.

POLICY OWNER

Muhimbili University of Health and Allied Sciences Council.

POLICY AUTHOR

The Directorate of research and Publications of the University.

CONTACT PERSON

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