

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED  
SCIENCES (MUHAS) - DAR ES SALAAM TANZANIA**



**Promoting the ‘phase down’ Approach of Dental Amalgam  
in Developing Countries – Tanzania**

**FINAL PROJECT REPORT**

**OCTOBER 2014**

**Sponsored by: UNEP,**



**In collaboration with WHO, FDI & IDM**



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## **EXECUTIVE SUMMARY**

The United Nations Environment Programme (UNEP) and the World Health Organization (WHO) in collaboration with the World Dental Federation (FDI) and the International Association of Dental Manufacturers (IDM) implemented a demonstration project for phasing down the use of dental amalgam in three Anglophone countries of East Africa: Kenya, Tanzania and Uganda. This report gives account of the implementation of the project in Tanzania.

The East Africa Dental Amalgam Phase-Down Project (EADAP) was divided into two groups of activities: Those that were carried out centrally for the three countries and those carried out at country levels either independently or in collaboration with the participating countries. Centrally organized activities included a study on trade flows in dental amalgam and its alternatives as well as dental amalgam waste management practices. Tanzania participated by distributing the questionnaires to dental practitioners and suppliers of dental materials and by submitting the questionnaire to iLima which was responsible for this project component. Activities carried out at country level included selection of national project coordinator and social preparation, institutional arrangements, stakeholders/interagency meetings, and selection of three demonstration dental health clinics (one government hospital/facility, one private clinic and one University/teaching hospital). Other activities included coordination with local waste management providers/companies, capacity building/training of trainers in the dental health sector, and demonstration of best practices in the environmentally sound management of dental amalgam waste. The activities also included validation of the results of the trade study on dental amalgam and its alternatives, development of awareness raising materials on available alternatives for dental restoration, to promote preventive dental care and to encourage appropriate use of alternative materials, and a results workshop. The results workshop took place in Dar es Salaam in November 2013. It convened participants representing UNEP, WHO, FDI and IDM as well as members from all three participating East African countries. The purpose was to present results of the project. Participants discussed project results and lessons learned for dissemination to other developing countries, thereby exploring the phase down approach in more detail. Tanzania also participated in the inception workshop, which was conducted in Nairobi, Kenya, and the Training of Trainers' workshop, which was conducted in Kampala, Uganda.

With the exception of the awareness raising activities that aimed at promoting preventive dental care and encouraging a switch to alternative materials for dental restoration, all other activities were carried out successfully. The preparation of awareness raising materials in form of brochures were not completed timely by the WHO and its production relied on each implementing country budget, therefore the brochures could not be produced and therefore not circulated as it was planned. All sectors, namely the Vice President's Office, the Division of Environment, the Ministry of Health and Social Welfare, the Muhimbili University of Health and Allied Sciences, the Government Chemist and Laboratory Agency (GCLA) and the Tanzania Dental Association, participated in all the activities. During the meetings and training session, participants were enthusiastic and active.

The main challenges encountered were:

- i. Difficulty to organize training workshops on working days
- ii. Unwillingness of dental suppliers to participate in the validation study
- iii. Delays in producing the awareness raising materials.
- iv. High cost of amalgam separators.
- v. Difficulty to implement environmentally sound disposal of mercury waste.

During this project it was feasible to demonstrate best management practices (BMPs) for dental amalgam in developing countries like Tanzania. The main challenges are the cost of amalgam separators and the feasibility of ensuring the environmentally sound disposal of amalgam waste. Tanzania as other developing countries allocates meager funds to run the health sector. Hence it would be difficult to purchase an amalgam separator for each dental clinic at public facilities in the country while for the private clinics they need an advocacy on this matter. Regarding amalgam disposal, we did not manage to get a local company that would be responsible to handle waste containing mercury from health facilities based on the current managing rules.

We recommend an extension of the project to cover the whole country. At the minimum, dental personnel should be sensitized and educated on the health and environmental effects of mercury as well as BMPs for dental amalgam.

## 1.0 INTRODUCTION

### 1.1 Background

Mercury is a chemical element with the symbol Hg. It is a metal that is liquid at standard conditions for temperature and pressure. It is a naturally occurring element and exists in various forms: elemental (metallic), inorganic and organic form. Mercury occurs in deposits throughout the world mostly as cinnabar (mercuric sulfide). The red pigment vermilion, a pure form of mercuric sulfide, is mostly obtained by reaction of mercury (produced by reduction from cinnabar) with sulfur. It is used in thermometers, barometers, manometers, sphygmomanometers, float valves, mercury switches, and other devices. Other items containing mercury still being produced are dental amalgam, chloro alkali, batteries, electrical and electronic devices and fluorescents lamps. Mercury is still being used in ASGM and industries producing vinyl chloride monomers (VCM).

Due to its toxicity, mercury has been listed by the WHO among the ten chemicals of major public health concern. In the medical practice currently mercury thermometers and sphygmomanometers are being largely phased out in clinical environments in favor of alcohol-filled, galinstan-filled, digital, or thermistor-based instruments.

The largest sources of mercury pollution include metal smelting, chlorine chemical plants, cement plants, etc. Artisanal and Small Scale Gold Mining (ASGM) is also a significant source of mercury pollution in the world. Mercury pollution will likely continue to grow for years to come because power hungry economies such as China and India rely heavily on coal power plants to drive their economies forward which will lead to an increased coal-burning.

Because it is an element, mercury is not biodegradable. It is converted among its various forms through a range of abiotic and biogeochemical transformations and during atmospheric transportation. Although its form and availability to living organisms may change over time, mercury persists in the environment. A very important factor in the

impacts of mercury on the environment is its ability to build up in organisms and accumulate up along the food chain. Although all forms of mercury can accumulate to some degree, methyl mercury is absorbed and accumulates to a greater extent than other forms. Inorganic mercury can also be absorbed, but is generally taken up at a slower rate and with lower efficiency than is methyl mercury. The bio magnification of methyl mercury has the most significant influence on the impact on animals and humans. Fish appear to bind methyl mercury strongly, with nearly 100% of mercury that bio accumulates in predator fish being methyl mercury.

People are affected by the elemental (metallic) and inorganic forms of mercury through workplace exposure while the organic form (methyl mercury) enters the human body via ingestion of contaminated food such as fish. The degree of toxicity of these forms differs as well as the extent of the effects they cause on various organs or systems in the body like central nervous system, digestive, immune system, lungs, skin and eyes (Mercury and health, WHO fact sheet).

For fetuses, infants, and children, the primary health effect of methyl mercury is impaired neurological development. Methyl mercury exposure in the womb, which can result from a mother's consumption of fish and shellfish containing methyl mercury, can adversely affect a baby's growing brain and nervous system. Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills have been seen in children exposed to methyl mercury in the womb.

In addition to the subtle impairments noted above, symptoms of methyl mercury poisoning may include; impairment of the peripheral vision; disturbances in sensations ("pins and needles" feelings, usually in the hands, feet, and around the mouth); lack of coordination of movements; impairment of speech, hearing, and walking; and muscle weakness.

The rising health and environmental effects are of concern at both national and international levels and the anticipated further increase in exposure motivated UN

delegates from over 90 countries to sign the Minamata Convention on Mercury on 10 October 2013 in Japan.

The Convention will enter into force on the ninetieth day after the date of deposit of the fiftieth instrument of ratification, acceptance, approval or accession. The Convention is named after the Japanese city of Minamata where serious health damage occurred as a result of mercury pollution in the mid-20<sup>th</sup> Century. The objective of the Minamata Convention is to protect human health and the environment from mercury pollution and releases. Among others, it establishes controls and reductions across a range of products, processes and industries where mercury is used, released or emitted.

Dental amalgam is a material used for dental fillings. It is an alloy of mercury with various metals. It commonly consists of mercury (50%), silver (~22-32%), tin (~14%), copper (~8%), and other trace metals (Materials, Ferracane). Amalgam is the dental restorative material of choice in many countries due to its low cost, ease of application, strength, and durability. It has been successfully used for over 150 years. Recently however, its popularity has diminished somewhat. Concern for aesthetics, environmental pollution, health, and the availability of improved, reliable, composite materials have all contributed.

In particular, concerns about the toxicity of mercury have made its use increasingly controversial. In the context of a plan to phase out the use of mercury, Sweden, Norway and Denmark have deliberated in 2008 a ban of mercury dental amalgam, substituting it with composite fillings. According to the Swedish authorities, the Swedish amalgam ban is motivated by both environmental and health concerns.

## **2. Project Objectives**

The project was divided into two phases.

2.1 Phase one had two objectives:

- i. Investigate the current supply and trade of dental amalgam and alternative materials and make recommendations for future information systems

- ii. Assess the current waste management practices in the three East African countries (Kenya, Uganda and Tanzania)
- 2.2 Phase two also had two objectives:
- i. Create awareness of the importance of preventive dental care and encourage a switch to appropriate alternatives to dental amalgam, when clinically indicated, among dentists and patients
  - ii. Demonstrate environmentally sound management of dental amalgam waste in selected dental facilities in the three countries.

### **3. PROJECT DESIGN/METHODOLOGY**

The United Nations Environment Programme (UNEP) and the World Health Organization (WHO) implemented demonstration projects for phasing down the use of dental amalgam in different regions of the world. In Africa, this project component was implemented in three Anglophone countries of East Africa: Kenya, Tanzania and Uganda. Implementation was done through collaboration between UNEP, WHO, the World Dental Federation (FDI) and the International Association of Dental Manufacturers (IDM). The project dealt with those stages of the life-cycle of dental amalgam pertinent to UNEP's mandate, in particular its potential for environmental releases during trade and supply, its environmental releases from dental clinics, and its environmentally sound management as waste. In terms of modalities, the WHO was responsible for oral health promotion and disease prevention activities. While the participating countries promoted amalgam best management practices (BMPs), and encouraged a switch to alternative dental restoration materials.

### **4. PROJECT COMPONENTS AND STRATEGY/ACTIVITIES**

The project was divided into activities that were carried out centrally for the three countries and those carried out at country levels either independently or together with the participating countries.

- 4.1 Centrally organized activities involved an investigation of the study on trade in dental amalgam and its alternatives as well as dental amalgam waste management practices. Tanzania participated by distributing the questionnaires to dental practitioners and

suppliers of dental materials. The questionnaires were submitted to iLima which was responsible for this part of the project.

#### 4.2 Activities carried out at country level include:

- 4.2.1 Selection of a national project coordinator and identification of project team members from the participating institutions
- 4.2.2 Institutional arrangements
- 4.2.3 Development of awareness raising materials on available alternatives for dental restoration
- 4.2.4 Inception and Training of Trainers workshops
- 4.2.5 Stakeholders/interagency meetings to present the trade and waste survey results and proposed demonstrations in the phase down approach
- 4.2.6 Selection of 3 demonstration dental health clinics (one government hospital/facility, one private clinic, and one University/teaching hospital) based on criteria set by WHO and IDM
- 4.2.7 Coordination with local waste management providers/companies
- 4.2.8 Capacity building/Training of Trainers of the dental health sector on oral health promotion, clinical preventive dentistry, and in the environmentally sound management of dental materials waste, using training materials developed by WHO, FDI and IDM
- 4.2.9 Demonstration of best practices in the environmentally sound management of dental amalgam waste: source reduction, use of dental amalgam separators, collection of waste, take back of contaminated capsules by manufacturers/recyclers, on-site storage, and, where treatment facilities exist, the treatment of contaminated sludge
- 4.2.10 Development of awareness raising materials on available alternatives for dental restoration to promote preventive dental care and encourage appropriate use of alternative materials for dental restoration amongst patients and dentists
- 4.2.11 Validation of phase one study results 4.2.13 A results dissemination workshop. This workshop was conducted in Dar es Salaam in November 2013. It convened collaborators representing UNEP, WHO, FDI and IDM as well as members from all three participating East African countries. The purpose was to present results of the project. Participants

discussed project results and lessons learned for dissemination to other developing countries, thereby exploring the phase down approach in more detail.

## **5. OUTPUT/RESULTS**

### **5.1 IMPLEMENTATION OF THE AMALGAM “PHASE DOWN” PROJECT IN TANZANIA**

Tanzania through the Muhimbili University of Health and Allied Sciences (MUHAS), School of Dentistry implemented a Small Scale Funded Project titled “Amalgam Phase down Project”.

#### **5.2 Project Organizing Team**

In order to coordinate the day-to-day project activities, an organizing team was established comprised of representatives from stakeholder institutions. The members of the team were from:

- Muhimbili University of Health and Allied Sciences (MUHAS)
- MUHAS WHO Collaborating Centre for Primary Oral Health Care, Planning & Research
- Vice President’s Office, Division of Environment
- Ministry of Health and Social Welfare
- Government Chemist and Laboratory Agency (GCLA) and
- Tanzania Dental Association.

#### **5.3 Project activities Implementation**

The following activities were implemented.

- i. Validation of phase one study results and revision, where necessary of the national mercury inventories (January 2013)
- ii. Selection of 3 demonstration dental health clinics (one representing government hospital/facility, one private clinic, one University/teaching hospital) based on criteria set by IDM (January 2013)

- iii. Stakeholders’/interagency meeting to present the current supply and trade of dental amalgam study and proposed demonstrations in the phase down, February 2013.
- iv. Training of trainer’s workshop (March 2013)
- v. Capacity building/training of the dental health sector in the environmentally sound management of dental amalgam waste using training materials developed by WHO, FDI and IDM (April 2013)
- vi. Coordination with local waste management provider/company (March 2013)
- vii. Demonstration of best practices in the environmentally sound management of dental amalgam waste: source reduction, use of dental amalgam separators, collection of waste, take back of contaminated capsules by manufacturers/recyclers, on-site storage, and, where treatment facilities exist, the treatment of contaminated sludge (May 2013 ongoing)
- viii. Awareness raising activities to promote preventive dental care and encourage a switch to alternative materials for dental restoration amongst patients and dentists (March 2013, still ongoing)
- ix. Results Dissemination Workshop (November 2013)

### **5.3.1 Validation of desk study results (trade and waste survey) and revision, where necessary, of the national mercury inventory**

The activity proceeded slowly. Participants were reluctant to respond to the questionnaire. Ultimately, 15 questionnaires from dental practitioners were returned. None of the dental suppliers was willing to fill in the questionnaire for the second time for validation purposes.

### **5.3.2 Selection of 3 Dental Health Clinics for Demonstration**

Three dental clinics were selected according to the project guidelines:

- Amana Hospital, a Government Regional Referral Hospital–Dar es Salaam
- Muhimbili University of Health and Allied Sciences, Dental Clinics representing the Government Training and Research institution
- Shree Hindu Mandal Hospital, representing private Hospitals

### **Stakeholders/interagency meeting**

The meeting was conducted on Wednesday 13<sup>th</sup> March 2013. The guest of honour was Prof. Mainen Moshi, Director for Research and Publications – MUHAS. The participants to the meeting were from:

- Vice President's Office, Ms. Magdalena Mtenga, Assistant Director of Environment
- Ministry of Health and Social Welfare, Dr. Ahadiel Senkoro, Chief Dental Officer
- Muhimbili University of Health and Allied Sciences, Dr. Elison Simon, Dean, School of Dentistry
- Government Chemist Laboratory Agency, Prof. Samwel Manyele, Chief Government Chemist, Registrar of Industrial & Consumer Chemicals; and Ms. Josephine Kalima, Ag: Director, Chemicals Management Department
- Tanzania Foods and Drugs Authority (TFDA), Dr. Danstan Hipolite

The meeting aimed to create awareness among decision makers and key players in the Amalgam Phase down Project on the control of mercury. In order to meet the intended objectives, the following papers were presented:

- Overview of Global Concern of Mercury
- Overview of the Minamata Convention on Mercury
- Overview of the Amalgam Phase Down Project in Tanzania

#### **5.3.3.1 Key issues raised at the stakeholders meeting**

- As regards the decision to base the proposal on a phase down approach, rather than phase out, It was informed and agreed that:
  - The use of dental amalgam has to be phased down slowly as it is still used in situations where alternatives are not yet well utilized.
  - Most dentists were taught to use amalgam rather than other alternatives. The phase down approach will allow time for in-service dentists to acquire the necessary knowledge and skill for alternative dental filling materials.

- The dental amalgam phase down approach is recommended in the Minamata Convention on Mercury.
- Participants voiced their concern that all three selected clinics are located in Dar es Salaam.
  - It was informed that the criteria for selection were guided by the funds provided for the project and the project duration.
- Participants wanted to know the function mechanisms of the amalgam separator and whether the separator has any specific materials for separation.
  - It was informed that the separator has no specific material for separation of the mercury waste and other substances; instead, the process is through sedimentation.
- Participants wanted to know if mercury can be extracted from the waste and recycled.
  - It was informed that Mercury can be recycled but that the process is very cumbersome and expensive. Worldwide there are a few countries (such as The United States of America, Australia, Germany, Switzerland and Japan) doing the recycling process.
- Participants raised their concern that the mercury imported for dental amalgam might be diverted for use in ASGM.
  - The issue was noted with concern; however, it was informed that currently dental amalgam is imported in the form of capsules, which should make it difficult to extract the mercury for use in mining.
- Participants wanted to know the currently available disposal methods for amalgam waste.
  - It was informed that currently there are no known environmentally sound methods for disposal of dental amalgam wastes, apart from the recycling process which is very difficult.

**5.3.3.2** In concluding the workshop, participants discussed and recommended the following as the way forward:

- To work together with TFDA and Tanzania Revenue Authority (TRA) in controlling mercury ordered for dental use but diverged to unlawful use.
- The Coordinator is to finalize registration of the project with the office of the Director, Research and Publications – MUHAS.
- Work together to promote the phase down of dental amalgam.

### **5.3.3 Training of Trainers workshop**

The training of trainer's workshop was conducted from 6<sup>th</sup> – 7<sup>th</sup> March 2013 in Kampala Uganda and was attended by Prof. Febronia Kahabuka, Dr. Emeria Mugonzibwa and Mr. Haruna Matwili from Muhimbili University of Health and Allied Sciences, and Dr. Msafiri N. Kabulwa from the Ministry of Health and Social Welfare, Oral Health Section. The purpose was to train the trainers in the environmentally sound management of dental amalgam waste. The workshop was sponsored by FDI. The following series of training modules were presented.

- i. Mercury life cycle, impacts , the UNEP Global Mercury Partnerships and the Minamata Convention on Mercury;
- ii. BMP for dental restorative materials, usage and environmentally sound waste management
- iii. Information on the alternative dental restorative materials; and
- iv. Clinical preventive dentistry

The trained participants in turn used the knowledge gained to build capacity by training the dental health care personnel at the three demonstration sites on sound management of dental amalgam using training materials developed by the WHO, FDI and IDM.

### **5.3.4 Capacity building/training of the dental health sector**

The capacity building training of dental health care personnel and installation of the amalgam separators was done at the three demonstration sites. The details of the training are described below.

#### **5.3.4.1 Topics covered during the training**

At all three sites, the following topics were taught:

- i. Mercury - global health, environmental concern, life cycle and use in dentistry;
- ii. Overview of the Minamata Convention on Mercury;
- iii. BMPs for dental amalgam usage and environmentally sound waste management;
- iv. Community and clinical preventive dentistry;
- v. Alternative materials for dental restorative materials; and
- vi. Practical demonstration of BMPs for dental amalgam usage and environmentally sound waste management.

#### **5.3.4.2 Training at Amana Regional Referral Hospital**

Training at the Amana Hospital was done on Wednesday 10<sup>th</sup> April 2013. It was led by Dr. Ahadiel Senkoro, Chief Dental Officer. Six staff attended the training.

#### **5.3.4.3 Training at Shree Hindu Mandal Hospital**

Training at Hindu Mandal Hospital was done on Wednesday 17<sup>th</sup> April 2013. Dr. Samwel Ogillo, Chief Executive Officer of the Association of Private Health Facilities in Tanzania (APHFTA), was the guest of honour at this meeting. Six staff attended the training.

#### **5.3.4.4 Training at MUHAS**

The guest of honour at the Muhimbili training was Prof. Mainen Moshi, Director for Research and Publications – MUHAS. The training was done on Wednesday 1<sup>st</sup> May 2013. Twenty five staff attended the training

#### **5.3.4.5 Key issues and recommendations from the trainees at the three sites**

- i. The Amalgam separators are expensive. It may take some time before the hospitals include them in their budgets. Sustainability appeared to be the main challenge. Request the project to provide separators for one more year.
- ii. Oral health care providers in service need training to empower them in the use of alternative dental materials.

- iii. The strength and longevity of alternative dental materials in comparison to amalgam raise concern among many practicing dentists.
- iv. There is a need to raise awareness among all dental practitioners in Tanzania on mercury and its health effects.
- v. To explore mercury said to have been ordered for dental use but diverged to other sectors.
- vi. What is the fate of patients with amalgam fillings?
- vii. How to control smell in the container with amalgam waste?
- viii. How to dispose gloves used during amalgam fillings?
- ix. Is there a possibility to know if the separator is full without having to weigh it or to wait for one year?
- x. Lack of assurance in the availability of a non chlorine containing disinfectant that is listed in the Medical Store Department (MSD) for sustainable supply.
- xi. Most fluoridated toothpaste sold in Tanzania has a low concentration of bio available fluoride to achieve the expected cariostatic effect.

### **5.3.5 Coordination with local waste management provider/company**

Two local waste management companies have been contacted. The first joint meeting was conducted on Friday 17<sup>th</sup> May 2013 between the EADAP project team and Ms. Elizabeth Scheepers, Operations Manager of Green Waste Pro Ltd. The company is dealing with municipal waste management in Dar es Salaam City, Ilala District.

During the meeting, members discussed general issues related to waste management practices, including mercury waste. However, Ms. Scheepers informed the team about the challenges they are facing in waste management practices, which include inadequate infrastructure for transportation and disposal of hazardous waste, liquid waste and other waste. She said that according to current practices all wastes collected from various sources are mixed and crude dumped at Pugu Kinyamwezi. This kind of waste management practice may pose high risks to health and the environment. She is knowledgeable of hazards of mercury waste and she indicated the interest of being

involved in project activities such as collection of mercury wastes, but at the moment she is not in a position to do so because no environmentally sound disposal site for such waste is available in the country. The team agreed on the following steps as the way forward:-

- To liaise with the Dar es Salaam City Council to provide and develop environmentally sound storage/disposal sites for hazardous waste, including mercury waste.
- To explore the possibility of utilizing existing international companies that deal with recovery and recycling of mercury waste.

The Second joint meeting was conducted on Wednesday 29<sup>th</sup> May 2013 between the EADAP project team and Mr. Innocent Macha, Director of Eco Protection Tanzania Ltd. of Kinondoni District. The company is willing to partner with the project in handling the amalgam waste but this can only be realised after addressing the following issues;

- A Tanzanian law which prohibits the collection of hazardous waste by private companies. The company needs a special permit to be able to deal with mercury waste.
- The quantity of waste produced should be known for the company to make required preparations.
- Identifying an institution responsible to pay for the collection of the dental waste containing mercury.

### **5.3.6 Demonstration of best practices in the environmentally sound management of dental amalgam waste**

The trained dental practitioners at the three demonstration sites implement BMPs for amalgam waste. The team carried out supervisory visits at the three demonstration clinics to monitor implementation of the BMP for dental amalgam and the status of the amalgam separators. During the supervisory visits, evaluation of the implementation of BMP for dental amalgam was done by project group members using a check list that was prepared for this purpose.

### **5.3.7 Awareness raising activities to promote preventive dental care and encourage a switch to alternative materials for dental restoration**

The awareness raising materials were prepared in collaboration with the three participating countries, WHO and UNEP. This process delayed the start of the activity. However the final version has been received and is with the printer. The printed materials will be distributed accordingly.

### **5.3.9 Results Dissemination Workshop**

The results dissemination workshop was conducted in Dar es Salaam, Tanzania on 5<sup>th</sup> to 6<sup>th</sup> November 2013.

The objective of the result dissemination workshop was to inform participants on the EADAP project in Kenya, Uganda and Tanzania on:

- The supply and trade flow data of dental restorative materials, especially amalgam
- Dental amalgam waste management practices
- Potential for political and professional attitude change in relation to phasing out the use of mercury containing products

The presentations covered the following issues:

- Global partners for the dental amalgam phase down: UNEP, WHO, FDI and IDM on their role in the project
- Project implementing countries on institutional arrangements, activities done and validation of data on trade flow of dental materials including amalgam and waste management.
- Setting down an action plan for project sustainability in each project implementing country

#### **Main Issues**

- i. The project preliminary findings have shown that the three governments have political will, professionally accepted ideology, and involvement of important

national institutions, including national dental associations, universities, ministries of health and environment, and others.

- ii. The demonstration project has been able to show that it is possible to practice BMPs for amalgam waste in the East African region settings so as to reduce environmental pollution with mercury.
- iii. The dental health care providers from the demonstration clinics should be supported and assisted in phasing down the use of dental amalgam in dentistry. The project demonstration clinics have created focal areas for awareness and learning among colleagues within the facilities and beyond.
- iv. Even though all three countries showed readiness for implementing this project, the oral health sector has allocated meager funds in all three countries, meaning that adoption and sustainability of the project ideology will be challenged.
- v. The participating countries will be provided with separators for replacement after one year since installation.
- vi. The Separators will be shipped to the U.S. for analysis of the amount of mercury that was trapped.

## **6. CHALLENGES AND OPPORTUNITIES**

With the exception of the awareness raising activities to promote preventive dental care and encourage a switch to alternative materials for dental restoration, all other activities were carried out as planned. All stakeholders, namely Vice President's Office, Division of Environment, Ministry of Health and Social Welfare, Muhimbili University of Health and Allied Sciences, Government Chemist and Laboratory Agency (GCLA), and Tanzania Dental Association, participated in all the activities. Participants were enthusiastic and active during all meetings and training sessions.

The main challenges encountered were:

- i. Difficulty to organize training workshops during working days:
  - a. In order to ensure that all staff and students are trained, additional training workshops were organized to be conducted during public holidays and utilize the regular symposium timetable

- ii. Unwillingness of dental suppliers to participate in the validation study
- iii. Delays in producing the awareness raising materials
- iv. High cost of amalgam separators
- v. Difficulty to implement environmentally sound disposal of mercury waste

## 7. LESSONS LEARNED

Implementation of the pilot project “Promoting the ‘phase down’ approach of dental amalgam in developing countries – Tanzania” offered the following lessons:

- i. Coordination and collaboration of different stakeholders facilitated the project implementation.
- ii. Dental personnel were cooperative in implementing the project.
- iii. The government has shown political will in implementing the project as well as the ‘phase down’ approach of dental amalgam.
- iv. Awareness raising of all dental practitioners as well as patients on the health and environmental effects of mercury is necessary in promoting the ‘phase down’ approach of dental amalgam.
- v. Through capacity building by training dental practitioners, it is possible to practice best management of amalgam waste in the country to reduce environmental pollution with mercury.
- vi. Dental suppliers were reluctant to participate in the validation of the study although they were assured that there will not be any implications. Therefore, the suppliers and practitioners needed to be educated on the importance of filling the validation questionnaire.
- vii. Organization of training workshops during weekdays was at times a problem. Therefore, in order to capture a bigger audience, it was necessary to organize the workshops during weekends.
- viii. Delays in producing awareness raising materials interrupted timely completion of the project.
- ix. Due to the high cost of separators, sustainability of the usage of amalgam separators in the selected clinics and other clinics might be difficult.

- x. Untimely release of funds caused a lot of hurdle and also delays in accomplishing the planned objectives.

## **8. CONCLUSIONS AND RECOMMENDATIONS**

It is feasible to demonstrate BMPs for dental amalgam in developing countries like Tanzania. The main challenges are the cost of amalgam separators and the feasibility of ensuring the environmentally sound disposal of amalgam waste.

We recommend an extension of the project to cover the whole country. At the minimum, dental personnel should be sensitized and educated on the health and environmental effects of mercury as well as BMPs for dental amalgam.

## **9. REFERENCES**

1. Chemicals of public health concern  
[http://www.who.int/ipcs/assessment/public\\_health/chemicals\\_phc/en/index.html](http://www.who.int/ipcs/assessment/public_health/chemicals_phc/en/index.html)
2. Mercury and health, WHO fact sheet,  
<http://www.who.int/mediacentre/factsheets/fs361/en/>
3. Health Effects – Mercury <http://www.epa.gov/hg/effects.htm>
4. Minamata Convention on Mercury, <http://www.mercuryconvention.org>

## **10. Appendices (Attached)**

1. Programme
2. Speeches
3. Attendance list
4. Photos
5. Sustainability plan
6. Financial report